



Technical Support Document for Environmental Proofing of Investments funded under the InvestEU Programme

Project Ref. ENV.F.1/FRA/2019/0001

Written by Meg Postle (RPA Europe S.R.L.)
Elizabeth Daly, Emma Carey (Risk & Policy Analysts Ltd)
Rima Rumbauskaitė, Marco Camboni (RPA Europe S.R.L.)
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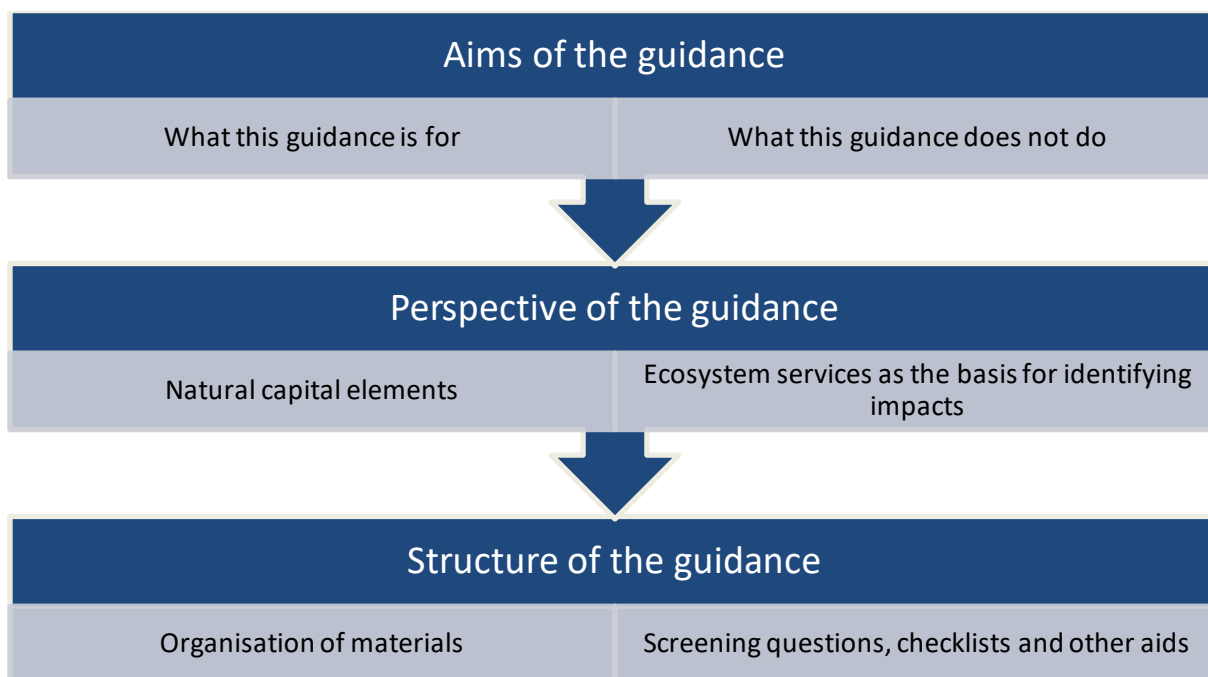
Table of Contents

1	Introduction to the Technical Support Guidance	1
1.1	Aims of this supporting guidance	1
1.2	Perspective	2
1.3	Structure	2
1.4	Organisation	3
2	The Analytical Process	4
2.1	Activities requiring InvestEU screening and environmental proofing	4
2.2	Scope of requirements	5
2.3	Risk-based approach to identifying proofing requirements	6
2.4	The InvestEU screening and environmental proofing process	9
2.5	Roles and Responsibilities	11
2.6	Impact categories	13
2.7	Mitigation of impacts	17
2.8	Quantification and monetary valuation of environmental impacts	18
3	Compliance Checking	23
3.1	Introduction	23
3.2	Compliance with EU and national legislation	23
3.3	General principles	24
3.4	Key directives for compliance checks	24
3.5	Outputs of the compliance check	27
4	Air	29
4.1	Overview	29
4.2	Step 1: Identify if the project needs to go through sustainability proofing for impacts on air quality	34
4.3	Step 2: Analysis of impacts	37
4.4	Step 3: Monetary valuation of environmental impacts	38
4.5	Step 4: Review and reporting	44
5	Water	46
5.1	Overview	46
5.2	Step 1: Identify if the project needs to go through sustainability proofing	53
5.3	Step 2: Analysis of impacts	57
5.4	Step 3: Monetary valuation of environmental impacts	60
5.5	Step 4: Review and reporting	66

6	Land	68
6.1	Overview	68
6.2	Step 1: Identify if the project needs to go through sustainability proofing for land and soil.....	74
6.3	Step 2: Analysis of impacts.....	77
6.4	Step 3: Monetary valuation of environmental impacts.....	77
6.5	Step 4: Review and reporting	80
7	Biodiversity	82
7.1	Overview	82
7.2	Step 1: Identify if the project needs to go through proofing for impacts on biodiversity	88
7.3	Step 2: Analysis of impacts.....	92
7.4	Step 3: Monetary valuation of environmental impacts.....	94
7.5	Step 4: Review and reporting	95
8	Cross-Cutting Impacts	97
8.1	Overview	97
8.2	Step 1: Identify if the project needs to go through proofing	104
8.3	Step 2: Analysis of impacts.....	106
8.4	Step 3: Monetary valuation of environmental impacts.....	108
8.5	Step 4: Review and reporting	111
	Annex 1 Legal Compliance Check	112
	Annex 2 Resources to Air	117
	Annex 3 Resources to Water	126
	Annex 4 Resources to Land	144
	Annex 5 Resources to Biodiversity	165
	Annex 6 Resources to Cross-cutting impacts	180
	Annex 7 IP Master Checklist	189

1 Introduction to the Technical Support Guidance

1.1 Aims of this supporting guidance



This is a technical support document aimed at helping InvestEU Implementing Partners (IPs), financial intermediaries and project promoters/final recipients to perform the screening and proofing required in accordance with the Commission’s “Technical Guidance on Sustainability Proofing for the InvestEU Fund”. Whilst all efforts have been made to ensure consistency between the two documents, in case of inconsistency the Commission’s “Technical Guidance on Sustainability Proofing for the InvestEU Fund” takes precedence over this support document.

The focus is on environmental proofing, where this requires consideration of the potential impacts of an investment on the different elements of natural capital: air, water (fresh and marine), land and biodiversity. Proofing as a process also involves consideration of mitigation measures to reduce environmental impacts, as well as consideration of the opportunities to improve the project’s environmental performance.

Whilst this technical support document focuses on the environmental dimension, it complements guidance and support documents on the climate and social dimensions. These three dimensions need to be dealt with in an integrated manner. This document is also not meant to be prescriptive: it provides guidance, but analysis always needs to respond to the circumstances of the individual project and changes in the overall framework for sustainability proofing.

This support document has been developed to provide IPs, financial intermediaries and project promoters / final recipients with a common framework for assessing the environmental impacts of projects and activities financed through InvestEU, while also allowing the flexibility necessary to assess a wide spectrum of investments and to respect the established assessment procedures of the more experienced IPs. It is of particular value for those IPs that have not previously managed funds for the Investment Plan for Europe and may not have procedures in place to assess the potential environmental impacts of the projects to be financed.

The framework takes into account:

- whether the project to be financed falls under the Environmental Impact Assessment Directive (EIA Directive), which places assessment requirements on project promoters to minimise the environmental impacts of projects; and
- whether the potential environmental impacts are likely to be significant, as determined by consideration of the information generated in response to requirements under the EIA Directive (which may be complemented by assessments under other EU directives/regulations).

In so doing, it may also help project promoters understand the type of review that will be carried out by IPs and financial intermediaries under InvestEU, and related requirements.

The ultimate objective of this supporting document is to ensure that investments deliver economic development that is environmentally sustainable. This means that lenders and project promoters need to have considered how to mitigate the environmental impacts of the proposed project, and report on any remaining impacts on the environment (air, water, land, biodiversity, together comprising natural capital) and the associated consequences for people's wellbeing.

1.2 Perspective

This support document is organised around the four elements of natural capital: Air, Water, Land and Biodiversity. In addition, cross-cutting impacts are taken into account, including noise and vibration, odour, light and safety.

It draws on the methodologies, tools and techniques already used in assessing impacts under each of the four elements. It builds on the requirements that exist under the EIA Directive, together with "good" practice in general within the overall field of environmental impact assessment. As practice is improving over time, it is recognised that some of the specific tools and techniques will also improve after this support document is made available. It is designed to be proportionate to the potential impacts, and set out an approach that does not lead to unnecessary administrative costs.

In some cases, good practice combined with proportionality (possible and reasonable depth of analysis) may result in minimal proofing requirements, where a project would give rise to no significant residual impacts. In other cases, where impacts may be significant, it will involve providing a more detailed qualitative/ quantitative assessment of residual impacts, to allow IPs to review the environmental sustainability of the project and/or identify the potential need for further mitigation measures. For projects giving rise to significant environmental impacts, undertaking monetary valuation of those impacts could be proportionate where the data allow and where reliable valuation methods exist for such purposes.

1.3 Structure

The Commission's Sustainability Proofing Guidance provides a checklist of the information to be assessed and provided by IPs and financial intermediaries when carrying out their own sustainability proofing, based on the assumption that either they will develop this information or require it from the project promoter or final recipient of the financing. IPs and intermediaries may therefore wish to ensure that project promoters / final recipients also have a clear understanding of the type of appraisal that will be expected within the context of InvestEU.

This support document has been developed to help in the following ways:

- Extended screening checklists are included to help guide users in determining whether or not proofing is required for a particular project, by supporting the identification of potentially significant residual impacts;
- Example summary tables are given to illustrate the information that should be reported as part of the proofing phase, where proofing is required;
- Guidance that could be used to quantify impacts for the several elements and enable the incorporation of related monetary values into the projects' economic appraisals; and
- Hyperlinks are provided to various useful reference and data sources.

1.4 Organisation

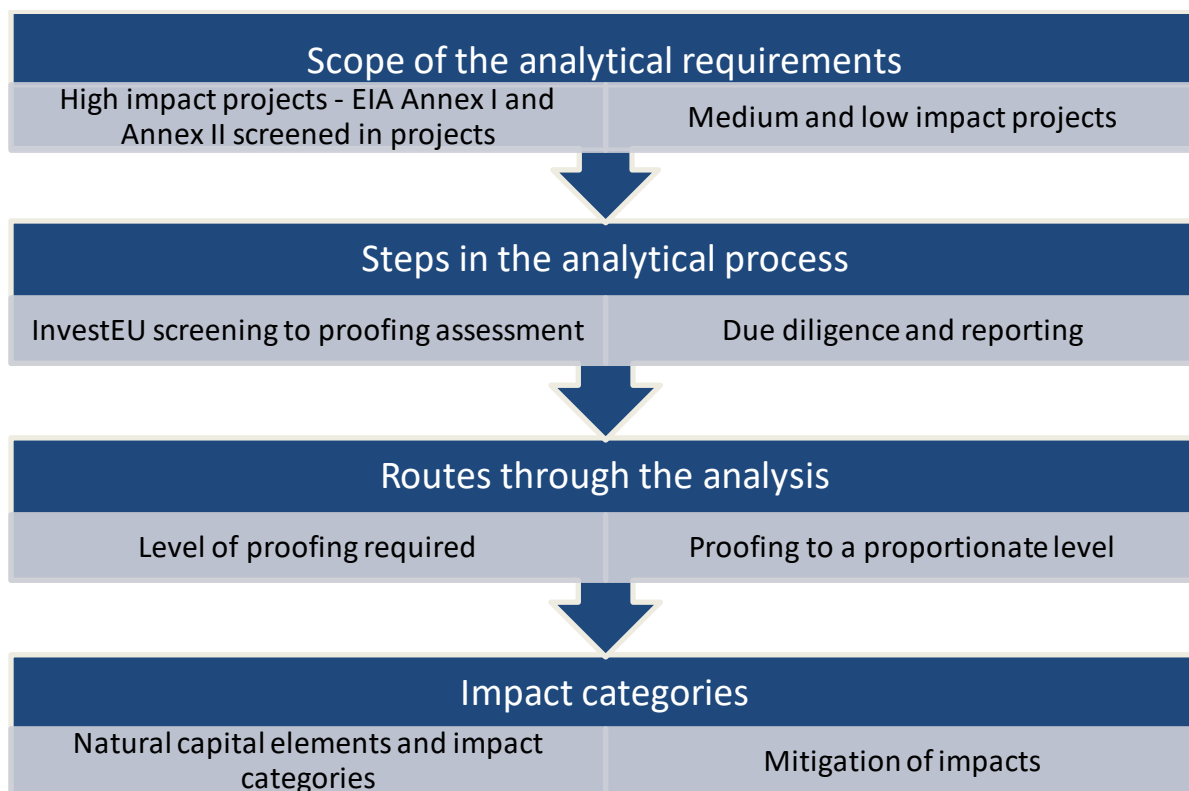
The remainder of this support document has been organised as follows:

- Section 2 provides context and an overview of the assessment process;
- Section 3 introduces the legal compliance check to be carried out by IPs and the conditions for determining whether further environmental proofing is required;
- Section 4 provides the guidance on InvestEU screening and proofing for air;
- Section 5 provides the guidance on InvestEU screening proofing for water, covering both fresh and marine waters, and surface and groundwaters;
- Section 6 provides the guidance on InvestEU screening proofing for land, covering changes in land use and impacts on soil and the terrestrial environment, as well as waste;
- Section 7 provides guidance on InvestEU screening proofing for biodiversity, covering protected habitats and species as well as more regionally and locally important biodiversity;
- Section 8 covers screening and proofing for cross-cutting environmental impacts which cannot easily be allocated to air, water, land or biodiversity.

Annexes are provided to support the proofing requirements laid out under Section 4 to 8, with these including checklists, tables and available monetary valuations. An overarching checklist for possible use by IPs and financial intermediaries as an aide-memoire is also provided.

The checklists in the Annexes of this report are for voluntary use of project promoters and IPs as extra aid to perform the sustainability proofing according to the requirement of the Commission's Sustainability Proofing Guidance (which shall prevail).

2 The Analytical Process



2.1 Activities requiring InvestEU screening and environmental proofing

The Commission's Sustainability Proofing Guidance sets out when an individual project or other activities financed by InvestEU must go through proofing and when a project is exempt. The requirements are reproduced here for clarity and due to their relevance to the analytical process set out in this guidance.

For projects falling under Annex I and Annex II screened-in of the EIA Directive (for which an EIA is always obligatory), InvestEU screening and proofing is to be performed regardless of the size of the project in the case of direct financing. For projects falling under Annex II of the EIA Directive and which are screened-out and projects outside the EIA Directive, InvestEU screening is to be performed only if the size of the project in the case of direct financing exceeds the threshold; the results of this screening will then determine if environmental proofing is also required.

The threshold for determining whether proofing is required in other cases is as follows:

1. **For directly financed operations:**
 - a. For (investment) projects, based on total project cost, it shall be **EUR 10 million**¹.
 - b. For general corporate finance, based on total financing given to the final recipient, it shall be EUR 10 million.

¹ VAT not included. Note that the threshold does not apply when there is an EIA.

2. For intermediated operations:

- a. For infrastructure funds the same threshold as for direct operations applies to the underlying projects. Based on total project investment cost, it shall be **EUR 10 million**.
- b. For financing of SMEs, small mid-caps and other eligible enterprises, no screening or proofing will be required. However, specific safeguards (not further detailed in this support document) will be set up to ensure a minimum alignment with EU commitments, while trying not to overburden small economic actors with complex requirements.

2.2 Scope of requirements

As stated in the Commission's Guidance on Sustainability Proofing: "... environmental proofing refers to a method for accounting for the consolidated impact of a project in terms of the principal components of natural capital, namely air, water, land and biodiversity, as required by Article 8(6) of the InvestEU Regulation... This includes positive and negative impacts, whether direct or indirect." It also requires consideration of cumulative effects.

Furthermore, proofing is to comprise two essential components:

- i) Identification of the residual² (post-mitigation) environmental impacts over the lifetime of the project³. This identification should include analysis of impacts (qualitative, quantitative and monetised where proportionate to do so), to allow a) the need for further mitigation measures to be determined and b) the Investment Committee to judge whether the project does harm to the environment over its lifetime.
- ii) Consideration of how any environmental changes may affect the project over its lifetime.

Environmental proofing should ensure the environmental sustainability of projects and activities financed through InvestEU. For projects in the planning or at an early stage (e.g. before having been granted environmental authorisations / permits / licences and a development consent), the assessment should ensure that significant environmental impacts are avoided or reduced through mitigation measures and adaptation of the project design (and approval for financing will only be given when the EIA process is well advanced or finalised). For projects which have already gone through the EIA process, and which have already been granted environmental authorisations / permits / licences, the analysis should consider the impacts of the project post-mitigation and identify any significant residual impacts. This will then allow for further consideration of mitigation measures.

For any project, one or more of the natural capital elements may need to be assessed. This is to be determined by IPs based on the scope of EIAs and the InvestEU screening and other investigations and, in some cases, the regulatory regimes under which the project would fall. For example, a project falling under the EIA Directive may also require a full assessment to demonstrate compliance with the Water Framework Directive or the Habitats Directive. In such cases, proofing will clearly have to

² Where residual impacts post-mitigation have been identified.

³ This is defined as the life of the capital asset resulting from financing or the operational life of a project which does not involve capital financing. It therefore extends beyond the life of the finance itself, to ensure that significant residual impacts that would last beyond the period over which a loan, for example, is paid back are taken into account.

consider the water environment and/or biodiversity, as well as any other relevant natural capital element.

The scope of the impacts covered by environmental proofing includes direct, indirect and cumulative effects, and market and non-market effects. It therefore includes analysis not just of the volume of emissions to air, for example, but in principle also the impact of this on ambient air quality and the consequent effects on human health and the environment, where these may be economic in nature (changes in health care costs or the value of crop yields) or more intangible (impacts on the ecological status of the environment).

In addition, to help improve comparability both between the different environmental impacts of the project (air, water, land, biodiversity, and carbon⁴) and between different projects, environmental proofing could include (as appropriate) the application of accepted methods for the monetary valuation of impacts, to enable environmental impacts to be incorporated into an economic analysis.

Because this support document sets out requirements for each of the four natural capital components, it cuts across the existing guidance developed and applied by IPs (and available to project promoters), which tends to specify requirements by type of project (transport infrastructure, wastewater treatment, energy development, manufacturing, etc.). Both should be used in combination as appropriate to provide the information required as part of formal reporting and completion of the Scoreboard.

2.3 Risk-based approach to identifying proofing requirements

The proofing process is risk-based in order to avoid undue administrative burden for projects or activities below a predetermined level of risk, with different levels of proofing required for different categories of projects and activities. It includes a decision point (based on the level of risk identified on one or more elements during the screening of a project) where it can be decided that no further proofing is required for impacts of potentially low risk (i.e. impacts unlikely to be significant).

For projects requiring an EIA (Annex I or screened-in Annex II project), the implementing partner will:

- Review the identified impacts and risks and the proposed measures to avoid, prevent or reduce (mitigation measures) and, as a last resort, offset (compensation measures) likely significant negative impacts on the environment. The above should be available in the EIA report and other documentation such as permits, additional studies or reports from other assessments.
- Review that an assessment has been carried out of the risks of any significant negative impacts remaining after mitigation (i.e. the residual impacts should have been assessed as part of the EIA report):
 - Where medium-risk and/or high-risk residual impacts have been identified in the EIA report, then the implementing partner should conduct proofing of those significant negative. Where feasible, the proofing should include quantification and monetisation. This further assessment could trigger additional (compensation/offset) measures as explained later in the chapter.
 - Where the residual impact has been assessed as low risk in the EIA report, no further proofing is necessary.

⁴ Assessment of the carbon footprint is not covered by this guidance, but it remains important that the overall assessment approach is consistent between that assessment and the approach towards environmental proofing.

For projects screened-out with mitigation measures, the implementing partner will:

- Review the identified impacts and risks and the mitigation measures proposed in the screening decision and supporting documentation, to avoid or prevent what might otherwise have been significant negative impacts on the environment:
 - Where medium-risk and/or high-risk residual impacts have been identified (e.g. in the screening documentation or during the review process), proofing of those significant negative impacts should be carried out. Where feasible, the proofing should include quantification and monetisation.
 - Where only low-risk residual impacts have been identified, no further proofing is necessary.

For projects screened out without mitigation measures and for projects outside the scope of the EIA Directive, the implementing partner will:

- In cooperation with the project promoter, recognise whether there is a need for additional studies or reports and review the impacts and risks identified in those additional studies and reports, and consider possible mitigation measures to avoid or prevent what might otherwise have been significant negative impacts on the environment.
- Where proportionate (possible and reasonable), quantify and monetise the identified impacts.

For all projects:

- The implementing partner is strongly recommended to use the positive checklist to identify possibilities to improve the performance of the project.
- The implementing partner must report to the InvestEU Investment Committee and monitor the project.

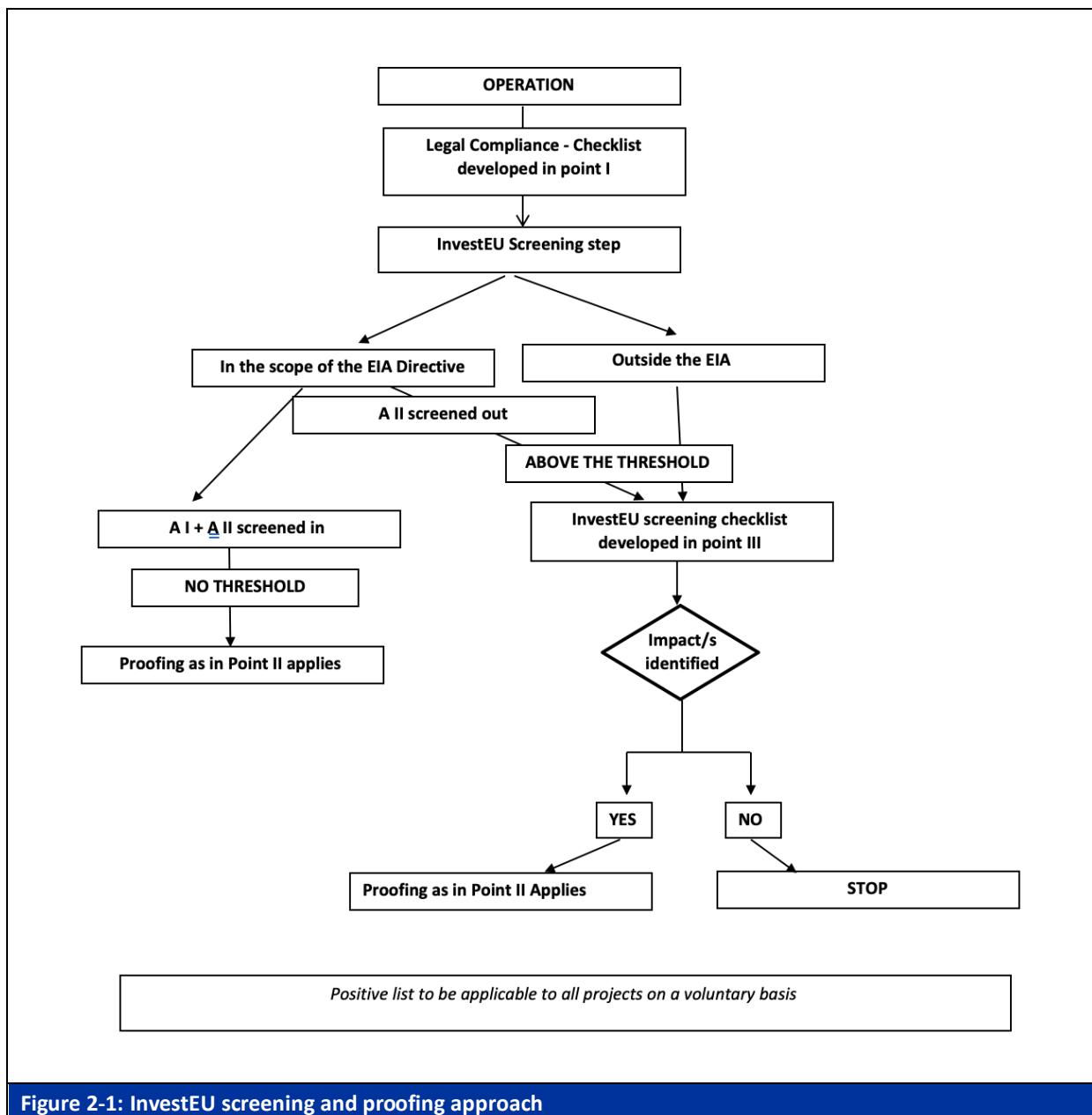


Figure 2-1: InvestEU screening and proofing approach

The process is as follows:

- Determine whether the project is compliant:** all projects should respect the minimum key legal requirements in respect of the environmental dimensions. When an environmental procedure is required, this legal compliance step can be finalised only when it is well advanced / completed. The more thorough legal compliance checks to be carried out for the environmental dimension are set out in the next steps.
- InvestEU screening checklist:** Once a (residual) impact is identified then this impact should be qualified in terms of risk by considering the combination of its significance and its likelihood of occurrence. Significance of the (residual) impact is categorised based on information provided by the project promoter:

Minor → Moderate → Significant/adverse

The following table shows where the screening checklists can be found.

Table Air S3 - 1:	For impacts to Air Quality
Table Water S2 - 5 and Table Water S3 - 3	For impacts on the Water Environment
Table Land S2 - 2 and Table Land S3 - 1	For impacts on Soil/Land
Table Biodiversity S2 - 1 and Table Biodiversity S3 - 1	For impacts on Biodiversity
Table CC S3 - 1	For Noise Impacts
Table CC S3 - 2	For Odour Impacts

Also taken into account is the likelihood of the impact (column 3 of Checklist 1):

Low (not likely to happen) → **Moderate** (even chances of happening or not) → **High** (likely to happen)

		Risk qualification for each impact identified		
		Impact		
		Minor	Moderate	Significant/Adverse
Likelihood	Low	Low Risk	Low Risk	Medium Risk
	Moderate	Low Risk	Medium Risk	High Risk
	High	Medium Risk	High Risk	High Risk

For medium- risk and/or high-risk impacts, the implementing partner must proceed with proofing.
This will involve:

- Qualitative assessment for all environmental impacts;
- Quantification of impacts where proportionate (possible and reasonable to undertake);
- Monetisation where this is proportionate (possible and reasonable to undertake). This document provides guidance on monetisation which is more likely to be appropriate where: residual impacts are large; and benefits transfer is possible, making monetisation easier.

In addition to the above, the IP is strongly recommended to proceed with a positive agenda proofing. No further proofing will be necessary for low risk impacts.

For projects at an early stage, approval for financing will only be given when the EIA process has been finalised or is well advanced. This will help ensure that the information needed for environmental proofing is available. When needed, covenants and conditions will be included in the loan agreement, as will ex-post reporting requirements regarding fulfilment of these conditions.

2.4 The InvestEU screening and environmental proofing process

The approach to InvestEU screening and environmental proofing is based on four steps, that apply across all four natural capital components. It includes a decision point at the end of Step 1 for projects with an EIA or which require InvestEU screening to determine whether proofing (Steps 2 and 3) is required based on consideration of the project's potential residual impacts. The aim has been to ensure consistency in what is required across projects and the different natural capital components,

while also taking into account the need for any proofing to be proportionate (reasonable and possible).

For projects subject to EIA, the InvestEU process is not intended to challenge the results of the assessment and the authorisation of a project or activity by national authorities. It is to determine if an authorised project or activity would give rise to significant⁵ residual effects (after mitigation), and if so to ensure that these are subject to proofing for InvestEU financing purposes. If the EIA concludes that there are no significant residual effects, then proofing may cease.

For projects not subject to EIA and above the financing threshold, InvestEU screening is carried out to identify impacts and to focus any further proofing that might be required.

The process is aimed at IPs and intermediaries, but also project promoters. It is assumed that IPs and intermediaries will request promoters to provide the relevant information for their projects or will work with them to undertake the necessary level of proofing.

Steps 1 to 4 of the process are as follows, see also **Figure 2-2**:

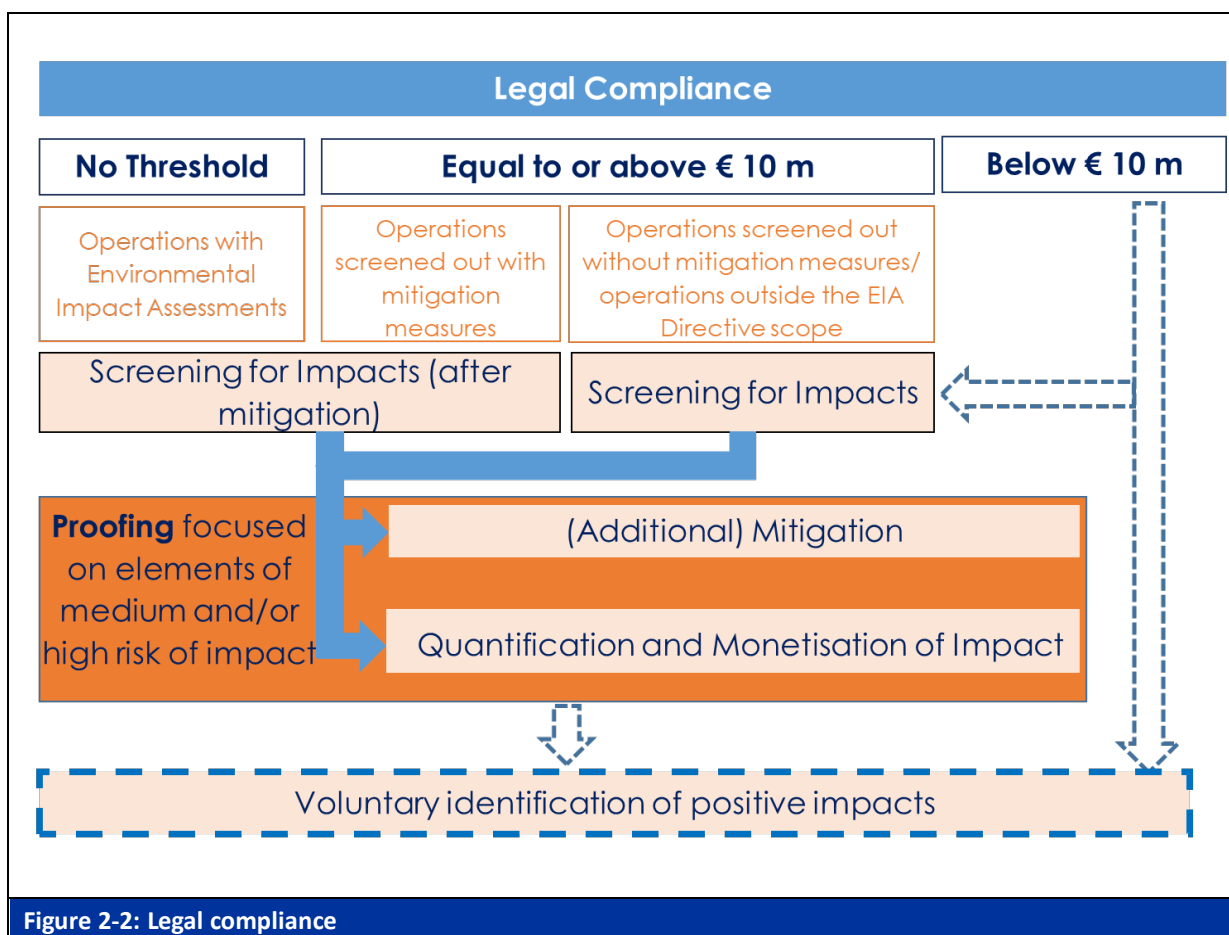
- 1) **Step 1: Identify if the project needs to go through sustainability proofing.** If there is the potential for significant negative residual impacts, then proofing should progress to Step 2 and the assessment of impacts. This will be the case if the project will go through an EIA (so Annex 1 or Annex 2 screened in), and the InvestEU screening checklist can be used to identify which are the significant impacts to be assessed. Proofing should look at project impacts after any mitigation measures (as set by environmental decision making) have been taken into account: note that mitigation measures can also be set in cases of screened out projects. Other projects (not going through an EIA) should go through InvestEU screening to identify if proofing should be undertaken, and for which impacts.
- 2) **Step 2: Analysis of impacts** should be carried out for any significant impacts on the environment to provide the information required for proofing purposes. Project promoters may also wish to quantify “positive” impacts, especially where these may highlight trade-offs in environmental impacts (i.e. positive versus negative impacts). The assessment of impacts should involve a qualitative assessment and quantification where proportionate.
- 3) **Step 3: Monetary valuation of the negative and/or positive environmental impacts** (costs and benefits) delivered by the project is recommended where proportionate and appropriate, to enable a more comprehensive economic appraisal for the project to be prepared by the IP.
- 4) **Step 4: Review and reporting.** This includes IPs and intermediaries reviewing the information resulting from Steps 1-3 to determine whether the proofing process has been followed as required and that aspects such as the mitigation hierarchy have been given due consideration. Reporting includes setting out assumptions underlying the assessment carried out and any associated uncertainties which may impact on the final conclusions.

As environmental proofing must be carried out for all projects that require an EIA, proofing draws on the types of issues that should have been considered as part of any EIA, as well as the types of

⁵ While it is not possible to provide a comprehensive definition of “significant impacts” for all elements of Natural Capital, as a minimum these include irreversible and irreparable changes to the environment and marginal changes to the environment which could result in failures to comply with legislative requirements.

information that are likely to be generated as part of the environmental modelling and assessment activities required under other legislation.

As a result, InvestEU screening is based on checklists that reflect the types of issues that should have been considered during an EIA if one was carried out, to ensure consistency of analysis. The approach also takes into account the assessments required to demonstrate compliance with other EU legislation, most notably the Habitats Directive and the Water Framework Directive, as well as the types of information that may have been generated as part of operating permit / license applications under for example the Industrial Emissions Directive.



2.5 Roles and Responsibilities

As noted earlier, this document is aimed first and foremost at IPs, who are responsible for undertaking Sustainability Proofing as required under the InvestEU Regulation. It is important, however, to be clear on the roles and responsibilities of different actors within the context of this guidance:

- **Implementing Partners (IPs)** are responsible for carrying out the InvestEU screening and the environmental proofing as part of their due diligence activities.
 - With respect to direct finance, these activities include verification of the documentation provided by the project promoter, and assessing the capacity of that promoter to manage residual environmental impacts.
 - In meeting these responsibilities, the IP may perform the environmental proofing on its own or require the project promoter to undertake the environmental proofing; this

includes proposing mitigation measures as appropriate and identifying opportunities for positive environmental impacts.

- IPs may also include specific clauses and covenants in the financial contract, as well as set environmental monitoring and reporting requirements in line with its own internal rules and procedures.
 - Information regarding the results of the proofing will be provided to the Investment Committee in the guarantee request form and the scoreboard (for direct financing). Where no environmental proofing is needed, IPs shall provide a justification to the Investment Committee.
 - With respect to intermediated finance, IPs are responsible for assessing the capacity of financial intermediaries to address environmental impacts as part of their due diligence and assessment activities, as applicable based on the requirements set in the Commission guidance.
- **Financial intermediaries** are encouraged to put in place environmental and social management systems (ESMS), based on the requirements set in the Commission guidance, to help ensure that they fulfil the EU's commitments under the InvestEU Regulation. As part of their due diligence, they will verify the compliance of the proposed project or operations with relevant legislation. They should also select projects that are in line with the IP's environmental (and social) standards.
 - **Project promoters / final recipients** are responsible for ensuring that IPs (and financial intermediaries) have all the information needed to meet their due diligence obligations, including for the screening and environmental proofing of a project, as appropriate.
 - This includes meeting all legal requirements for performing certain types of environmental assessments (e.g. under the EIA Directive or Industrial Emissions Directive), obtaining necessary permits/licences as well as providing details of the project's characteristics and location, reports from any investigations, information on mitigation measures and their impacts, details of permit/licence conditions and exchanges with authorities as relevant and appropriate.
 - The project promoter is responsible for carrying out additional studies or impact assessments, if required, as well as performing any stakeholder consultations as required by law (e.g. under the EIA Directive).
 - The project promoter is responsible for implementing all measures identified for minimising the environmental impacts of the project, as well as for putting in place any necessary plans and policies (i.e. a Major Accident prevention and safety policy).
 - On an on-going basis, the project promoter is responsible for assessing and managing the environmental aspects of the project, and putting in place an environmental and social management plan in order to address any environmental impacts, including through the adoption of mitigation measures or actions to enhance positive effects.
 - The project promoter is also required to provide periodic reports on the environmental performance of the project to the IP or financial intermediary as requested, in accordance with their existing rules and procedures.
 - **In principle, competent public authorities** should assist project promoters, and possibly the IPs and financial intermediaries, in understanding the environmental impacts of proposed projects and their broader context with respect to the cumulative impacts on the environment, and also provide timely decisions on Environmental Impact Assessments, planning permits and licences.

- **The European Commission** will monitor that the guidance is applied consistently and coherently across the windows of the InvestEU Fund and will update it regularly to maintain its relevance.
- **The Investment Committee** will take into account the results of the environmental proofing assessment for direct financing operations, and could request supplementary information from the IP on the results of the environmental proofing if they consider it necessary. They could also draw on the results received from IPs to develop and drive best practice amongst IPs on proofing.

2.6 Impact categories

Natural capital is defined in terms of both the environment for its own sake and the ecosystem services the physical environment provides:

- **The physical environment:** this reflects habitats and their condition. Projects can affect both the extent of habitats (e.g. by changing land use) and the condition of habitats. Impacts on the physical environment are measured in quantities (e.g. hectares affected) and change in condition of those quantities from excellent/good condition to some lower condition. This could include change in the total volume of water available (m^3) or the area of woodland (ha).
- **Environmental services:** the physical environment provides ecosystem services that arise or flow from natural capital. Flows are measured as quantity over time. For example, abstraction affects the stock of water and can affect the future availability of water over time (m^3 /year); discharge of pollutants affects the condition of air or water (exceedance of limit values per day); changes to land use can affect the number of recreation trips made to a site (number of trips per year) or reduction in enjoyment from those trips (level of enjoyment per trip).
- **Final impacts:** the changes in flows leads to the final impacts, or damages resulting from a project. This is where monetary valuation is relevant, to capture the impacts in monetary terms. Valuation helps convert impacts to damage costs (or benefit estimates), such as the value of water no long available for use (as € per m^3 per year), costs incurred due to increased health issues from air pollution (as € per disease case per year), or the loss of biodiversity for its own right (or for the enjoyment of future generations).

Figure 2-3 shows the relationship between the physical environment, the flow of ecosystem services and final damages or benefits. These concepts underlie the approach set out in this guidance. **Table 2-1** below provides a non-exhaustive summary of different types of impacts on the physical environment, the linked impacts on flows and the end damages that could be subject to monetary valuation.

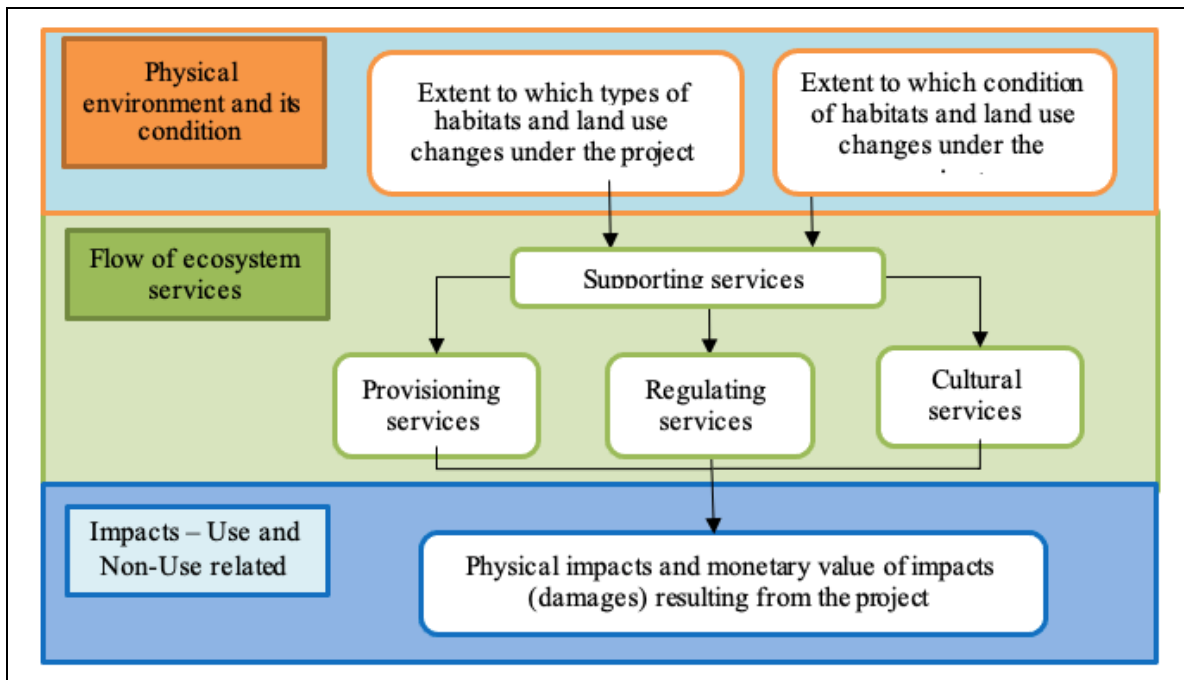


Figure 2-3: Linking natural capital to the physical environment and flows of ecosystem services

Table 2-1: Linking impacts to relevant changes in the physical environment and damages or benefits

Natural capital	Changes to the physical environment	Changes to flows	Examples of impacts (positive and negative)
Air			
Air pollution	Volume of pollutants emitted	<ul style="list-style-type: none"> Change in regulating services (bioremediation, dilution, disease control) 	<ul style="list-style-type: none"> Impacts on human health Impacts on buildings (e.g. erosion)
Water			
Water pollution	Volume of pollutants discharged	<ul style="list-style-type: none"> Change in regulating services (bioremediation, dilution, disease control) 	<ul style="list-style-type: none"> Impacts on human health Impacts on the quality of inland or marine waters
Water consumption	Volume of water abstracted	<ul style="list-style-type: none"> Change in provisioning services (water, aquaculture, etc.) Change in regulating services (lifecycle maintenance, extreme events) Change in cultural services (recreation (use), appreciation (non-use)) 	<ul style="list-style-type: none"> Impacts on water dependent activities Impacts on water-dependent physical environments Impacts on the hydrological cycle (e.g. flooding, low flow events)
Land			
Waste generation	Tonnes of waste generated	<ul style="list-style-type: none"> Change in regulating services (bioremediation, attenuation of natural hazards) 	<ul style="list-style-type: none"> Impacts on waste management costs Impacts on the physical environment (e.g. due to landfill, emissions from incineration) and hence flows
Change in land use	Hectares of land use developed or intensified	<ul style="list-style-type: none"> Change in provisioning services (crops, timber, minerals, etc.) Change in regulating services (bioremediation, attenuation of natural hazards, sequestration) Change in cultural services 	<ul style="list-style-type: none"> Changes in outputs and materials from land Changes in carbon sequestration and storage Changes in costs of providing services that would have been provided naturally Impacts in in-situ and outdoor interactions Changes in the cultural value of land

Table 2-1: Linking impacts to relevant changes in the physical environment and damages or benefits

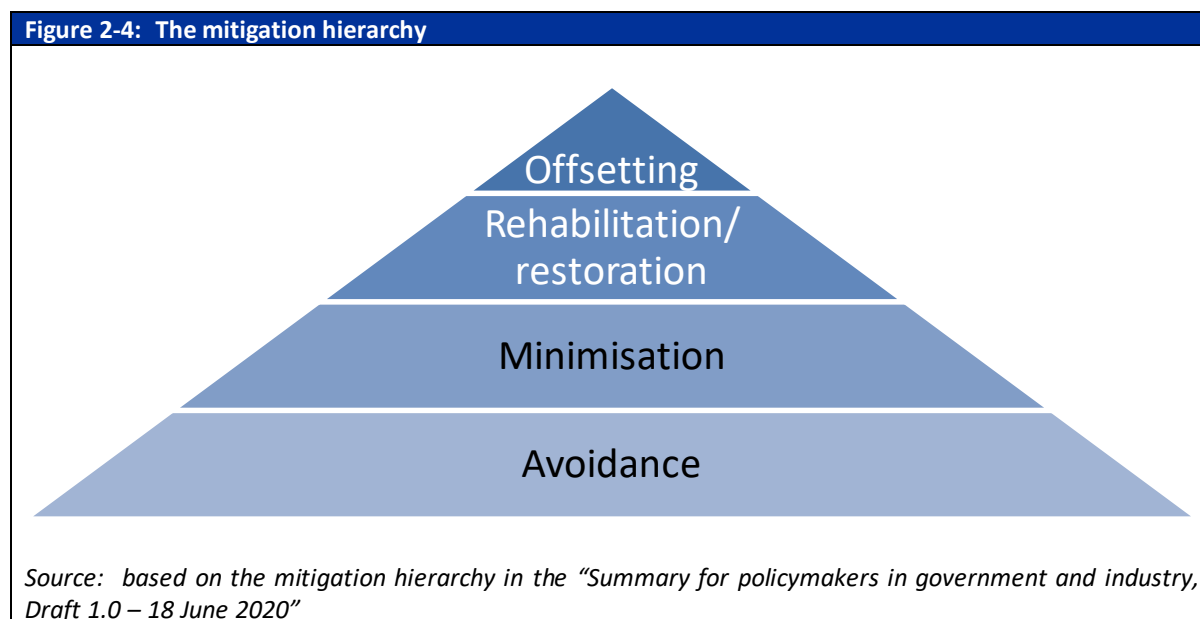
Natural capital	Changes to the physical environment	Changes to flows	Examples of impacts (positive and negative)
Biodiversity			
Effects on species	Proportion of species affected	<ul style="list-style-type: none"> • Change in provisioning services (genetic material) • Change in regulating services (pest control) • Change in cultural services (recreation (use), appreciation and bequest (non-use), culture, religion, entertainment) 	<ul style="list-style-type: none"> • Changes in the local population and conservation status of species • Changes in the value of genetic resources (may be opportunity cost) • Changes in the costs of providing services that would have been provided naturally (e.g. pest control) • Changes in the cultural value of species
Effects on habitats and ecosystems	Area of habitat lost or in reduced condition	<ul style="list-style-type: none"> • Linked to change in land use • Change in provisioning services (genetic material) • Change in regulating services (pollination, nursery habitats, disease control, sequestration) • Change in cultural services (recreation (use), appreciation and bequest (non-use), culture, religion, entertainment) 	<ul style="list-style-type: none"> • Changes in conservation status of habitat or condition of ecosystem⁶ • Changes in outputs and resources from land and sea • Changes in the costs of providing services that would have been provided naturally • Changes in the cultural value of land and sea • Changes in resilience (for example natural disasters)
Multi-category			
Risk of major accidents and disasters	Volume or tonnes of pollutants to air, land, water	<ul style="list-style-type: none"> • Linked to specific impacts above 	<ul style="list-style-type: none"> • See specific damages by type of impacts that may be caused
	Area of habitat lost or in reduced condition	<ul style="list-style-type: none"> • Linked to change in land use • Change in provisioning services (genetic material) • Change in regulating services (pollination, nursery habitats, disease control, sequestration) • Change in cultural services (recreation (use), appreciation and bequest (non-use)) 	<ul style="list-style-type: none"> • Changes in outputs and materials from land • Changes in costs of providing services that would have been provided naturally • Changes in the cultural value of land •

⁶ In line with EU guidance on integrating ecosystems and their services into decision-making, SWD (2019) 305 final.

2.7 Mitigation of impacts

The mitigation hierarchy should be considered when initially proposing projects and considering their likely impacts. This is in line with the Environmental Impact Assessment Directive.

It is also in line with the EU biodiversity strategy, which sets out mitigation clearly⁷. The current guidance for policy makers on the effective integration of ecosystems and associated services into policies and plans⁸ identifies the mitigation hierarchy as a guiding principle to be followed⁹. The mitigation hierarchy includes four measures as illustrated in the following figure and is relevant for other forms of natural capital.



The measures should be applied in order. The first measure, avoidance of negative impacts, covers monitoring and planning prior to any projects being implemented. Once a project has considered how it can avoid impacts on stocks (and hence flows), the hierarchy moves to minimisation. This involves decreasing the extent of any unavoidable impacts, with consideration given to impact duration, intensity and type (direct, indirect and cumulative). The third measure, rehabilitation and restoration, is intended to ensure that stocks that have been degraded or negatively affected by a project are restored or renewed. Finally, offsetting can be considered for negative impacts that cannot be avoided, minimised, or balanced out through restoration.

For projects where proofing is compulsory and an EIA has been undertaken or is expected, then mitigation measures are likely to have been built into the project already. This should be the case for other assessments as well, for example, under the IED where permitting will require the adoption of

⁷ European Commission (2019): Commission staff working document, EU guidance on integrating ecosystems and their services into decision making, SWD (2019) 305 final.

⁸ EU Guidance on integrating ecosystems and their services into decision making, Summary for policymakers in government and industry, Draft 1.0 – 18 June 2020

⁹ The full list of principles covers: prioritising actions to improve ecosystem condition and contribute to wellbeing; address inter-dependencies and trade-offs; apply the mitigation hierarchy; apply the precautionary principle; set long-term objectives/plans to secure essential ecosystem services; ensure adaptive management; coordinate and integrate planning across sectors and levels; and enable stakeholder engagement.

best available techniques (BAT). Where available, information should be extracted from the existing assessments to demonstrate that mitigation has been considered / adopted.

If there is insufficient information on mitigation, or mitigation has not yet been considered (for example, where proofing is being undertaken voluntarily), then the mitigation hierarchy should be reviewed as part of Step 1 of the assessment process. Following the hierarchy may result in the project being re-designed or changed to the extent that the results of proofing would have to be revisited.

2.8 Quantification and monetary valuation of environmental impacts

2.8.1 Introduction

As part of the assessment of impacts, environmental proofing should build on an understanding of the environmental impacts by including quantification and monetary valuation of significant environmental impacts, where proportionate and reasonable. It is likely to be of particular use for impacts:

- that are particularly significant and contentious (after mitigation measures); and
- for which the feasibility of undertaking monetary valuation is high because, for example, there are unit values that can be readily used, making values transfer possible.

Quantification will be important for enabling IPs to understand the magnitude of the impacts of the project after mitigation measures have been taken. It is also often a pre-requisite for monetary valuation, which can be used to demonstrate the social cost (benefit) of any negative (positive) environmental impacts.

The monetary valuation of the negative and/or positive environmental impacts delivered by the project (where feasible and proportionate) would normally feed into the economic appraisal that is usually carried out in the context of EU supported projects. IPs might also use economic appraisal as part of their usual project appraisal process.

Carrying out economic appraisal is standard practice for EU supported projects to ensure an optimal allocation of available funding and to verify the supported projects are good value for money. Depending on sectors and project type/size, different tools are used for economic appraisal.

For example, the EIB uses CBA (cost-benefit analysis) as the main tool, but CEA (cost-effectiveness analysis) or MCA (multi-criteria analysis) are also adopted in specific circumstances.¹⁰ In the context of Cohesion Policy, the regulation for 2014-2020 included a strict obligation for major projects to undertake a CBA, while for the period 2021-27 a more flexible and proportional approach will be proposed, consistently with the approach to economic appraisal followed by the EIB.¹¹

When CBA is used, a monetary valuation of the negative and/or positive environmental impacts is usually already included as a discounted cash flow item of the analysis and contributes to the calculation of the economic performance indicators (see 2.8.7). When CEA or MCA is used, this

¹⁰ See par. 1.3.4 of 'The economic appraisal of the investment projects at the EIB'

¹¹ The new approach will be presented in the forthcoming *Economic Appraisal Vademecum* that is being prepared by DG REGIO with the support of JASPERS.

information is usually not present because it is considered a too resource-intensive process and not proportionate to the type and size/importance of the project.¹²

In the following, the key concepts used for monetary valuation of environmental impacts – usually in the context of a CBA/Economic Appraisal - are discussed.

2.8.2 Total Economic Value

There are three main types of valuation methods available for assessing impacts on the environment, including on its physical condition and on the flow of ecosystem services and associated benefits from it. These are (see also Annex VI of the European Commission, DG REGIO CBA guide)¹³:

- 1) use of market prices to capture the physical effects of environmental changes on production or on the market for goods and services (e.g. health care) required due to negative externalities;
- 2) use of data on people's revealed preferences, where these data are drawn from people's actual expenditures/behaviour (including travel cost methods, random utility methods, hedonic pricing methods, avertive behaviour, replacement costs); and
- 3) use of stated preferences or people's expressed willingness to pay for (or accept) and change in the environment (including contingent valuation, contingent ranking and other choice experiments).

These methodologies combined form the basis for capturing the Total Economic Value (TEV) of natural capital, where this is comprised of economic use and non-use values. It must be noted, however, that the methods used in the valuation of non-market externalities (2 and 3 above) require a detailed understanding of the underlying techniques as well as the capacity to carry out surveys and/or choice experiments. As a result, such studies are generally only undertaken by academic researchers, specialist consultancies or relevant EU research centres (although they may act as the basis for a value transfer exercise, see next sub-section).

Use and non-use values can be defined as follows:

- **Use Values:**
 - **Direct use values:** these are values that can be linked to the actual or planned consumption of the services provided by the environment, e.g. abstraction of drinking water and aquaculture, as well as non-consumptive uses such as recreation and amenity;
 - **Indirect use values:** these are values that are linked to the benefits from the ecosystem services that are supported by natural capital rather than from its direct use and including supporting and regulating services such as water storage, flood protection, waste decomposition, climate regulation, etc.;
 - **Option values:** these are the values that people place on having the "option" to use a resource in the future, either directly or indirectly.

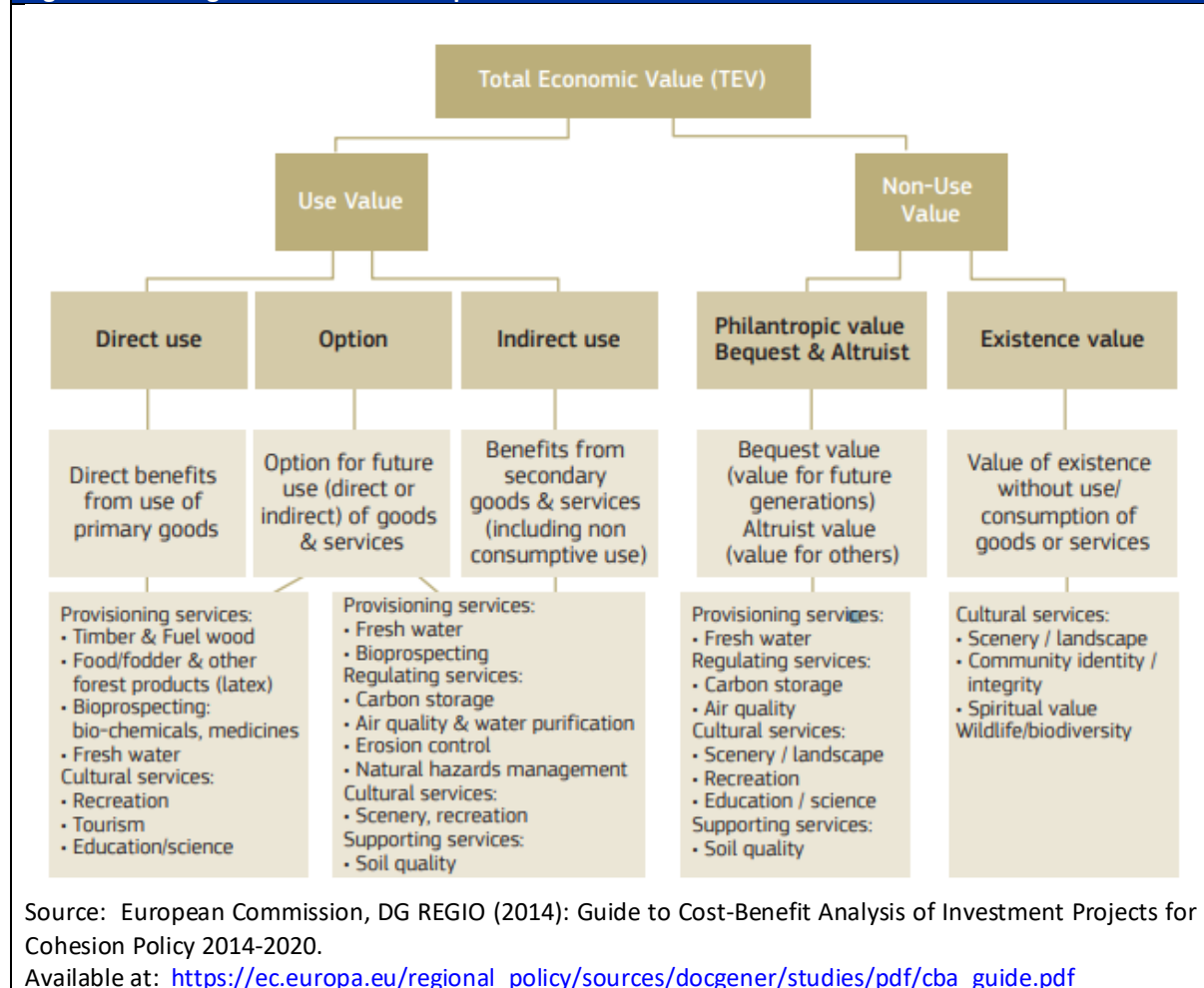
¹² However, in some sectors (e.g. energy), cost-effectiveness analyses focussing on mature technologies can integrate a monetary valuation of environmental externalities as costs in order to penalise relatively polluting or carbon-intensive generation technologies. See par. 4.3 of the economic appraisal of the investment projects at the EIB.

¹³ https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

- **Non-use values:**
 - **Bequest:** these reflect people’s willingness to pay to protect the environment for future generations;
 - **Philanthropic or Altruistic values:** these reflect the value that people attach to the availability of ecosystem goods or services to others within the current generation;
 - **Existence values:** these reflect people’s willingness to pay to ensure the existence of an ecosystem resource, even though there is no planned direct or indirect use of that resource.

See also **Figure 2-5** taken from European Commission, DG REGIO (2014), which illustrates the linkages between these concepts and natural capital.

Figure 2-5: Linkage between natural capital the TEV framework



2.8.3 Use of value transfer for assessing environmental impacts

Value transfer or ‘benefits transfer’ is the process of taking existing economic values and applying them in a new context, where this includes valuing the environmental impacts of a proposed project or programme of measures. Value transfer is used because it provides a ready approach to monetising environmental impacts so that they can be incorporated into an economic appraisal / cost-benefit analysis (CBA). It is generally considered to provide a lower cost and quicker means of capturing

environmental impacts compared to commissioning project-specific primary valuation studies. This is especially important within the context of InvestEU and the need for environmental proofing to be proportionate.

Undertaking value transfer, however, is not necessarily straightforward and requires careful consideration of the original study context compared to the proposed project or programme context, as well as key assumptions such as the relevant populations. The closer the context of the original study (including geographic context) to the project under consideration, the more accurate the transfer exercise will be.

Value transfer requires:

- 1) Assessment of the extent to which value transfer is appropriate given the project context including the significance of the environmental impacts;
- 2) Specifying the impact to be valued in terms of its magnitude, severity, duration, distribution and the associated user and/or non-user populations;
- 3) Identifying relevant valuations from the economics or other literature and checking for comparability and consistency with the project in question; identifying key assumptions and the potential limitations of using available transfer values; and
- 4) Carrying out the transfer exercise to estimate the money value of the impacts and sensitivity analysis to address uncertainties surrounding key assumptions and, hence, the reliability of the end estimate.

To aid in the use of a benefits transfer approach, unit values are provided in Sections 4 to 8 of this guidance. These unit values vary in terms of their robustness and hence acceptance. For example, the use of existing unit values for the damage costs associated with increased air emissions and noise impacts is now a consolidated practice, consistently adopted across EU by project analysts in their evaluation process. In contrast, existing unit values related to impacts on the water environment, land and biodiversity are considered less robust, and albeit used, it is considered that developments in this field, both empirical and theoretical are still needed.

2.8.4 Shadow prices

The economic analysis that will be carried out to support a project application for direct financing under InvestEU should ideally be based on the use of shadow prices for market-based goods and services. The European Commission's, DG REGIO "Guide to Cost-Benefit Analysis of Investment Projects for Cohesion Policy 2014-2020" provides guidance on how to derive shadow prices with respect to environmental impacts, as follows:

- "Where valuation of the environmental impacts of a project on ecosystem goods and services is based on market prices, then adjustment to shadow prices may be required.
- Valuations of non-market effects based on willingness to pay do not require shadow price adjustments, as the valuation itself is deemed to reflect individuals' willingness to pay for the environmental good or service."

2.8.5 Updating values to current prices

Prior to using any monetary values drawn from the literature – including unit values presented in the later sections of this document - as part of a benefits transfer exercise, it is important to ensure that they reflect the same price basis as other costs and benefits included in the CBA. The recommended approach is to use the GDP deflator, with quarterly and annual data available for the EU from Eurostat.

Updating a value involves the following calculation:

$$\text{Updated value} = \text{original value} \times (\text{GDP deflator for base year} / \text{GDP deflator for original year})$$

2.8.6 Adjustment for purchasing power parity

If a benefits transfer unit value is sourced from a study carried out in a country with different economic characteristics, then it may be important to adjust that value for differences in the purchasing power parity of the two countries.

Purchasing power parity – PPP – measures the total amount of goods and services that a single unit of a country’s currency can buy in another country. In other words, the PPP between countries A and B measures the amount of country A’s currency required to purchase a basket of goods and services in country A as compared to the amount of country B’s currency to purchase a similar basket of goods and services in country B. The relative PPP for each country can be used to convert the cost of goods and services in different countries into a common currency by eliminating price differentials between the countries.

2.8.7 Incorporating environmental impacts into the analysis of economic viability

When CBA is used, the project’s overall economic viability is measured by the following indicators:

- Economic Net Present Value (ENPV). This is the difference between discounted total social benefit and social cost, valued at shadow prices and is expressed in monetary values;
- Economic Rate of Return (ERR). It is the social discount rate producing a zero value of the ENPV and is expressed in percentage points;
- B/C Ratio. It is the ratio between discounted economic benefits and costs.

In order to measure the indicators listed above, discounting of future impacts on the environment should be carried out using the social discount rates set by the European Commission. The social discount rate (SDR) reflects society’s view on how future benefits and costs should be valued against present ones.¹⁴

In the programming period 2014-20, the social discount rates applied by the European Commission are 5% for projects in countries eligible for the Cohesion Fund support and of 3 % for the other Member States. For the 2021-27 period, a more flexible approach will be put in place, where a Member State can assess its own country-specific SDR (following the formula presented in Annex II of the 2014 CBA Guide) or keep using the EC’s pre-established values.¹⁵

In principle, projects with an ERR lower than the social discount rate (or which have a negative ENPV) should be rejected. From the EU perspective, giving a loan or capital grant to a project with low social returns means diverting precious resources from more valuable development uses.

¹⁴ European Commission, DG REGIO (2014): Guide to Cost-Benefit Analysis of Investment Projects for Cohesion Policy 2014-2020.

¹⁵ Some relevant good practices for the period 2021-27 will also be described in the forthcoming ‘Economic Appraisal Vademecum’ (EAV) being prepared by DG REGIO in coordination with other Commission DGs and with the support of JASPERS.

3 Compliance Checking

3.1 Introduction

All InvestEU supported operations, irrespective of whether subject to sustainability proofing or not, should be consistent with the core environmental policy objectives underlying EU legislation, as well as the core environmental principles enshrined in the Treaty on the Functioning of the European Union, and should comply with applicable EU and national legislation. It is a pre-requisite for any support.

IPs therefore have to put in place or review their existing procedures to verify¹⁶ such compliance for direct operations and intermediated financing.

To ensure that all IPs apply the same set of standards, this section:

- Sets out the core environmental policies and principles of relevance;
- Outlines general principles for the compliance checks; and
- Sets minimum standards for compliance checks with key EU environmental directives.

In addition, as part of the European Union's 'European Green Deal'¹⁷, there is a commitment to 'do no harm'. This green oath goes beyond compliance with EU legislation.

This compliance check is to be carried out before InvestEU screening and environmental proofing is carried out in detail, as IPs may reject a project on the basis of the compliance checks.

3.2 Compliance with EU and national legislation

3.2.1 Aims and scope of compliance checks

All InvestEU supported operations, irrespective of whether subject to sustainability proofing or not, should comply with applicable EU and national legislation. It is a pre-requisite for any support. IPs have to put in place or review their existing procedures to verify¹⁸ such compliance for direct operations and intermediated financing.

To ensure that all IPs apply the same set of standards, this section:

- outlines general principles for the compliance checks; and
- sets minimum standards for compliance checks with key EU environmental directives.

For projects subject to an Environmental Impact Assessment (EIA), as a rule, the compliance checks carried out as part of this proofing exercise should cover all key EU environmental directives referred to below.

For projects where proofing has been undertaken on a voluntary basis for the environmental dimension, the scope of the compliance checks might be adjusted. IPs or financial intermediaries (if

¹⁶ Including requesting declarations of compliance from final recipients.

¹⁷ European Commission Communication "The European Green Deal" of 11.12.2019, COM(2019) 640 final.

¹⁸ Including requesting declarations of compliance from final recipients.

authorised) could make such modifications, depending on the nature of the operations seeking support, or could require declarations of compliance from final recipients. However, such modifications or acceptance of self-declarations should not lead to poor environmental performance of operations or the potential for non-compliance.

3.3 General principles

The general principles are listed below:

- The compliance checks of an operation with the applicable EU environmental legislation should result in a **clear-cut answer on whether an operation is 'compliant' or 'non-compliant'**. It should be supported with proof in the form of permits, approvals, licences or permissions as provided by competent authorities with reference to relevant directives or transposed national legislation (to be fed to the report to be submitted to the Investment Committee).
- **EU environmental directives** or transposed national legislation should be the **main reference points** for carrying out compliance checks. Irrespectively, such verification should also take into account the specificity of the Member State's legal system.
- The Member States have the primary responsibility for transposing, applying and implementing EU law correctly. However, in case of **non-transposition or non-conforming transposition** of a certain directive into the national legislation, the reference point for carrying out compliance checks (as pointed above) should be the respective EU environmental directives. In consequence, an operation would have to comply with relevant requirements on its own merit, despite the non-transposition or the non-conformity gaps of EU legislation.
- If an **infringement procedure** is ongoing against a given MS which might have affected an operation, it should be taken into account in the compliance checks. However, the IP might not be aware of such situations. Such cases can be only identified by the Commission services as part of a standard consultation following the submission of a request for support to the Investment Committee.
- It is recommended that projects belonging to categories listed in Annex I of the EIA Directive and Annex II projects that require an EIA (i.e. projects with significant and/or likely significant impacts) be considered for InvestEU financing when they are at a reasonably mature stage. Considerations on maturity of the project are set out in Section 2.3.2 of the Sustainability Proofing Guidance.
- If there are **serious doubts** on whether an operation complies with EU legislation, IPs should consult Member States or the Commission services.

3.4 Key directives for compliance checks

The compliance checks exercise is organised according to the headings in the Sustainability Proofing Guidance Section 2.3.2 on 'Legal Compliance'. It provides a short overview of the relevant directives subject to compliance checks. It is supplemented by Annex I with four checklists for guiding the compliance checks.

3.4.1 EIA Directive

The EIA Directive 2011/92/EU as amended by Directive 2014/52/EU applies to a wide range of public and private projects, which are defined in Annexes I and II to this Directive:

- **Mandatory EIA:** all projects listed in **Annex I** are considered as having significant effects on the environment and require an EIA (e.g. long-distance railway lines, motorways and express roads, airports with a basic runway length ≥ 2100 m, installations for the disposal of hazardous waste, installations for the disposal of non-hazardous waste > 100 tonnes/day, waste water treatment plants > 150.000 p.e.).
- **Discretion of Member States (screening):** for projects listed in **Annex II**, the national authorities have to decide whether an EIA is needed. This is done by the 'screening procedure', which determines the effects of projects on the basis of thresholds/criteria or a case by case examination. However, the national authorities must take into account the criteria laid down in Annex III. The projects listed in Annex II are in general those not included in Annex I (railways, roads waste disposal installations, wastewater treatment plants), but also other types such as urban development projects, flood-relief works, changes of Annex I and II existing projects).

Once it is decided that an EIA is needed (Annex I or a screened-in Annex II projects), the EIA procedure is typically organised according to the following steps:

- the developer may request the competent authority to say what should be covered by the EIA information to be provided by the developer (scoping stage);
- the developer must provide information on the environmental impact (EIA report);
- the environmental authorities and the public (and affected Member States) must be informed and consulted;
- the competent authority decides on a project, taking into consideration the results of consultations; and
- the public is informed of the decision afterwards and can challenge the decision before the courts.

The EIA compliance check should confirm the operation's fulfilment of key EIA requirements. It is important to distinguish that several operations might still have been authorised under the previous 'non-revised' EIA regime (2011/92/EU) and not under 'revised' current EIA regime (Directive 2011/92/EU modified by Directive 2014/52/EU). New elements introduced by the 2014 amendment include: a 'one-stop shop' for assessments deriving from EIA and Nature Directives; quality control mechanism; mandatory assessment of reasonable alternatives; monitoring; broader scope of the EIA covering new issues (climate change, biodiversity, risks prevention); as well as justification of screening/EIA decisions.

Checklist 3.2 (see also Annex 1 of this technical support document) proposes a list of questions to guide the verification of the compliance with the EIA Directive.

3.4.2 Biodiversity

The Natura 2000 network has been established pursuant to the Habitats Directive¹⁹. Under this Directive, Member States designate Special Areas of Conservation (SACs) to ensure the favourable

¹⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043>

conservation status of habitat types listed in Annex I and species listed in Annex II to the Directive throughout their range in the EU. Under the Birds Directive²⁰, the network must include Special Protection Areas (SPAs) designated for 194 particularly threatened species and all migratory bird species.

Any plan or project likely to have a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects, has to undergo an **appropriate assessment** by the Member State (pursuant to Article 6) to determine its implications for the site, in view of the **site's conservation objectives**²¹. The competent authorities can only agree to the plan or project after having ascertained that it will not adversely affect the integrity of the site concerned (Article 6.3 of the Habitats Directive).

In exceptional circumstances, a plan or project may still be allowed to go ahead, in spite of a negative assessment, provided there are no alternative solutions and the plan or project is considered to be justified by imperative reasons of overriding public interest. In such cases, the Member State must take appropriate **compensatory measures** to ensure that the overall coherence of the Natura 2000 network is protected (Article 6.4 of the Habitats Directive). The Commission has to be informed about these measures.²² In certain cases, when a priority habitat or species is significantly affected and the plan or project is justified by socio-economic reasons, an opinion of the Commission is required.

For IPs, when checking compliance with the Habitats Directive and national implementing measures, three scenarios are possible:

- a project has been screened out by a Member State from requiring an appropriate assessment, i.e. the project is not likely to have significant negative effects on Natura 2000 site/s; or
- a project has been subject to an appropriate assessment by the Member State authorities, which resulted in a positive conclusion being given by the authorities, that the project will not have significant effects on Natura 2000 site/s (under Article 6(3) of the Habitats Directive); or
- a project has been subject to an appropriate assessment, which resulted in a negative conclusion from the Member State authorities, i.e. the project has significant negative effects on Natura 2000 sites (under Article 6(4) of the Habitats Directive).

When assessing the submitted information for any of these three scenarios, it is essential for IPs to verify whether conclusions of a Member State's screening-out decision or an appropriate assessment are based on the **site-specific conservation objectives** established for concerned Natura 2000 sites. Checklist 3.3 (see also Annex 1 of this technical support document) proposes a list of questions to guide the verification of the compliance with the Habitats and the Birds Directive, depending on the scenario (as described above) applicable to an individual operation.

3.4.3 Water Framework Directive

The Water Framework Directive (2000/60/EC) ensures the full integration of the economic and ecological perspectives in water quality and quantity management. It applies to fresh, coastal and transitional waters and ensures an integrated approach to water management respecting the integrity of whole ecosystems.

²⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009L0147>

²¹ According to the [Commission guidance on setting conservation objectives](#) (2012), site-specific conservation objectives define the condition that species and habitat types in a site shall achieve, so that the site can contribute to the overall goal of favourable conservation status of these species and habitat types at national, biogeographical or European level (see Article 2(2) of the Directive).

²² https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/form_art_6_4_en.doc

Its key objective is to achieve [by 2015²³], good status for the over 111 000 surface waters (e.g. rivers, lakes, coastal waters) and the over 13 000 groundwaters in EU territory. Achieving “good status” means securing good ecological and chemical status for surface waters and good quantitative and chemical status for groundwaters, main sources of abstraction of drinking water.

The Water Framework Directive introduces also a requirement for river management to be based on river basins (i.e. the natural geographical and hydrological unit) and not be dependent on administrative or political boundaries. The River Basin Management Plan details how the objectives set for the river basin (ecological status, quantitative status, chemical status and protected area objectives) are to be reached within the timescale required.

Finally, the Directive requires adequate water pricing to incentivise a sustainable use of water resources. Checklist 3.4 (see also Annex 1 of this technical support document) proposes a list of questions to guide the verification of the compliance with the Water Framework Directive.

3.4.4 Other relevant Directives

Depending on the nature of operations falling under specific line of support, IPs are expected to develop compliance check templates for specific directives.

3.5 Outputs of the compliance check

In answering the questions set out in Checklists 3-2 to 3-4, IPs and intermediaries should develop an understanding of the likely scope of environmental proofing requirements based on the following:

- 1) A review of the EIA report as part of answering the questions in **Checklist 3 - 2** should identify whether or not any significant environmental effects have been identified for the proposed project, as well as provide a baseline “without” project scenario. It should also highlight what measures are proposed to avoid or prevent significant adverse effects on the environment. Together these should help identify the need to carry out proofing for air, water, land, biodiversity and for cross-cutting impacts.
- 2) If the compliance check highlights that a project has required an appropriate assessment under the Habitats and Birds Directive, then proofing for impacts on biodiversity should be undertaken when the project falls under either Option 2 or 3 (see **Checklist 3 - 3**). Proofing for biodiversity may also be required where an appropriate assessment has not been undertaken but the EIA report highlights the potential for significant impacts.
- 3) If the compliance check highlights that a project may have impacts on a WFD waterbody which would impact on achievement of good status or potential, then proofing for water should be undertaken (see **Checklist 3 - 4**).

²³ The finding of the fitness check of the Water Framework Directive shows that the Directive has been successful in setting up a governance framework for integrated water management for the more than 110,000 water bodies in the EU, slowing down the deterioration of water status and reducing chemical pollution.

On the other hand, the Directive’s implementation has been significantly delayed and less than half of the EU’s water bodies are in good status, even though the deadline for achieving this was 2015, except for duly justified cases.

Where a project promoter (or an IP / intermediary) wishes voluntarily to undertake proofing in order to demonstrate the significant environmental benefits that would stem from a project, then they should undertake environmental proofing starting with Step 1 of the process.

4 Air

4.1 Overview

4.1.1 Relevant projects

Environmental proofing for impacts on air quality may be important for a range of different project types. It is likely to be most important for the types of projects listed in **Table 4-1**, as these may give rise to significant impacts on air quality, although this list is by no means exhaustive.

Table 4-1: Indicative list of relevant projects

- Infrastructure projects involving increased capacity or new construction of industrial plant and other manufacturing activities
- Infrastructure projects aimed at improving the energy efficiency of existing plant, and which may therefore result in positive impacts on air quality
- Industrial projects involving the use and emission of hazardous substances, such as solvents and other chemicals of very high concern
- Energy infrastructure projects, where it may be important to report on either negative or positive impacts, with this also including domestic heating and renewables
- Transport infrastructure projects, including both expansion of infrastructure (road, rail, ports and airports) and improvements in public transport systems, as well as transport projects aimed at reducing the energy intensity of transport networks
- Waste disposal and recycling projects which may give rise to negative or positive impacts on air quality
- Agricultural projects falling under National Air Quality programmes
- Social housing projects with energy efficiency improvements and/or applications of no-emission renewable energy schemes (RES)

4.1.2 Legislative context

This relates to atmospheric emissions from construction, operation or demolition or other activities or aspects of a project where these may give rise to a range of air pollutants (e.g. PM_{2.5}, NO_x, SO_x, heavy metals and other gases). These pollutants may have either direct effects on human health and the environment or may react with other pollutants to impact on human health and the environment.

The focus here is on air pollution impacts that are mainly local or regional in nature, with the severity of such impacts being dependent on local factors such as population density, other local activities and weather conditions. The separate proofing guidance developed specifically to assess climate impacts and GHG emissions should also be referred to as necessary.

As noted in the Commission's guidance, when assessing the environmental impacts of a project with respect to air, the following environmental issues are to be taken into consideration:

- A project's contribution to a reduction of pollution from gases (other than greenhouse gases) and from other pollutants and the related impacts on public health; and
- A project's contribution to national emission reduction commitments under Directive 2016/2284/EU²⁴.

Particular attention should be given to projects in areas where air quality standards as laid down by Directive 2008/50/EC²⁵ and target values as established by Directive 2004/107/EC²⁶, as amended, are already exceeded or are likely to be exceeded. Under this Directive limit values are defined for a range of air pollutants. Directive (EU) 2016/2284 complements these by setting out national emission reduction commitments for the period 2020-2029 and more ambitious ones for 2030 onwards, with the objective of overall health impact reductions. Under the Directive, national air pollution control programmes have to be developed which consider measures applicable to all relevant sectors, including agriculture, energy, industry, road transport, inland shipping, domestic heating and use of non-road mobile machinery and solvents²⁷.

Table 4-2: Air pollutants relevant to environmental proofing	
Directive 2004/107/EC	<ul style="list-style-type: none"> • Arsenic • Cadmium • Mercury • Nickel • Polycyclic aromatic hydrocarbons
Directive 2008/50/EC	<ul style="list-style-type: none"> • Sulphur dioxide, nitrogen dioxide and oxides of nitrogen and carbon monoxide • Benzene • Particular matter (PM10, PM2,5) and lead • Ozone and related NO and NO2, and volatile organic compounds
Directive EU 2016/2284	<ul style="list-style-type: none"> • SO2, NOx, NMVOC, NH3, CO • PM10, PM2,5, Total suspended particles and black carbon • Heavy metals (Cd, Hg, Pb) and AS, Cr, Cu, Ni, Se, Zn and their compounds • POPs (total PAHs, HCB, PCBs, dioxins/furans)
Industrial Emissions Directive (2010/75/EU)	<ul style="list-style-type: none"> • Sulphur dioxide and other sulphur compounds • Oxides of nitrogen and other nitrogen compounds • Carbon monoxide • (Non-methane) Volatile organic compounds • Metals and their compounds • Dust including fine particulate matter • Asbestos (suspended particulates, fibres) • Chlorine and its compounds • Fluorine and its compounds • Arsenic and its compounds • Cyanides • Substances and mixtures which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air • Polychlorinated dibenzodioxins and polychlorinated dibenzofurans

²⁴ Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC.

²⁵ Directive 2008/50/EC on ambient air quality and cleaner air for Europe.

²⁶ Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air

²⁷ See Annex II of Directive (EU) 2016/2284 for national emission reduction commitments and Annex III of Directive (EU) 2016/2284 for details on the National Air Pollution Control Programmes

Table 4-2: Air pollutants relevant to environmental proofing

Medium Combustion Plant Directive (EUJ)2015/2193	<ul style="list-style-type: none">• Emissions of SO₂, NO_x and dust to air.• Monitoring of carbon monoxide (CO) emissions.
Ecodesign Directive 2009/125/EC and Energy Labelling Regulation (EU) 2017/1369	<ul style="list-style-type: none">• In various implementing measures (e.g. on boilers and stoves) emission limits are set for relevant air pollutants such as PM₁₀ and NO₂.

4.1.3 Human health and environmental impacts

Emissions to air from all sectors (industry, transport, energy, agriculture in particular) can impact on ambient air quality either directly or indirectly through secondary effects (e.g. giving rise to high levels of ozone, with consequent impacts on human health).

For environmental proofing purposes, this support document focuses on the impacts that have been assessed using existing policy tools and methods. The focus is therefore on:

- **Human health:** in particular respiratory and cardiovascular effects, which may be short term or longer term in nature, with air pollutant emissions giving rise to significant societal costs. The key diseases include asthma, chronic bronchitis, pulmonary diseases, lung cancer and cardiovascular diseases, although other effects may arise from emissions of a wide range of industrial pollutants (e.g. the impacts of lead on children's IQs);
- **Agriculture:** increased atmospheric concentrations of some air pollutants can have an impact on crop yields (e.g. ozone and acid rain), and at the extreme can cause damage to crops both directly and through the deposition of pollutants to soil which may in turn be absorbed by crops and lead to dietary sources of certain pollutants; and
- **Built environment:** Acid rain related emissions in particular can result in the erosion or corrosion of certain building materials, leading to structural damage and the need for remedial works, while particular pollutants can lead to the discoloration of certain building materials (e.g. stone) impacting on the aesthetic and cultural value.

Air pollutants can also have negative impacts on ecosystems, which are difficult to capture without using sophisticated modelling techniques. They will therefore not be captured by the proofing requirements set out below. Potential impacts on ecosystems include the following:

- **Water resources:** Emissions that lead to the formation of acid rain (e.g. SO₂ and NO_x) can have significant impacts on lakes and other water bodies, damaging the health of these

ecosystems, while deposition of heavy metals may also impact on the health of aquatic ecosystems;

- **Soil:** Through deposition, atmospheric emissions may impact on soil chemistry, leading to impacts on flora and fauna, with long term impacts having been identified due to acid deposition but also heavy metal deposition;
- **Forests and timber:** Increased atmospheric concentrations of certain pollutants can also impact on the growth of trees;
- **Visibility:** Particulate emissions and ozone formation can lead to impacts on visibility;
- **Other ecosystem services:** Emissions of a variety of long-range air pollutants can impact on the health of ecosystems, with secondary impacts on birds, mammals and fish.

The above impacts may have direct economic effects by impacting on yields/harvests or populations, and more indirect effects associated with people's reduced enjoyment of the natural environment.

4.1.4 Existing guidance for assessing impacts on air quality

There is a range of existing guidance on assessing the impacts of projects on air quality, including calculation of changes in emissions to air that is already used for environmental proofing of investment projects. A selection of these is provided in **Table Air - 1** in Annex 2.

Where projects would result in environmental improvements, e.g. due to improvements in the energy intensity of production or transport, the net effect should be quantified to the degree possible. As a result, it may be important to also consider trade-offs between greenhouse gas emissions and other atmospheric emissions (as well as other project impacts). See also the separate the guidance on assessing GHG emissions.

European Commission, DG REGIO "Guide to Cost-benefit Analysis of Investment Projects" (2014) also provides examples related to the assessment of air quality impacts and recommends the adoption of the impact-pathway approach to assessing externalities, and highlights a range of data sources that may assist in quantifying and valuing impacts. The Guide provides examples of assessment requirements for transport schemes and energy schemes (and waste management schemes) which may be relevant to assessing impacts on air quality.

Key references for proofing purposes are:

- the DG MOVE "Handbook on estimation of external costs in the transport sector" as a useful reference that provides unit costs for emissions of carbon dioxide, noise and air pollutants;
- the European Environment Agency (EEA) report "Revealing the costs of air pollution from industrial facilities in Europe"; and
- the 2019 EMEP/EEA "Air pollutant emission inventory guidebook" which provides detailed literature on air pollutant emissions from different economic sectors, with the latest version published in 2019²⁸.

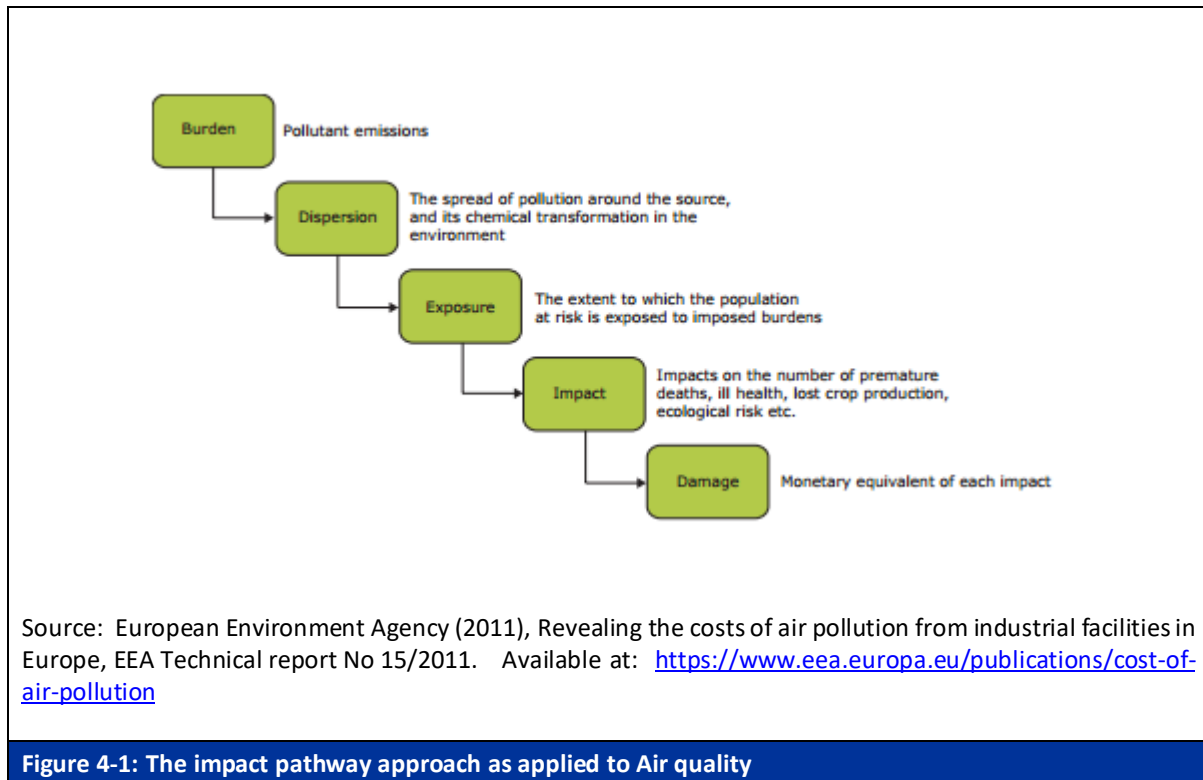
The DG MOVE "Handbook on estimation of external costs in the transport sector" was updated in 2014 and covers air pollution impacts on human health, buildings and crops. It also sets out best practice valuation approaches for assessing the noise and accident impacts from transport projects (see also Section 8). The Handbook and the EEA report are discussed further below.

²⁸ <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019>

4.1.5 The Approach

The Impact Pathway

The approach adopted here builds on the use of the Impact Pathway Approach which underlies the approaches which will be used in most modelling-based assessments of air pollutant impacts. For example, it is used extensively at the EU and national level for developing air quality strategies²⁹, and has been applied in work carried out for the European Environment Agency. **Figure 4-1** provides a summary of the impact pathway approach as applied to Air.



Recommended steps to proofing for Air

In order to identify and assess significant adverse effects, the InvestEU screening and proofing process is summarised below. Projects that fall under Annex I of the EIA Directive or that have been screened in under Annex II regardless the total project costs should go through Steps 1 to 4.

For EIA Annex II screened out projects and any other projects outside the EIA Directive above the threshold, IPs (based on discussions with project promoters) will carry out InvestEU screening to identify possible impacts (Step 1), and take a decision on whether proofing is required (Steps 2 to 3, followed by Step 4). Where projects would lead to an improvement in air quality in an air quality zone (under the Air Quality Directive), proofing may help ensure that these environmental benefits are taken into consideration when evaluating the project proposal.

The steps are as follows:

²⁹ https://ec.europa.eu/environment/air/pdf/clean_air_outlook_economic_impact_report.pdf

- 1) **Step 1: Identify if the project needs to go through sustainability proofing.** If there is the potential for significant negative residual impacts, then proofing should progress to Step 2 and the assessment of impacts. This will be the case if the project will go through an EIA (so Annex 1 or Annex 2 screened in), and the InvestEU screening checklist can be used to identify which are the significant (residual) impacts to be analysed. Other projects (not going through an EIA³⁰) should go through InvestEU screening to identify if proofing should be undertaken, and for which impacts. Depending on the checklist responses and conclusions on the potential for significant impacts, the assessment should move to Step 2 to assess (and preferably quantify) the expected volumes of emissions to air (kg per year) and to describe their likely local/regional significance. Proofing should look at project impacts after any mitigation measures (as set by environmental decision making³¹) have been taken into account.
- 2) **Step 2: Analysis of impacts** should be carried out for any significant changes in emissions to provide the information required for proofing purposes. Project promoters may also wish to quantify “positive” impacts, especially where these may highlight trade-offs in environmental impacts (i.e. positive versus negative impacts). The assessment of impacts should involve a qualitative assessment and quantification where proportionate.
- 3) **Step 3: Monetary valuation of the negative and/or positive environmental impacts** (costs and benefits) delivered by the project is recommended where proportionate and appropriate, to enable a more comprehensive economic appraisal for the project to be prepared by the IP.
- 4) **Step 4: Review and reporting.** This includes IPs and intermediaries reviewing the information resulting from Steps 1-3 to determine whether the proofing process has been followed as required and that aspects such as the mitigation hierarchy have been given due consideration. Reporting includes setting out assumptions underlying the assessment carried out and any associated uncertainties which may impact on the final conclusions.

4.2 Step 1: Identify if the project needs to go through sustainability proofing for impacts on air quality

4.2.1 Overview

Step 1 comprises four components involving information gathering, consideration of the mitigation hierarchy, InvestEU screening, and the voluntary undertaking of screening to identify positive impacts:

- Step 1.1: Information gathering;
- Step 1.2: Consideration of the mitigation hierarchy;
- Step 1.3: Application of the screening checklist;
- Step 1.4: Voluntary screening for positive impacts on air.

4.2.2 Step 1.1: Information gathering

³⁰ Note that if a project relates to measures under the national air pollution control programme (as required under MS implementation of Directive 2016/2284/EU³⁰), the Directive leaves it to MS to decide which measures under their national programme are subject to EIA and SEA.

³¹ Please note that mitigation measures can also be set in cases of screened out projects.

Step 1.1 involves collating the information required to assess whether the project could give rise to medium or high risk of impacts on air quality. It is assumed that InvestEU proofing is being undertaken in circumstances where:

- 1) The project is/will be subject to an EIA;
- 2) The project is not subject to an EIA;
- 3) The project promoter is voluntarily completing the positive checklists.

Where situation (1) applies and the project has been subject to an EIA or the project stems from plans or programmes subject to SEA, then detailed data on air quality should be collated from the associated reports. For projects that are at an earlier stage, any available data on likely air quality impacts should be collected. Information from other assessments may also be relevant, for example, from assessments carried out under the IED to gain operating permits.

Where situation (2) applies, the IP (or financial intermediary, both potentially with support from the project promoter) will be undertaking InvestEU screening and further proofing, if necessary, to show how the project is expected to impact on air quality (e.g. in relation to the achievement of targets set within Air Quality Plans), in which case the assessments or reports carried out in response to other legislative requirements should be collated.

For situation (3), the IP should ask the project promoter to collect information on the expected benefits for air quality, in preparation for the voluntary completion of the checklists in Step 1.3.

Table Air S1 - 1 in Annex 2 provides likely sources of data and information relating to air quality impacts where proofing is being undertaken as a requirement (i.e. because the project is subject to an EIA). For projects where an EIA has been carried out, then the expectation is that most of the information will be available from the EIA report. For projects not requiring a full EIA, the non-EIA data sources listed in this table may be particularly relevant. If the information on emissions and air quality available from the sources described in **Table Air S1 - 1** indicates that the project would give rise to no increases in emissions and therefore have no significant air quality impacts, then no further proofing will be required.

Information on the expected impacts of the project on air quality should be extracted from all relevant assessments prior to proceeding to Step 1.2.

4.2.3 Step 1.2: Consider the mitigation hierarchy

Step 1.2 requires consideration of the mitigation hierarchy. This should be considered before applying the InvestEU screening checklist and any further proofing as it may indicate that the project needs to be re-designed. **Table Air S1 - 2** in Annex 2 indicates the types of questions that should be posed for each level of the hierarchy.

For projects where proofing is compulsory and an EIA has been undertaken, then mitigation measures are likely to have been built into the project already. This may be the case for projects that are not subject to EIA as well, for example, under the IED where permitting will require the adoption of best available techniques (BAT). Where available, information should be extracted from the existing assessments to demonstrate that mitigation has been considered / adopted.

If there is insufficient information on mitigation, or mitigation has not yet been considered (for example, where the EIA has not yet been finalised or projects falling under situations 2 or 3 as described above), then the mitigation hierarchy should be reviewed prior to moving to Step 1.3.

Following the hierarchy may result in the project being re-designed or changed to the extent that proofing may need to return to Step 1.1 with additional information on likely impacts sought.

4.2.4 Step 1.3: Application of the screening checklist to identify the risk of any significant negative impacts

The aim of Step 1.3 is to ensure that information is available to IPs on the risk of any significant air pollutant emissions that will arise from the project. For projects subject to EIA, the aim is to identify any significant residual impacts post-mitigation and to focus the proofing required under Steps 2 to 3. For projects not subject to EIA and above the financing threshold, the checklists provide the basis for InvestEU screening to identify significant impacts and to focus any further proofing.

Use of the same checklist for both should ensure consistency:

- The checklist is provided in **Table Air S1 - 3** of Annex 2 and is aimed at identifying significant negative effects on air quality;
- Completing the checklist will provide IPs with an overview of the project's environmental profile with respect to any significant emissions to air;
- When completing the checklist, reference should be made to **Table 4-2** above which lists the air pollutants of relevance, making sure to consider those listed under all Directives.

Table Air S1 - 3 provided in Annex 2 sets out a series of questions designed to help identify whether or not a project may give rise to significant impacts on air quality. It has been developed to reflect the types of question used as part of screening under the EIA Directive, but it is meant to help with identifying impacts also for other projects outside the scope of the EIA. Where a full EIA is available, it should be possible to answer these questions based on the more detailed EIA reports covering emissions to air, with the checklist helping to identify any significant residual effects. Where a full EIA is not available, assessments carried out under legislation (such as to gain an operating permit under the IED) may help in answering the questions. It may also be useful to refer to the impact criteria suggested by IPs in their guidance documents.

It is not possible to provide a generic indicator of what would constitute a “significant” impact on air quality. It is clear though that, even if relatively small, it may not be environmentally sustainable to support a project in an Air Quality Zone which already has exceedances of the pollutants of concern, or in a Member State which does not comply with a national emission ceiling.

Where a “Yes” answer results for any of the checklist questions for identifying potentially significant negative impacts to Air (**Table Air S1 - 3**), then further proofing is required and the assessment should move to Step 2. If “No” is answered to all of the checklist questions, then this should be recorded and any review for Air can stop. In order to reach a decision on whether or not an impact may be significant, it may be useful to consider the types of questions that are used at the screening stage in EIAs for assessing significance. These questions can be found in the Commission's Guidance on Screening in EIAs.³²

A series of available reference sources may also assist with providing an indication of the potential for change in emissions to lead to significant environmental effects. For example, national air quality maps, regional air quality plans under Directive 2008/50/EC and regional data sources could be referred to, with the European Environment Agency also providing a range of air quality maps, emissions factors and reference sources.

³² https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf

4.2.5 Step 1.4: Voluntary screening to identify significant positive impacts

The checklist provided in **Table Air S1 - 4** in Annex 2 has been developed to support voluntary screening (which can be followed by proofing) to identify the environmental characteristics of a project to help ensure its environmental sustainability into the future. For air, the focus is on energy efficiency, the use of technologies or solutions (transport, infrastructure, etc.) to reduce atmospheric emissions at source, recycling and re-use, and substitution away from the use of more hazardous chemicals which if emitted could have impacts on the general population or the environment. It should also help capture indirect environmental benefits.

4.3 Step 2: Analysis of impacts

4.3.1 Introduction

If the EIA report and/or application of the InvestEU screening checklist indicates that there is the potential for significant impacts, it will be important that further information is provided by project promoters so that IPs can consider their significance and the potential for action to reduce impacts. This step therefore comprises two sub-steps:

- 1) Step 2.1: Identification of significant emissions of concern; and
- 2) Step 2.2: Providing key project information relevant to significant emissions of concern.

These are detailed further below.

4.3.2 Step 2.1: Identification of significant emissions of concern

The screening questions given in **Table Air S1 - 3** (and **Table Air S1 - 4** for positive impacts) in Annex 2 will highlight what types of emissions and sources of emissions are of concern and, hence, the information to be provided to allow a qualitative / semi-quantitative assessment of changes in emissions that may arise from the project.

Table Air S2 - 1 in Annex 2 sets out the types of data that should be collected and reported under Step 2.1. Such data should be readily available for all projects which have gone through an EIA, or which have required an environmental permit as part of gaining planning permissions under the IED or national legislation. These data are relevant to Member State's reporting and the Commission's own reporting to Parliament and the Council on achievement of objectives under Article 11 of the National Emissions Ceiling Directive. Otherwise, project promoters/developers should ask to provide such data.

Other examples of the types of data that should be provided can be found in guidance such as Greening Projects for Growth and Jobs³³ which highlights the types of indicators that may be relevant

³³ Interreg IIIC and GRDP (2006): Greening Projects for Growth and Jobs, GRDP, October 2006. At: www.grdp.org

to determining the significance of the environmental impacts arising from projects (in the case of this guidance, positive impacts that projects are aspiring to).

4.3.3 Step 2.2: Providing key project information for significant emissions of concern

Step 2.2 is aimed at providing context to any significant environmental emissions. The types of information to be considered by IPs is set out in **Table Air S2 - 2** in Annex 2, based on the types of information that would generally be reported by project promoters as part of a direct application for funding. The aim here is to ensure that specific consideration is given to the potential for impacts on air quality.

In particular, it will be important that there is adequate justification for any significant emissions to air, and that despite these the project is consistent in general with EU environmental/ sustainable development policy.

4.4 Step 3: Monetary valuation of environmental impacts

4.4.1 Introduction

Monetary valuation should only be carried out where the impacts on air quality would be significant and where valuation is feasible and the data required are readily available. In such cases, valuation of changes in atmospheric emissions on air quality should be assessed using an impact pathway approach based on the following:

- 1) Provision of data on volume of emissions per year associated with the key air pollutants arising from the project;
- 2) Predicting the impacts of changes in emissions on atmospheric concentrations at different receptor sites using dispersion models;
- 3) Using dose-response (concentration-response) functions and data on populations exposed, to predict the impact of changes in atmospheric concentrations at specific locations on specified health or environmental outcomes (e.g. premature mortality/years of life lost, asthma, crop yields); and
- 4) Valuation of the predicted outcomes either through the use of appropriate monetary valuations and/or through the use of disability adjusted life years (DALYs), which may also be converted to a monetary value.

The first three steps outlined above may have been carried out as part of an EIA or as an assessment undertaken as part of project preparation work or a permitting process (and even if it hasn't monetary valuation of impacts on air quality may still be feasible - see below). It is expected that modelling will have been required by national competent authorities for projects that may involve significant increases in atmospheric emissions, as they will want information on the likely impact of the project on atmospheric concentrations for key locations. The output of such modelling may or may not have gone on to the final stage in an impact pathway approach of monetary valuation of environmental damages. This final step requires linking dose-response functions with predictions of the changes in atmospheric concentrations of the air pollutants of concern at different geographic locations (i.e. receptor sites), and the monetary valuation of changes in impacts on exposed receptors.

Note it is recognised that it is unlikely that IPs will have the specialised in-house expertise required for conducting this type of assessment; it is assumed instead that they would rely on any modelling carried out by project promoters / developers with the aid of specialised consultancies.

The approach set out below is also relevant to assessing the benefits of projects that may result in significant reductions in emissions to air, for example, due to the adoption of more energy efficient equipment and/or shifts to reliance on greener energy sources. Although most available monetary valuations will relate to the avoidance of negative externalities, it is generally assumed that these are also good proxies of the value of the positive externalities stemming from improvements in air quality.

The approach

Two different steps have been included here depending on whether or not modelling has been carried out and therefore outputs are available on changes in atmospheric concentrations.

- Step 3.1: this step is for those projects which have **undertaken modelling but not monetary valuation**;
- Step 3.2: this step is for those projects which **have not undertaken any modelling and which require a simplified approach to monetary valuation**.

The approach to monetary valuation does extend to the impacts of dust emissions which may arise from construction activities. If these are considered to reflect a significant impact, then this should be reflected in the qualitative/quantitative description of impacts.

Variations by type of project

The environmental and human health impacts of emissions to air may vary depending on the nature of the emitting activity, due for example to differences in the height of the emissions and thus the potential for transport, the nature of the emissions and the duration and frequency of emissions. As a result, it may be important to use activity specific data on emissions per unit activity and on resulting concentrations as part of economic valuation of the impacts of changes in air quality. The dose-response functions and values used to convert impacts to an economic value should not vary across activities, but in some cases the simplified approaches set out below provide composite average figures per tonne of emissions that embody dispersion of the emissions and assumptions on exposed populations.

As a result, three different approaches are set out below for:

- Non-transport projects, including industrial, energy, waste, agriculture etc. projects; and
- Transport schemes.

4.4.2 Step 3.1: Modelling outputs available

Assessment route

If modelling outputs are available but monetary valuation has not been carried out, then one could either:

- 1) Combine the outputs of the modelling work with damage cost estimates that are applied at the national level by authorities in the member state where the project is located, giving appropriate details of the source of these estimates;
- 2) Combine the outputs of the modelling work with damage cost estimates available from the reference sources given here, or as updated.

Several reference sources provide unit cost damage estimates that could be combined with the outputs of models predicting emission levels from the project. The two main sources used here are the European Environment Agency report on “Revealing the costs of air pollution from industrial facilities in Europe” and the DG MOVE Handbook, which provide readily used unit values. There are other potential references relevant to industrial plant including power plants, waste disposal projects and recycling schemes, and reductions in exposures to hazardous chemicals, and which could be used if referenced and justifications as to the reason for use are given. Similarly, the EMEP/EEA Guidebook 2019³⁴ on emissions inventories also identifies emission factors for various types of agricultural practices, which may be used to predict the changes in emissions for projects such as those aimed at reducing ammonia emissions from livestock.

Damage costs of air pollution from non-transport projects

The European Environment Agency produces on an annual basis the Air Quality in Europe report series³⁵, which provides an updated analysis of air quality in Europe and the impacts that it has on human health and ecosystems. Unfortunately, the data presented in these reports would not allow estimation of the change in damage costs associated with a change in emissions.

The 2011 European Environment Agency (EEA) report³⁶ “Revealing the costs of air pollution from industrial facilities in Europe” provides the results of a report describing the findings from a simplified modelling approach developed to assess, in monetary terms, the cost of damage to health and the environment from selected air pollutants released from industrial facilities reporting to the pollutant register E-PRTR³⁷. The pollutants included within the scope of study include all of those listed in Table 4-2 above, and focuses on the main impacts selected as relevant for environmental proofing purposes.

Although this report may now be somewhat outdated, there is a series of tables in Sections 2 and 3 of the EEA report which provide damage costs per tonne of pollutant emitted for each EU Member State and for the year 2020. These could act as the basis for monetary valuation of significant residual impacts on air quality as part of InvestEU proofing. These estimates are given in 2005 prices, so should be updated to reflect current prices (see Section 2.6 of these guidelines for further details).

By way of illustration, **Table Air S3 - 1** provided in the Annex reproduces a table for PM2.5 emissions from Annex 1 of the EEA report. **Table Air S3 - 1** gives the damage costs per tonne of emissions for 2020 (2005 prices). Similar tables are given in Annex 3 of the EEA report for heavy metals and other carcinogenic pollutants. All the tables include either low and high valuations or confidence intervals.

Although the damage cost figures available from the EEA report were developed using data for industrial facilities, they should be appropriate for simplified proofing purposes for non-transport development projects.

³⁴ <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/4-agriculture>

³⁵ <https://www.eea.europa.eu/publications/air-quality-in-europe-2019>

³⁶ <https://www.eea.europa.eu/publications/cost-of-air-pollution>

³⁷ <https://www.eea.europa.eu/publications/cost-of-air-pollution>

It should be noted that these damage estimates are based on what would now be considered relatively low valuations for a fatal cancer, where this would be linked to exposure to hazardous chemicals such as heavy metals, benzene and PAHs. A more up to date valuation of a statistical life (VOSL) is available from the OECD, which provides an estimate for the EU of around €3.7 million³⁸. The European Chemicals Agency provides valuations for a range of other health endpoints of relevance to substances that meet the criteria for being substances of very high concern under REACH³⁹.

Projects involving changes in transport infrastructure or the energy intensity of transport

The main air pollutant emissions associated with transport projects are: carbon monoxide, non-methane VOCs, NO_x, PM₁₀, PM_{2.5} and SO_x. These pollutants are all regulated under either Directive 2008/50/EC or Directive 2016/2284 and, as part of an EIA, any project likely to have significant impacts on air quality may have also carried out modelling of changes in emissions to air.

The DG MOVE “Handbook on the external costs of transport” (Version 2019)⁴⁰ provides a very valuable reference source for undertaking the economic valuation of transport related impacts on air quality (negative and positive). It relies on the approach set out in **Figure 4-2** to estimating the air pollution costs of transport, and covers all of the above transport-related pollutants with the exception of carbon monoxide (which should be assessed as part of the greenhouse gases component of environmental proofing).

³⁸ See page 127 of the OECD report on Mortality Risk Valuation in Environment, Health and Transport Policies, available at: https://read.oecd-ilibrary.org/environment/mortality-risk-valuation-in-environment-health-and-transport-policies_9789264130807-en#page128

³⁹ <https://echa.europa.eu/support/socio-economic-analysis-in-reach/willingness-to-pay-to-avoid-certain-health-impacts>

⁴⁰ <https://ec.europa.eu/transport/sites/transport/files/studies/internalisation-handbook-isbn-978-92-79-96917-1.pdf>

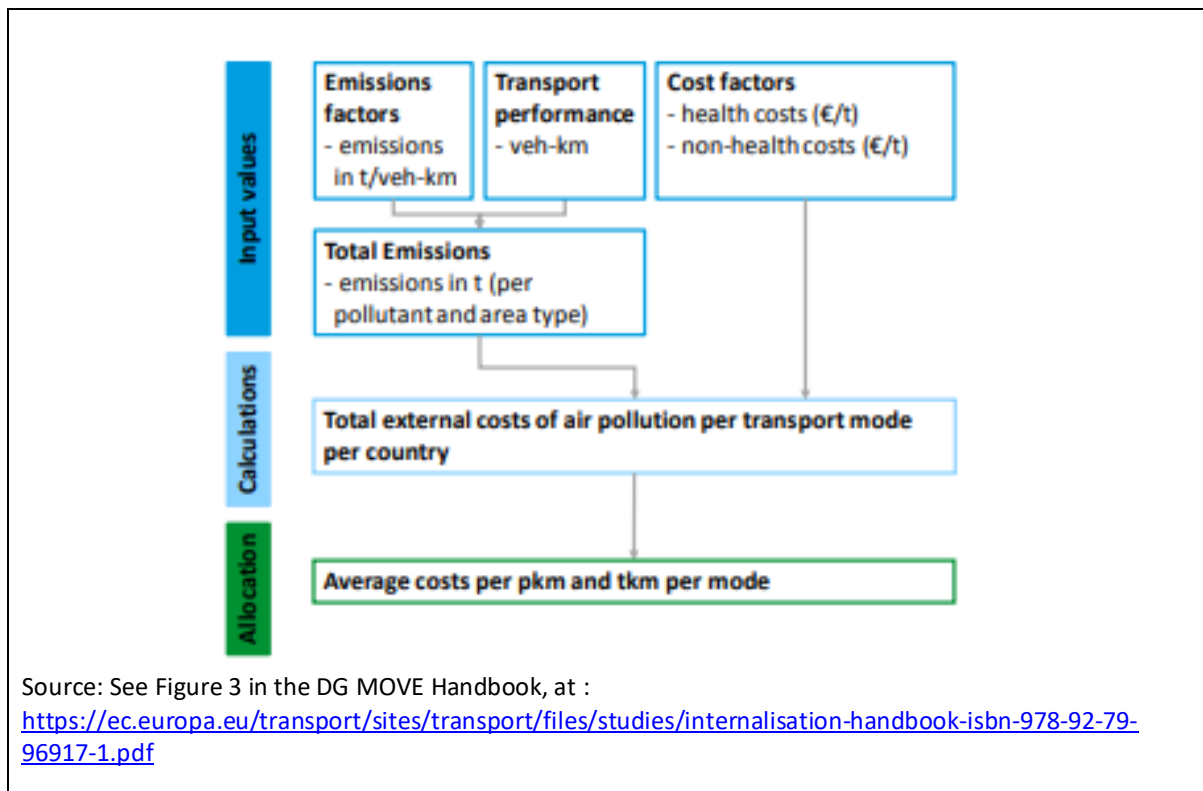


Figure 4-2: “Handbook on external costs of transport” approach to estimating average and total air pollution costs from transport

The damage cost estimates provided in this report were developed in a manner that is consistent with the approach underlying the EEA estimates for industrial activities. These estimates are totals covering all health effects, crop losses, biodiversity losses and materials damages. The average damage cost values are given in €/kg of emissions for each of the pollutants as national averages for all transport other than maritime, and then separately for maritime emissions. The figures are given in terms of €/kg emissions as a national average (in 2016 prices, so would need to be updated accordingly to reflect the year of the assessment, e.g. 2020). **Table Air S3 - 2** in Annex 2 provides air pollution damage cost values for use in proofing of transport projects. This table reproduces Table 14 from the DG MOVE Handbook.

These average damage cost values provided can be combined with information on the changes in emission volumes that would result from a transport scheme (e.g. from planned increases in road access and hence traffic, to reductions in congestion, and to shifts from diesel to electric trains) to provide a monetary valuation of the impacts on air pollution.

Clearly, for some schemes marginal cost estimates that relate to changes in the number of passenger km may be of more value and link more easily to modelling results. The Handbook also provides the associated marginal cost estimates in €-cent per passenger km for different emission classes of motor vehicle and areas, broken into metropolitan, urban and rural. The vehicle types covered range from cars to motorcycles and mopeds, buses, light commercial vehicles, freight transport, train, barge, ferry sea-going container vessels and aviation.

To summarise:

- **For roads:** calculations of the air pollutant quantities could be done on a link-by-link basis, or by using aggregate modelled estimates of vehicle-km, where possible broken down by vehicle

type and by road type. Technical guidance to prepare national emission inventories is provided in the EMEP/EEA air pollutant emission inventory guidebook. The same source can be used for default emission factors if country-specific data are not available. **If only aggregated modelled estimates of vehicle-km are available, where possible differentiated by vehicle category, average country-specific air pollution costs per vehicle-km for road transport are provided in the Excel Annex ‘Complete overview of country data’ accompanying the 2019 Handbook.**

- ***For Rail/air/public transport:*** Country specific estimates of emissions factors per vehicle type and mode may be available from national appraisal guidelines. Where these are not available, marginal air pollution costs per passenger-km and tonne-km, for each mode of transport, are available from Tables 20-23 of the 2019 Handbook. These may be applied to modelled changes in passenger-km and tonne-km for relevant transport modes to calculate air pollution impacts due to transport interventions.

Incorporating the estimates in the Cost-Benefit Analysis / economic appraisal for the project

The resulting estimates from the above assessment should be incorporated into the economic analysis and calculation of either the Economic Net Present Value (ENPV) or the Economic Rate of Return (ERR), see Section 2.8.7 of this guidance. Note that the need to convert any transfer values to current prices or to adjust for purchasing power parity should also be considered (see Sections 2.8.5 and 2.8.6).

4.4.3 Step 3.2: Modelling outputs not available

If no modelling has been carried out as part of the environmental permitting of a facility, then it would probably not be proportionate to require modelling be undertaken for InvestEU environmental proofing purposes. However, there may be value in undertaking a simplified form of the assessment laid out under Step 3.1.

Assessment route

It is assumed that the data set out under Step 2 has been collated and is therefore available to form the basis for the assessment.

The approach to the assessment in this case would involve the following:

- 1) Collection of the data on expected emission volumes / reduction in emissions, as measured in tonnes, kg or appropriate unit per year, resulting from the project during its operational phase;
- 2) Apply the available valuations to these, with a preference for country-specific damage estimates, to develop a monetary value for the negative or positive externalities resulting from the project (see also Step 3.1);
- 3) Identification of the key uncertainties arising from this approach.

The assessment can draw on either the European Environment Agency⁴¹ country-specific damage cost estimates for non-transport projects or from the DG Move damage cost estimates expressed per km of transport by transport mode for changes in air emissions due to transport projects (see **Table Air S3 - 2** on the marginal air pollution costs associated with different transport modes, i.e. expressed as

⁴¹ <https://www.eea.europa.eu/publications/cost-of-air-pollution>

€-cent per passenger km or per freight km). (Note that transport externalities related to noise and accident risks should be assessed separately, see also Section 8 on cross-cutting impacts.)

There will be several uncertainties surrounding the adoption of this simplified approach especially where a project would result in a reduction in emissions to air. Key uncertainties will relate to aspects concerning the transport and dispersion of emissions from the site, current air quality levels at receptor sites, and population densities in the surrounding area and at receptor sites.

It is not expected that such uncertainties will be assessed quantitatively, but the simplifying assumptions underlying the assessment should be made clear as part of reporting.

4.4.4 Incorporating the estimates into the economic analysis

The resulting estimates from the above assessment should be incorporated into the economic analysis and calculation of either the Economic Net Present Value (ENPV) or the Economic Rate of Return (ERR), see Section 2.8.7 of this guidance. Note that the need to convert any transfer values to current prices or to adjust for purchasing power parity should also be considered (see Sections 2.8.5 and 2.8.6).

4.5 Step 4: Review and reporting

Step 4 is expected to be undertaken by the IP or intermediary, as part of their review process and reporting of the results of proofing.

This involves reviewing the assessment and determining whether the available information demonstrates adequate proofing for air quality purposes. This is expected to involve consideration of the following questions:

- 1) Has proofing been carried out because it was mandatory?
 - a. If yes, proofing was triggered by the requirement for an EIA, what other legislative compliance was required? Is this information available for scrutiny, e.g. has the basis for environmental permitting or gaining planning permissions been provided?
 - b. If no, and proofing was carried out as a result of the InvestEU screening process, what information has been provided by the project promoter?
- 2) For all projects, is there evidence that the mitigation hierarchy has been followed⁴²?
 - a. Have project promoters documented the measures taken for avoiding impacts?
 - b. Where relevant, what mitigation measures have been suggested?
 - c. Has consideration been given to rehabilitation/restoration if needed?
 - d. If the project needs to offset air emissions, are these measures recorded?
 - e. Are costs available for the measures considered in the mitigation hierarchy?
- 3) Have project impacts been quantified?
 - a. Have impacts on air quality been quantified in terms of tonnes/kg emitted or avoided?
 - b. What are these impacts?
 - c. Have the damage costs arising from significant impacts been monetised?
- 4) Have significant impacts been monetised?
 - a. What was the source of the monetary values and what are the end estimates?

⁴² For projects under preparation, reporting should indicate what the approach towards consideration of mitigation will be.

- b. How do these present value damage costs compare with project costs? What proportion of the total costs do they represent?
- c. What would be the costs of any additional measures aimed at further mitigation significant impacts?

Following review, reporting should follow the stepped approach described above. A summary should also be provided of the following as part of recording the results of the assessment:

- What air pollutants were considered in the assessment and what geographic scale was considered by the analysis in terms of receptors (i.e. the scope of the assessment);
- What the general approach to the assessment was, including to the qualitative and quantitative elements of the assessment;
- What the sources of data were, including of any quantitative data or dose-response relationships used in the assessment and the associated human health and environmental impacts were;
- What monetary value estimates were used to monetise human health and/or environmental impacts;
- What the total economic value of the negative or positive impacts over the life of the project are, including an indication of the time horizon over which these have been estimated; and
- What the key uncertainties are and how significant these may be to the end conclusions.

5 Water

5.1 Overview

5.1.1 Relevant projects

Environmental proofing for impacts on water will be necessary for any projects subject to EIA and which may have a significant residual impact on the water environment; it may also be required for projects not subject to EIA but which have the potential to lead to deterioration or compromise the achievement of Water Framework Directive objectives or to achievement of objectives under the Marine Strategy Directive.

Table 5-1 below provides an indicative list of the types of projects which are likely to require a more detailed assessment for impacts.

Table 5-1: Indicative list of relevant projects

- Wastewater treatment schemes
- Water supply projects
- Hydropower projects, including dams and run of river projects
- Ports and dredging activities (inland and coastal)
- Food and drink manufacturing facilities
- Chemicals manufacturing facilities
- Pulp and paper production
- River engineering (e.g. for flood defence purposes and including channelization, weirs, bridges, river restoration, etc.)
- Navigation projects
- Agricultural projects, including land drainage, large scale irrigation, construction of new reservoirs
- Road or rail projects which require the realignment of or would impact on surface water bodies
- Various engineering and other maintenance activities

See also CIS Guidance Document No. 36: https://circabc.europa.eu/sd/a/e0352ec3-9f3b-4d91-bdbb-939185be3e89/CIS_Guidance_Article_4_7_FINAL.PDF

5.1.2 Legislative context

The water environment as a category of natural capital covers **freshwater resources**, including rivers, lakes, wetlands and groundwater; and **coastal resources**, where this includes both brackish/saline wetlands, transitional waters and marine waters.

When assessing the environmental impacts of a project on natural capital in terms of the physical environment or the flows of good and services from it, the European Commission requires the following environmental issues be taken into consideration with respect to a project's impacts on the water environment:

- Its contribution or otherwise to protection of the aquatic environment;
- Its contribution or otherwise to objectives related to a reduction in water pollution;
- Its actions to ensure the avoidance of the risk of contamination of surface and ground waters and of drinking water;
- Its contribution to more efficient water use; and

- Its contribution to sustainable use of the marine ecosystem to prevent overexploitation and exhaustion of marine resources.

With respect to the above, particular attention is to be given to projects in areas where the water quantitative and qualitative objectives are not being met or are at risk of not being met, or where the project might impact on the oceans (due to the absence of the exact jurisdiction).⁴³ The potential sources of information available for these purposes are discussed further below.

For the purposes of proofing, the Water Framework Directive (WFD) and Marine Strategy Directive (MSFD) are the main legislative drivers for protecting the water environment. Other potentially relevant water-focused legislation includes the Urban Wastewater Treatment Directive for projects involving creation of new or modifications to existing treatment wastewater treatment works, the Floods Directive (flood risk management projects may impact on the hydromorphology of a water body), the Drinking Water Directive, and the Industrial Emissions Directive.

The EIA Directive and the SEA Directives are also relevant given the role they play in requiring environmental impact assessments for infrastructure projects and in the development of plans and programmes. The other key linking directives are the Habitat and Birds Directives.

Table 5-2: Legislation for “water” relevant to environmental proofing	
Directive 2000/60/EC – Water Framework Directive	<ul style="list-style-type: none"> • Surface waters – achievement of good ecological status and good chemical status; for heavily modified and artificial water bodies, good ecological potential should be achieved • Groundwater – achievement of good chemical status and quantitative status
Directive 2008/56/EC – Marine Strategy Framework Directive	<ul style="list-style-type: none"> • Achievement of good environmental status
Council Directive 91/271/EEC – Urban Wastewater Treatment Directive	<ul style="list-style-type: none"> • Collection and treatment of wastewater in all agglomerations above 2000 population equivalents with level of treatment varying by size • Pre-authorisation of certain discharges • Controls on sewage sludge disposal and re-use and treated wastewater re-use when appropriate
Directive 98/83/EC – Drinking Water Directive (under revision)	<ul style="list-style-type: none"> • Sets limit values for 48 specific parameters that must be monitored • Requires remedial measures if limit values are not met
Directive 2007/60/EC – Floods Directive	<ul style="list-style-type: none"> • Preparation of flood risk maps and flood risk management plans focused on prevention, protection and preparedness
Directive 2010/75/EU - Industrial Emissions Directive	<ul style="list-style-type: none"> • Sets BAT which will require prevention or minimisation of discharges to water as part of plant permitting
Directive 2014/52/EU - Environmental Impact Assessment Directive	<ul style="list-style-type: none"> • Requires assessment of impacts on the water environment for infrastructure developments

⁴³ There are various tools available on the European Environment Agency Website that enable identification of the status of water bodies in different member states. For example, the interactive maps available for bathing waters, provide the potential to look at bathing water by location and to establish whether they are of excellent, sufficient, poor or other quality. The WISE Database provides data and maps on WFD waterbody status. See: <https://www.eea.europa.eu/themes/water>

5.1.3 Human health and environmental impacts

As noted above, compliance with the WFD and MSFD are the key tests of the environmental sustainability of a development project (taking into account overlaps with the other directives and in particular with the EIA Directive). These directives define impacts in terms of “status”:

- Water Framework Directive (WFD):
 - Chemical status – determined with respect to achievement of Environmental Quality Standards for priority and priority hazardous substances (as set by Directive 2008/105/EC as amended);
 - Ecological status – determined with respect to a series of biological quality elements, physico-chemical elements and hydromorphological elements.
- Marine Strategy Framework Directive – qualitative descriptors related to:
 - Ecosystems: biodiversity; non-indigenous species; commercial fish species; elements of food webs; eutrophication;
 - Hydromorphology and physical conditions: sea floor integrity, permanent alterations of hydrographical conditions;
 - Chemical conditions: concentrations of contaminants in water and in seafood; and
 - Marine litter and introduction of energy (including noise).

5.1.4 Existing guidance on proofing for investment financing purposes

There are several different data sources that can assist with assessments of impacts on the water environment. These include the following which provide access to key documents and links to Member State River Basin Management Plans (RBMPs), map-based information on RBMPs, etc.

- European Environment Agency WISE Database: <https://www.eea.europa.eu/data-and-maps/data/wise-wfd-4/wise-wfd-database-1>
- European Water Data Centre: <https://www.eea.europa.eu/themes/water/dc>
- The Commission's online library CIRCABC: https://ec.europa.eu/environment/water/water-framework/economics/index_en.htm

The most important existing guidance for investment financing purposes is the checklist tool developed by JASPERS with respect to the WFD. This is based on and complements the CIS Guidance Document No. 36⁴⁴ which sets out the legal assessment requirements for new projects under the WFD.

The starting point for the assessment required by the JASPERS' checklist tool is the potential for projects to result in a deterioration in the current status of a water body or for the modifications or alterations required by a project prevent or compromise the achievement of an improvement in status that would otherwise have been expected (due to measures being undertaken under the River Basin Management Plans (RBMP) for that waterbody). As clarified in the CIS Guidance, an “Applicability Assessment” is first required to determine whether or not a project would affect the environmental objectives being met for the relevant waterbodies. If it would not, then a project can be authorised by the relevant competent national authority.

If a project could affect the status of one or more waterbodies, then it falls under Article 4(7) of the WFD. Article 4(7) sets out the conditions for exemption in the event of new modifications to the

⁴⁴ https://circabc.europa.eu/sd/a/e0352ec3-9f3b-4d91-bdbb-939185be3e89/CIS_Guidance_Article_4_7_FINAL.PDF

physical characteristics of a body of surface water, alterations to the level of bodies of groundwater or new sustainable human development activities. It only allows for the authorisation of such projects under certain conditions.

In particular, the following conditions must be met with a few exceptions (JASPERS, 2018):

- a) All practicable mitigation measures must be in place;
- b) The reasons for the modification or alteration are set out in the relevant RBMP (or it can be demonstrated that the proposed project has been subject to at least as much public consultation as the RBMP and the project will be reported in the next RBMP);
- c) The modification or alteration can be demonstrated to be of overriding public interest, or its benefits to human health, safety or sustainable development can be shown to outweigh the benefits of maintaining or improving water body status (a balancing test); and
- d) It can be demonstrated that there are no technically feasible and not disproportionately costly alternatives that are significantly better from an environmental perspective.

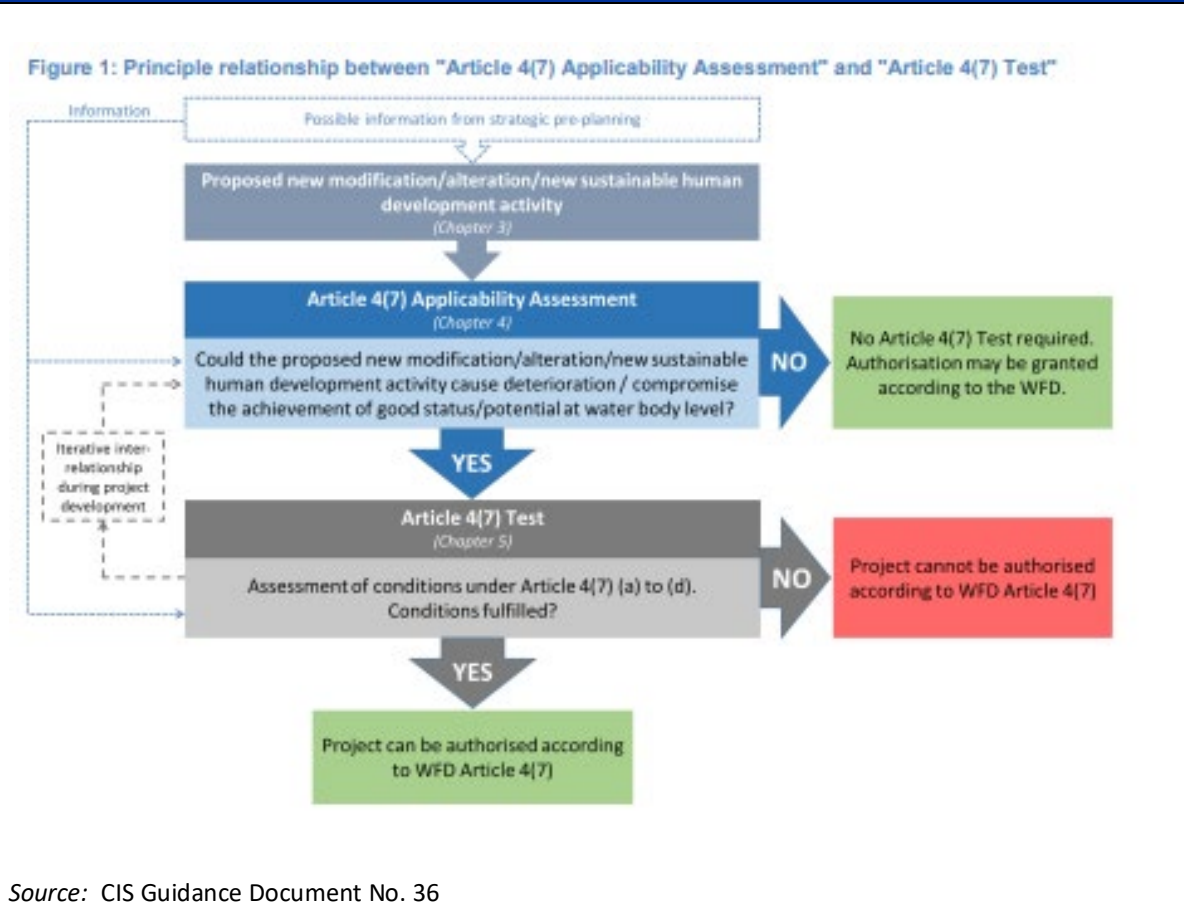
Figure 5-1 reproduced from CIS Guidance Document No. 36 sets out the relationship between “Applicability Assessment” and the Article 4(7) Test. If the above conditions are not met, the proposed project cannot be authorised. In particular, Article 4(7) cannot be used to exempt new, point source (e.g. wastewater treatment works) or diffuse inputs of pollution in any of the following situations:

- 1) In all water bodies, where an input causes a chemical status deterioration (i.e. a deterioration in relation to one or more priority or priority hazardous substance);
- 2) In water bodies currently at good status or below, where an input of other pollutants affects status at element level. Pollutants in this case cover the specific pollutants, nutrients, etc. under the physico-chemical supporting elements;
- 3) In high status water bodies, where deterioration caused by the input of any pollutant drives status to below good.

If a project is likely to have an adverse effect on water body status due to an input of pollutants, then it is strongly recommended that advice be sought via early discussions with the WFD competent authority. See *CIS Guidance Document No. 36* and JASPERS (2018) for further discussion on the relevance of other WFD exemptions, as well as practical considerations and illustrative examples to aid in determining whether the conditions under Article 4(7) have been met.

There may also be value in reviewing the range of other guidance that exists and which sets out the detailed assessment requirements of other lenders such as the European Investment Bank (EIB). For example, the EIB’s Guidelines on Hydroelectric Power Development provides a checklist of requirements that must be met for the design and operation of hydropower projects, where these are aimed at preventing degradation of the water environment. The EIB guidelines require assessment of impacts on upstream hydrology and limnology (including environmental flow regimes), on water quality and sedimentation, as well as the potential for eutrophication due to inundation of land. Such assessments must therefore go beyond consideration of WFD changes in status, to also consider the potential environmental risks that such schemes may create.

Figure 5-1: “Applicability Assessment” and the Article 4(7) Test



5.1.5 Approach

Summary of the Approach

In order to identify and assess significant adverse effects, the InvestEU screening and proofing process is summarised below. Projects that fall under Annex I of the EIA Directive or that have been screened in under Annex II regardless the total project costs should go through Steps 1 to 4.

For EIA Annex II screened out projects and any other projects outside the EIA Directive above the threshold, IPs (based on discussions with project promoters) will carry out InvestEU screening to identify possible impacts (Step 1), and take a decision on whether proofing is required (Steps 2 to 3, followed by Step 4). In both cases, the approach also draws on the JASPERS checklist tool.

Where projects are expected to lead to an improvement in the status of water bodies, completion of the positive checklists in Step 2 may highlight these benefits, thus indicating that the project is in line with principle 1 (“Prioritise measures that improve ecosystem condition and contribute to wellbeing”) from the guidance on integrating ecosystems and their services into decision making.

The process is as follows:

- 1) **Step 1: Identify if the project needs to go through sustainability proofing.** If there is the potential for significant negative residual impacts, then proofing should progress to Step 2

and the assessment of impacts. This will be the case if the project will go through an EIA (so Annex 1 or Annex 2 screened in). For freshwater resources, **WFD checklist** (Steps 1 and 2 of the JASPERS checklist tool) acts as the InvestEU screening checklist, while an InvestEU **MSFD checklist** has been developed for this support document (provided in Annex 3). Other projects (not going through an EIA) should go through InvestEU screening using these two checklists to identify if proofing should be undertaken, and for which impacts. Depending on the checklist responses and conclusions on whether there is the potential for significant impacts, the assessment should move to Step 2. Proofing should look at project impacts after any mitigation measures (as set by environmental decision making⁴⁵) have been taken into account.

- 2) **Step 2: Analysis of impacts** should be carried out for any significant impacts on the water environment to provide the information on their likely local/regional significance required for proofing purposes. The requirements under the WFD or as part of an EIA will be sufficient for this purpose, with a similar approach set out for marine waters. Project promoters may also wish to quantify “positive” impacts, especially where these may highlight trade-offs in environmental impacts (i.e. positive versus negative impacts). The assessment of impacts should involve a qualitative assessment and quantification where proportionate.
- 3) **Step 3: Monetary valuation of the negative and/or positive environmental impacts** (costs and benefits) delivered by the project is recommended where proportionate and appropriate, to enable a more comprehensive economic appraisal for the project to be prepared by the IP.
- 4) **Step 4: Review and reporting.** This includes IPs and intermediaries reviewing the information resulting from Steps 1-3 to determine whether the proofing process has been followed as required and that aspects such as the mitigation hierarchy have been given due consideration. Reporting includes setting out assumptions underlying the assessment carried out and any associated uncertainties which may impact on the final conclusions.

Relationship to CIS Guidance and JASPERS checklist tool

For the freshwater environment, this support document draws extensively on the *CIS Guidance Document No. 36* and *JASPERS’ Water Framework Directive: Project assessment checklist tool*⁴⁶. IPs (and project promoters) should refer to this guidance where a detailed assessment is required. It may also be important to refer to *CIS Guidance Document No. 36* for discussion on the potential for streamlining assessments required under the SEA and EIA Directives with those required under Article 4(7).

The *CIS Guidance Document* sets out the approach that should be taken to the “Applicability Assessment”, with this embodied within the JASPERS checklist tool which also provides a reporting framework.

The JASPERS checklist tool is based on the following steps (see also **Figure 5-2** which maps the checklist tool against the requirements set out here for environmental proofing):

- 1) Step 1: Context and Screening (see also “Screening for potential effects” in *CIS Guidance*)

⁴⁵ Please note that mitigation measures can also be set in cases of screened out projects.

⁴⁶ This support document draws on Version 1 of the checklist tool, released in 2018, available at: <http://www.jaspersnetwork.org/plugins/servlet/documentRepository/downloadDocument?documentId=441>

- 2) Step 2: Scoping the Assessment (see also “Scoping of further investigations”)
- 3) Step 3: Further Data Collection or Investigations (see also “Data collection and assessment”)
- 4) Step 4: Article 4(7) Test (same in *CIS Guidance*).

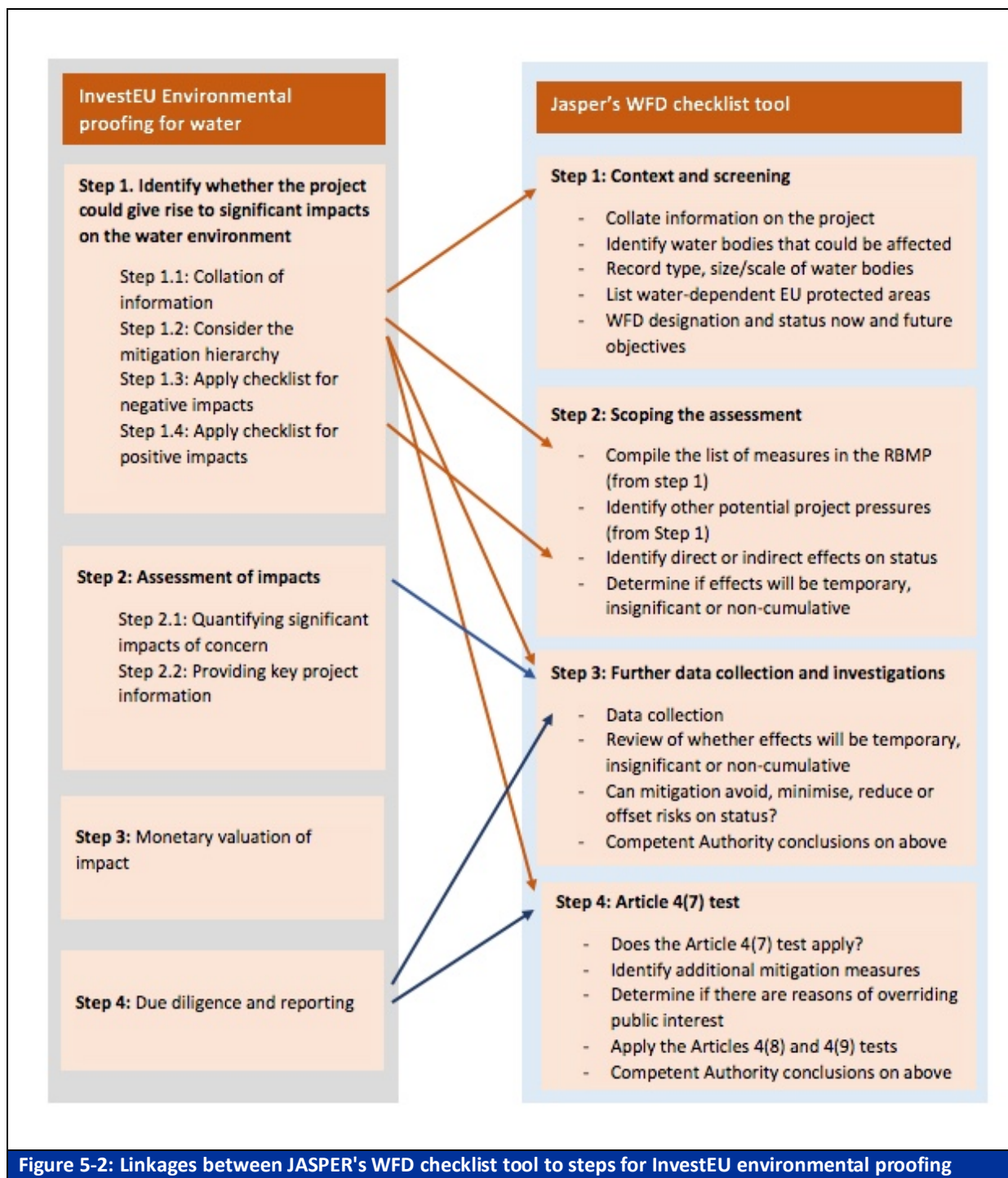


Figure 5-2: Linkages between JASPER's WFD checklist tool to steps for InvestEU environmental proofing

National procedures for determining whether the Article 4(7) tests need to be applied may differ from those set out in the CIS Guidance Document and in the JASPERS checklist. However, the JASPERS checklist should represent current good practice at EU level.

Note also that the assessment approach set out in the checklist or the CIS Guidance does not include any monetary valuation as part of determining if the conditions under Article 4(7) (c and d) would be

met. Monetary valuation may be one means of demonstrating that the modification or alteration of a waterbody is of overriding public interest, or that its benefits to human health, safety or sustainable development outweigh the benefits of maintaining or improving water body status (a balancing test). This potential for further assessment is discussed below in these guidelines, although with respect to the water environment it is only encouraged where valuation would be expected to provide reasonably robust results.

No similar guidance exists for assessing projects under the MSFD. As a result, for environmental proofing purposes a consistent “checklist” approach has also been developed to provide an assessment framework for use by IPs. Annex III of the Directive provides an indication of the descriptions of characteristics that should be available within the national strategies for different marine regions/subregions, together with the types of pressures or human impacts that may affect the degree to which good environmental status is achieved in those marine regions/subregions.

Finally, it is of note that the approach proposed here varies to a degree from the generalised proofing process set out for other impact categories. This is due to the existence of the already detailed guidance that exists in the form of the JASPERS checklist, which is considered to provide an equivalent (if not higher) level of proofing.

5.2 Step 1: Identify if the project needs to go through sustainability proofing

5.2.1 Overview

Step 1 comprises four components involving information gathering, consideration of the mitigation hierarchy, InvestEU screening, and the voluntary undertaking of screening to identify positive impacts:

- Step 1.1: Information gathering;
- Step 1.2: Consideration of the mitigation hierarchy;
- Step 1.3: Application of the screening checklists; and
- Step 1.4: Voluntary screening for positive impacts on the water environment.

5.2.2 Step 1.1: Information gathering

Step 1 involves collating the information required to screen and assess whether the project could give rise to medium or high risk of significant impacts on the water environment. It is assumed that InvestEU proofing in circumstances where:

- 1) The project is/will be subject to an EIA;
- 2) The project is not subject to an EIA, but is subject to InvestEU screening and further proofing, e.g. because the project would impact on a designated WFD waterbody or on objectives set under the MSFD; or
- 3) The project promoter wishes to voluntarily complete the positive checklists.

Where situation (1) applies and the project has been subject to an EIA, then detailed information from the EIA on impacts on the water environment should be collated. For projects that are still at the scoping stage, any available data on likely impacts should be collected. Information from other assessments may also be relevant, for example, from the Applicability Assessment carried out under the WFD if available, or any assessment carried out under the MSFD or the Industrial Emissions Directive. IPs should be aware that they should request this information from project promoters.

Where situation (2) applies, the IP may be undertaking proofing to show how the project is expected to benefit the water environment, in which case the assessments or reports identifying these benefits should be gathered from the project promoter. Situation (2) may also cover projects that have had to carry out an assessment under the WFD or which would impact on designated marine waterbody. Project promoters should provide to IPs any information on the predicted impacts on waterbody status and/or achievement of objectives, but also consider the mitigation hierarchy discussed in Step 1.2 below, in particular whether the project should be re-designed or planned as part of the first mitigation measure (avoid).

For situation (3), the IP (with assistance from the project promoter) should collect information on the expected benefits of the project for the water environment, in preparation for completing the checklists in Step 2.

Table Water S1 - 1 in Annex 3 indicates the potential sources of data and information relating to impacts on the water environment where the project is subject to an EIA or to InvestEU screening. For projects not requiring a full EIA, the non-EIA data sources may be particularly relevant.

Note that a project may trigger more than one assessment. Streamlining of assessments is mandatory (where appropriate) when an EIA is required alongside a WFD related assessment⁴⁷. The specific requirements of each directive do need to be met, however, as they may otherwise be considered to be unfulfilled⁴⁸.

5.2.3 Step 1.2: Consideration of the mitigation hierarchy

Step 1.2 requires consideration of the mitigation hierarchy. This should be considered before moving on to assess the likely impacts of the project for the water environment as it may indicate that the project needs to be re-designed. **Table Water S1 - 2** in Annex 3 provides the types of questions to be posed for each level of the hierarchy, with avoiding impacts being the primary mitigation measure.

For projects where an EIA has been prepared or is in preparation, then mitigation measures are likely to have been built (or will be built) into the project. This should be the case for other assessments as well, for example, an “applicability assessment” (see Step 3 below) will include investigating alternative solutions that would avoid negative impacts on the waterbody. Where available, information should be extracted from the existing assessments to demonstrate that the hierarchy has been followed.

If there is insufficient information on mitigation, or mitigation has not yet been considered (for example, where proofing is being undertaken voluntarily so mitigation has not been triggered by a legislative requirement), then the mitigation hierarchy should be reviewed prior to moving to Step 1.3. Following the hierarchy may result in the project being re-designed or changed to the extent that proofing may need to return to Step 1.1 with additional information on likely impacts sought.

⁴⁷ European Commission, Commission notice – Commission guidance document on streamlining environmental assessments conducted under Article 2(3) of the Environmental Impact Assessment Directive (Directive 2011/92/EU of the European Parliament and of the Council, as amended by Directive 2014/52/EU), Official Journal 2016/C 273/01.

Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C:2016:273:FULL&from=EN>

⁴⁸ Common Implementation Strategy for the Water Framework Directive and the Floods Directive, Guidance Document No. 36 Exemptions to the Environmental Objectives according to Article 4(7), accessed at: https://circabc.europa.eu/sd/a/e0352ec3-9f3b-4d91-bdbb-939185be3e89/CIS_Guidance_Article_4_7_FINAL.PDF on 18th June 2020.

Once the mitigation hierarchy has been followed to the extent that the IP (with information provided by the project promoter) is able to provide information on the way in which the proposed project is avoiding, minimising, rehabilitating or offsetting impacts on biodiversity, proofing should move to Step 1.3.

5.2.4 Step 1.3: Screening for the risk of negative impacts on the water environment

Interaction with JASPERS checklist tool

The aim of Step 1.3 in these guidelines for project subject to EIA is to ensure that information is available to IPs, and that they are therefore able to assess, any significant residual water-related impacts that will arise from the project. For projects requiring InvestEU screening, it is to ensure that potential significant impacts are identified.

Screening for significant negative effects draws on the checklists used in the JASPERS tool and complements these with a checklist developed for this support document specific to the MSFD and based on EIA screening questions. In this case, as a minimum, the JASPERS checklist tool should be applied to any project requiring an EIA or otherwise requiring InvestEU screening if an “applicability assessment” has not been carried out; the MSFD checklist should be applied if relevant.

Checklist for the Water Framework Directive

Step 1 of the JASPERS checklist tool requires that a range of project information is collated and summarised (for reporting purposes). **Table Water S1 - 3** in Annex 3 provides a summary of the types of information that will be required for this step in relation to the WFD. A key source for this information will be the RBMP(s) for the waterbody(bodies) which could be impacted by the project. These should be available from national authorities, with data also available from the European Environment Agency’s WISE Water Framework Directive Database.

Based on the project characteristics, the assessment involves determining if the project could directly or indirectly affect the ecological or chemical status of a surface water body or the chemical or quantitative status of a groundwater body, or compromise the status of a water-dependent EU protected area.

This requires the project promoter to establish whether cause and effect mechanisms exist, using a series of checklist tables, covering the different WFD elements (hydromorphological, physicochemical, biological, chemical (priority and priority hazardous) status, and EU protected areas). Separate tables exist for surface waters, lakes, transitional waters, coastal waters and groundwater bodies (see also the CIS Guidance Document for practical examples).

At the waterbody level, if there is no potential causal mechanism or the effect would be minor then no further proofing is required. If a potential causal mechanism does exist or there is uncertainty, then the assessment must progress to Step 2 of the JASPERS checklist tool. Step 2 of the JASPERS tool is aimed at determining what WFD elements require further investigation, if any. It has clear linkages with identifying what types of investigations that may be needed for a formal EIA, as well as for an Appropriate Assessment under the Habitats Directive (see also Section 6).

This step requires a review of the information collected in Step 1 of the JASPERS tool, including that highlighted as being relevant to Step 2 in the tool, and determining whether:

- The effects will be temporary, as temporary effects (e.g. lasting less than 6 years – a full WFD planning cycle) should not trigger the Article 4(7) tests;
- The effect will be insignificant in the context of the water body, taking into account its size and whether the effect will only be local in nature; and
- Whether it can be concluded that there are no potential cumulative effects, due to impacts on multiple locations, or to the combined effects with other projects.

Refer to the JASPERS tool which provides a checklist and template for recording the results of this assessment across the different elements and water body types.

If the conclusions from consideration of the above are that effects will be temporary and/or insignificant and that there will be no cumulative effects, then no further assessment for WFD purposes is required. Environmental proofing can stop at this point for impacts on freshwater resources.

Where there is the potential for effects, then further data will need to be collected and/or investigations carried out by the project developer in order to provide information on the nature, magnitude and significance of those effects. Note that such data may also be required as part of an EIA or an assessment under the Habitats Directive. If this is the case, then proofing (Step 2) should proceed regardless of the conclusions with regard to the WFD alone.

Checklist for the Marine Strategy Framework Directive

The JASPERS checklist tool for WFD compliance includes within its scope assessment of the potential for hydromorphological, physicochemical and biological and chemical status for marine waters, including for EU protected areas.

In order to ensure that a project does not conflict with achievement of the MSFD objectives for marine regions and subregions, screening is required with respect to the other qualitative elements or “descriptors” that will have had objectives set for them. As a minimum, this includes consideration of the objectives set for ecosystems (biodiversity; non-indigenous species; commercial fish species; elements of food webs; eutrophication), concentrations of chemical contaminants in seafood, marine litter, and the introduction of energy.

Table Water S1 - 4 in Annex 3 sets out the equivalent types of information for screening in relation to the MSFD. **Table Water S1 - 5** in Annex 3 provides a checklist of a similar nature to that provided in the JASPERS checklist tool to act as the basis for screening for InvestEU purposes. As for the JASPERS checklist tool, the significance of any effects is not relevant at this stage, only the potential for such impacts.

Checklist for the EIA Directive – water environment

Table Water S1 - 6 in Annex 3 provides a screening checklist for identifying potentially significant negative impacts on the water environment. It sets out a series of questions designed to help identify whether projects not requiring an Applicability Assessment under the WFD or an assessment under the MSFD may still give rise to significant impacts on the water environment. It has been developed to reflect the types of question used as part of screening under the EIA Directive.

Where a “Yes” answer results for any of the checklist question provided in **Table Water S1 - 6**, then environmental proofing is required and the assessment should move to Step 2. If “No” is answered to all of the checklist questions, then this should be recorded and the assessment for water can stop. In order to reach a decision on whether or not an impact may be significant, it may be useful to consider

the types of questions that are used at the screening stage in EIAs. These are reproduced in **Table Water S1 - 7** in Annex 3 from the Commission's guidance on Screening in EIAs.⁴⁹

A series of available reference sources may also assist with assessing the potential significance of impacts, including the RBMPs and national programmes of measures under the MSFD, as well as the databases and maps available from the EEA's WISE references and resources.

5.2.5 Step 1.4: Voluntary screening to identify significant positive impacts

Table Water S1 - 8 in Annex 3 provides a checklist for voluntary screening (which can be followed by proofing) to identify project characteristics that would reduce impacts on the water environment. It has been developed to help IPs identify the environmental characteristics of the project that underlie its environmental sustainability into the future. The focus is on improving water efficiency, reducing discharges to the environment, substitution away from the use of more hazardous chemicals which if emitted could have impacts on the environment. It should also help capture indirect environmental benefits.

5.3 Step 2: Analysis of impacts

5.3.1 Introduction

If the outcome of any of screening indicates that there is the potential for significant impacts, the environmental proofing is required and it will be important that attempts are made to quantify these impacts to the degree possible. This will be required in any event for the assessments required under the WFD or as part of an EIA but may not be automatic in relation to the MSFD or to projects falling outside the WFD and EIA legal requirements.

It is recommended that projects falling under the WFD prepare an assessment in line with that set out in Steps 3 and 4 of the JASPERS checklist tool and taking into account the CIS Guidance Document #36. An equivalent approach has been developed for these guidelines for projects which may impact on marine waters or which may have impacts that are not covered by a WFD assessment (e.g. a significant temporary effect).

This step involves:

- 1) Step 2.1: Identification of significant impacts of concern; and
- 2) Step 2.2: Providing key project information relevant to significant impacts of concern.

As a starting point, the type of information set out in **Table Water S2 - 1** in Annex 3 will be relevant to setting the baseline for the quantitative assessment of impacts.

⁴⁹ https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf

5.3.2 Reviewing significant impacts relevant to the Water Framework Directive

Step 2.1: Identifying significant impacts of concern

Step 3 of the JASPERS checklist tool is focused on the collection of data in order to answer three key questions (JASPERS, 2018):

- Could the project have a non-temporary effect on the status of one or more of the WFD elements at the scale of the water body?
- Is the project expected to have an adverse effect on the water-dependent features of relevant EU protected area objectives?
- Are significant in-combination effects on status possible?

Further assessment by the project promoter is only required if the answer to any of these questions is yes. In addition, no further assessment is required if the status of any of the biological quality elements of a water body at good status or below would not be affected.

Where impacts may arise, the assessment to be carried out by the project promoter as part of Step 3 of the JASPERS checklist tool involves consideration of mitigation measures, which in this case includes the potential for offsetting or compensatory measures, where these include measures taken in another water body (see the tool for further discussion and examples). Where these measures would result in the project not causing a deterioration in status or compromise the future achievement of good status, and this is confirmed by the relevant national WFD competent authority, then proofing can cease.

It is assumed that quantitative details on the number and length/area of the water bodies that may be affected has been provided by the project promoter as part of the descriptions required under the earlier steps (Step 1). In addition to this, it may be important to provide qualitative/quantitative data on the following as relevant:

- Predicted changes in hydrological and morphological parameters, e.g. changes in the residence time of water within a lake, or the quantity impacts of changes in hydrologic connections between surface waters and groundwaters;
- Predicted changes in physico-chemical elements, e.g. changes in dissolved oxygen or biological oxygen demand (providing details of the baseline concentrations and the change from these);
- Predicted changes in the biological quality elements, e.g. impacts on fish populations or species mix; and
- Predicted changes in concentrations of priority or priority hazardous chemicals, e.g. kg discharged or increases in concentrations where dredging or other physical activities would result in the resuspension of heavy metals.

It also may be important for the project promoter to accompany the above data by indications of the duration of the impacts, as well as the frequency of e.g. discharges where these would not be continuous.

Step 2.2: Providing key project information relevant to significant impacts of concern

The aim of this step is to provide context to any significant environmental impacts. The types of information to be reported by project promoters on under Steps 1 and 2 of the JASPERS checklist tool

will provide part of this, as should the write-up of any investigations as required under Step 3 of that tool. If it is concluded that a project would not cause deterioration or compromise the achievement of good status then Step 3 within the JASPERS checklist tool also asks for any confirmation of this conclusion by a competent authority to be provided.

If the outcome of the WFD assessment to this point indicates that there may be a significant impact on the status of a waterbody, following the adoption of all technically feasible and not disproportionately costly mitigation measures, then the assessment proceeds to Step 4 within the JASPERS tool. This step involves application of the Article 4(7) tests requiring that (see also CIS Guidance Document #36 and JASPERS checklist tool):

- all practicable mitigation measures are in place;
- the reasons for the modification or alteration are set out in the relevant River Basin Management Plan, or it can be demonstrated that the proposed project has been subject to at least as much public consultation as is the case for the RBMP (e.g. as part of an EIA) and the project will be reported in the next RBMP);
- the modification or alteration can be demonstrated to be of overriding public interest, or its benefits to human health, safety or sustainable development can be shown to outweigh the benefits of maintaining or improving water body status (a balancing test); and
- it can be demonstrated that there are no technically feasible and not disproportionately costly alternatives that are significantly better from an environmental perspective.

Step 4 in the JASPERS checklist tool overlaps with Steps 4 and 5 of the generalised approach set out in these guidelines. Its requirements are therefore discussed under Steps 4 and 5 here.

For completeness, however, **Table Water S2 - 2** in Annex 3 provides an indication of the types of contextual information that should be made available to IPs by project promoters from application of Steps 2 to 3 of the JASPERS tool.

5.3.3 Reviewing significant impacts relevant to the Marine Strategy Framework Directive

Step 2.1: Identifying significant impacts of concern

The screening questions given in **Table Water S1 - 6** and **Table Water S1 - 8** in Annex 3 will highlight what types of impacts may be of concern for marine waterbodies and, hence, provide an indication of the information to be provided to allow a more detailed qualitative / semi-quantitative assessment of the impacts that may arise from the project.

Table Water S2 - 3 in Annex 3 sets out the types of data that should be collected and reported under Step 2.1. Such data should be readily available for all projects which have gone through an EIA, and for those WFD waterbodies that are also covered by the MSFD. For the MSFD, it is recognised that it may be harder to provide quantitative data on impacts, with the aim in this case to provide the best data available for describing the significance and magnitude of the impacts with respect to achievement of GES.

Step 2.2: Providing key project information for significant impacts of concern

Table Water S2 - 2 in Annex 3 sets out the types of information that should be provided for waterbodies falling under the WFD. This table is also relevant to marine regions/subregions under the MSFD and providing better context on potential impacts.

5.3.4 Reviewing other significant impacts

Step 2.1: Identifying significant impacts of concern

Table Water S1 - 6 in Annex 3 sets out the screening questions relevant to projects requiring an EIA, and which do not require an assessment under the WFD or MSFD. These screening questions (and **Table Water S1 - 8** in Annex 3 for positive impacts) will provide an indication of the types of impacts which may be of concern and, hence, the information to be provided to allow a qualitative / semi-quantitative assessment of changes in emissions that may arise from the project.

Table Water S2 - 4 in Annex 3 provides an indication of the types of quantitative data that should be provided for these projects. Such data should be readily available for all projects which have gone through an EIA, as part of environmental permitting or gaining planning permissions.

Given the range of potential impacts that might arise on the water environment, this table should be viewed as a guide rather than as setting the full scope as to the information that IPs may require from project promoters.

By way of example, **Table Water S2 - 5** in Annex 3 provides an indication of the types of information that may be relevant to a scheme that would impact on water quality.

5.3.5 Step 2.2: Providing key project information for significant impacts of concern

Table Water S2 - 1 in Annex 3 sets out the types of information that should be provided as context for impacts on the water environment. This table is relevant to all impacts on the water environment and to ensuring that there is context to any potentially significant impacts. This information should be developed by IPs with help from project promoters.

5.4 Step 3: Monetary valuation of environmental impacts

5.4.1 Introduction

Ideally, any impacts on the water environment would be quantified in monetary terms to enable the impacts to be combined with other economic impacts into an economic analysis for the project. Given the difficulties that arise in trying to place a monetary value on such impacts, monetary valuation has not been required by most lenders in the past, except as part of larger EU grant programmes (and even in these cases the approach has generally been based more on cost-effectiveness analysis and checks to ensure that the least cost option complies with EU environmental legislation).

Steps 1 and 2 will provide a semi-quantitative assessment of the physical impacts (at least) of a project on the water environment. In some cases, one can move directly from these physical indicators of impacts, e.g. volume of abstracted water, to an economic impact. In other cases, monetary valuation requires that a linkage is made between the change in the water environment and the consequent impact on users (direct or indirect) of that component of the water environment.

Monetary valuation will in general require that further information is collected in addition to that required by the assessment approach set out in Steps 1 and 2 above, and by the JASPERS checklist tool. It will require further information on the populations affected, for example, as well as current levels of activity.

In particular, it is important to note the role that monetary valuation can play in demonstrating whether or not the impacts of a project on the water environment can be demonstrated to be of overriding public interest, or its benefits to human health, safety or sustainable development can be shown to outweigh the benefits of maintaining or improving water body status (a balancing test).

In the field of water, monetary valuation draws on a range of techniques to derive economic valuations for changes in environmental goods and services. These include the use of market prices (as proxies for economic value), revealed preference methods (including averted expenditure, replacement costs, the production function method, travel cost/recreational demand models and hedonic pricing methods), and stated preference or willingness to pay methods.

As illustrated in the European Commission, DG REGIO "Guide to Cost-benefit Analysis of Investment Projects" (par. 4.1.7.4), different methods can be adopted to estimate people's WTP to have surface water bodies of a better water quality. Indeed, estimation of the WTP for a project aiming at improving the quality of a lake used for fishing differs from that of a lake used for bathing and differs also from that for a project concerning a river without any use. In other words, the use or non-use of the concerned surface water body must be known first in order to choose the best estimation method.

For water bodies (including seawaters) where prohibition to bathing, fishing or other recreational and/or productive activities is removed thanks to the project, an operational approach for benefit estimation is to use the market value of the concessions given for the provision of the recreational activities (e.g. beach resorts) or productive activities (e.g. fishing, shellfish) as a proxy of WTP.

For water bodies that are not used for bathing or other water related recreational and/or productive activities, the WTP for the simple existence (non-use value) of a less polluted water body (preserving or increasing the amenity or ecological value of the place) must be estimated. A contingent valuation would be the preferred choice. However, it is usually expensive and time consuming. As an alternative, a benefit transfer approach, transferring and adjusting values calculated somewhere else for similar projects, can be adopted.

Stated preferences pay studies may be used to provide valuations for impacts on informal and more formal recreation (bathing, canoeing, angling, etc.) and impacts on water-related conservation and biodiversity, as well as heritage and landscape related impacts. Travel cost methods may also be used for valuing impacts on recreation, while hedonic pricing methods may be relevant for valuing impacts on amenity and the aesthetic value of the environment.

Impacts on flood and coastal erosion risks tend to be assessed using risk-based approaches, where both the probability (likelihood) and the consequences (positive and negative impacts) of flooding and/or erosion are taken into account. Changes in such risks are frequently assessed in terms of the change in the probability of damages on physical property, infrastructure, agricultural yields, as well as risks to life and associated impacts arising from stress, the loss of personal belongings, etc. Some of these impacts are assessed using market prices while others rely on the use of stated preferences/willingness to pay methods.

5.4.2 The approach

The approach set out below is relevant to assessing either positive or negative impacts on the water environment in monetary terms. Although most available willingness to pay valuations will relate to the avoidance of negative impacts, it is generally assumed that these can also be used to derive the value of the positive impacts.

The approach is based on the functions of the physical water environment and its capacity or potential to deliver ecosystem services. Ecosystem services are in turn defined with respect to the goods or benefits that people obtain from the ecosystem. A change in the physical condition of an ecosystem will therefore have an impact on the functioning of that ecosystem and, hence, on the benefits that it delivers. At the waterbody level, the actual economic value of any specific ecosystem service depends on the demand for that service. For example, certain types of grasses and wetlands can provide coastal flood protection and erosion services, but if no one benefits from these then there are no coastal protection benefits to property or benefits from reduced risks to humans.

As a result, the approach to monetary valuation will need to vary depending on the nature of the waterbody (ground or surface/fresh or marine), the type of impact (with flood and erosion risks discussed separately), the nature of the impact (small change in quality/large change in quality) and the population benefitting.

The valuation process will require:

- 1) Identifying relevant ecosystem services and the cause and effect mechanisms linking changes in waterbody status and economic impacts;
- 2) Determining the most appropriate approach to monetary valuation and determining whether the available monetary valuations would be robust indicators of the economic welfare value of the effects from changes in water body status. This step includes identifying the additional data required for valuation and establishing whether or not it is feasible and would be proportionate to collect the additional data – if it would not then the assessment should stop here; and
- 3) Estimating the economic value of changes in water body status, carrying out sensitivity analysis on key assumptions underlying the valuation exercise and incorporating the results into the economic analysis.

Note that impacts on biodiversity with respect to the water environment may be covered by this assessment (see also Section 7). Care should be taken to ensure no double-counting of impacts arises.

5.4.3 Step 3.1: Identification of cause and effect mechanisms

Impacts on water quality or quantity may lead directly or indirectly to other environmental effects, linked to the services provided by the water environment (both by stocks and flows). The services provided by the water environment that are most often considered as part of impact assessments related to the water environment include the following:

- Impacts on the quality of abstracted water for supply purposes, leading to the need for additional treatment prior to use;
- Impacts on the capacity of the environment to provide a water purification service;
- Impacts on physical property, including residential and commercial property, infrastructure and the built environment;
- Impacts on natural and recreational fisheries, with this including both the health of a fishery in terms of its recruitment rates, productivity and yields, and the fish species within a water body;
- Impacts on shellfisheries in terms of their productivity and yields, and role as a food source for birds and other marine life;

- Impacts on in-stream and bankside recreation, with the former including boating, canoeing, bathing, and the latter including walking near the riparian zone e.g. for dog-walking, birdwatching/nature watching, etc.;
- Impacts on the amenity value associated with waterside property; and
- Impacts on biodiversity and nature conservation.

Table Water S3 - 1 in Annex 3 sets out the links between the different ecosystem services linked to the water environment, the associated goods or benefits provided by these, the economic valuation methods that may be relevant deriving an economic value for changes in the provision of these goods, and the types of information that will be needed to enable monetary valuation. The table draws on (but simplifies) the CICES classification system and reflects the types of methods that are commonly used for monetary valuation purposes. The table is relevant to changes in chemical quality, biological quality and quantity, and it covers the range of ecosystem services that combined would comprise a water body's Total Economic Value.⁵⁰ The CICES classification system is based on identification of the final ecosystem services that link to the goods and benefits that are valued by people. It excludes "supporting" ecosystem services as they are fundamental to virtually all other ecosystem services and including them could lead to double counting (especially as assessment of biodiversity is also covered separately in Section 7).

Monetary valuation requires that linkages are made between the physical changes identified through Steps 1 and 2 to the ecosystem services and associated goods/benefits summarised in **Table Water S3 - 1**. This includes defining the impacts in sufficient detail to enable the data needed for valuation of those impacts. This may be possible from the information generated as part of an EIA or from that collected as part of the Step 3 assessment for the WFD and MSFD.

A range of tools also exists to support such work, with sources such as Scottish Natural Heritage's *An ecosystem approach to marine planning – a summary of selected tools, examples & guidance*, providing a range of useful links.⁵¹

5.4.4 Step 3.2: Determining the approach to monetary valuation and data requirements

Step 3.2 essentially involves establishing what the most appropriate approach is to monetary valuation and determining what additional data would be required in order to undertake valuation. **Table Water S3 - 1** in Annex 3 provides a rough, generalised guide as to methods and the types of additional data that would be required. In general, for the water environment, where the approach would be based on market-price based methods or replacement cost types of approach, valuation may be more feasible than where it would rely on the use of a benefits transfer approach drawing on existing monetary valuations.

Tools for assessing changes in ecosystem services

Table Water S3 - 2 in Annex 3 provides details of some of the tools that are available to assist in both assessing changes in ecosystem services and valuation of those changes. In addition to these tools,

⁵⁰ European Commission, DG REGIO, Guide to Cost-Benefit Analysis of Investment Projects for Cohesion Policy 2014-2020, 2014.

⁵¹ <https://www.nature.scot/sites/default/files/2018-11/An%20Ecosystem%20approach%20in%20marine%20planning%20-%20a%20summary%20of%20selected%20tools%2C%20examples%20and%20guidance.pdf>

which are global or European in scope, there is also a series of national tools (e.g. the UK uses valuations developed purposefully for WFD assessment purposes).

For example, InVEST (Integrated Valuation of Ecosystem Services and Trade-offs)⁵² is a suite of standalone, open source models that can be used to map and value the range of ecosystem goods and services. InVEST combines land use and land cover (LULC) data with information on the supply (biophysical processes) and demand of ecosystem services to provide a service output value in biophysical or economic terms. The InVEST model has been validated extensively for various case studies mostly on water yield, nutrient retention and sediment delivery and is regularly updated.

Co\$ting Nature⁵³ is a sophisticated, web-based tool for natural capital accounting and analysing the ecosystem services provided by natural environments, which enables testing of the consequences of development projects on ecosystem service provision. It includes spatial datasets so does not require the use of GIS and is free for non-commercial use. Co\$ting Nature starts by mapping 13 ecosystem services and then combines them with analysis of current pressure, future threats, biodiversity and delphic conservation priority to produce an assessment of priority areas for conservation and careful (sustainable) management on the basis of all of these factors. It is a web-enabled model with globally available data. It relies on cost-based approaches for valuation purposes, with the outputs providing an indication of the opportunity cost of nature being protected to produce ecosystem services). Related to Co\$ting Nature is WaterWorld⁵⁴ which has been developed to assist with water resources assessment, water security analysis and hydrological ecosystem services accounting.

Market based approaches (including cost-based approaches such as replacement costs, damage costs avoided and preventive expenditure)

A range of information sources will be available that can assist in the use of market price-based approaches, as well as in estimating replacement costs or potential preventive expenditures (sometimes referred to as the substitute cost method). The key difficulty in applying these methods may be in making the linkages between the predicted physical changes in water bodies and the impacts on the associated goods or benefits provided under the with and without project situations. IPs should also be aware of their relative advantages and drawbacks.⁵⁵

Potential sources of information include for example:

- RBMPs which may provide an indication of the long run marginal costs of developing water supplies, especially potable supplies, for other river basins. They are also likely to be good sources of information on the marginal costs of water treatment, which could be used to provide an indication of the costs that would arise to abstractors from deterioration of water body chemical status;
- EU thematic reports such as “Water saving potential in agriculture in Europe”⁵⁶ provide a range of data on the costs of on farm storage, water harvesting etc. which could be used as a means of valuing losses in the availability of other supply sources, while “EU Water saving potential” provides example estimates for a range of other sectors⁵⁷;

⁵² <https://naturalcapitalproject.stanford.edu/software/invest>

⁵³ <http://www.policysupport.org/costingnature>

⁵⁴ <http://www.policysupport.org/waterworld>

⁵⁵ A straightforward discussion can be found at: https://ecosystemvaluation.org/cost_avoided.htm#appo

⁵⁶ https://ec.europa.eu/environment/water/quantity/pdf/BIO_Water%20savings%20in%20agriculture_Final%20report.pdf

⁵⁷ https://www.ecologic.eu/sites/files/project/2013/917_water_saving_1.pdf

- Similarly, studies such as the “Economic Report of the EU Aquaculture sector”⁵⁸ provide data at the national level on the value of different fisheries and aquatic plants, including details of net profits which could act as the basis for valuing changes in harvests in the absence of more localised data.

A range of examples can be found via internet searches, for example, related to flood protection as an ecosystem service or the value of wetlands for their pollution assimilation capacity.

Travel cost and hedonic pricing approaches

The economics literature provides a range of different references which have assessed the value of recreation linked to both freshwater and marine water bodies, including studies which have used travel cost-based methods to look at the additional consumer surplus associated with higher quality water resources. Given the site-specific nature of these studies, any benefits transfer based on an existing study should be treated with care.

In terms of available tools, however, the ESTIMAP models provide a basis for calculating the number of visitor days to an area for recreation purposes based on the type of natural habitat, its location and other features that determine what types of sites people visit and how often. However, the outputs from such predictive tools will be less reliable than data that are likely to be locally available (e.g. through consultation).

Willingness to pay approaches

Although willingness to pay values valuations exist from a range of past studies, there are no valuations with the same standing as those for emissions to air or for noise for use in a benefits transfer approach for assessing impacts arising from a change in waterbody status. As a result, no single set of transfer values are recommended in this guidance.

In the absence of a clearly transferrable existing valuation to the environmental changes which would result from the project, and where the level of effort required would be disproportionate to the size/importance of the impact concerned, valuation should not be carried out.

To aid IPs in determining whether valuation use WTP estimates may be proportionate, a summary of some relevant studies is provided below.

The Blue2 study⁵⁹ identified 15 different European willingness to pay studies providing valuations of changes in Good Environmental Status or Good Ecological Status at the national level (see Annex B of the study report). These studies essentially derive willingness to pay estimates for the incremental change associated with a move from one status to another, e.g. from bad to poor, poor to moderate and moderate to good (or in some cases from poor to good status); they are expressed in **willingness to pay per person per river basin**. The studies cover a range of countries and a range of environmental pressures on the water environment, together with varying status changes. **Table Water S3 - 3** in Annex 3 reproduces the summary table provided in the Task B4 report from the Blue2 study as being relevant to the assessment of changes in waterbody status for both the WFD and the MSFD.

⁵⁸ <https://stecf.jrc.ec.europa.eu/documents/43805/2192243/STECF+18-19+-+EU+Aquaculture+Economics.pdf/dc9c871e-830e-477f-aec8-5252ac102e19>

⁵⁹ Schasfoort et al (2019): Freshwater and Marine Benefits Concept and Model Assessment tool, Task B4 of the Blue2 project “Study on EU Integrated policy assessment for the freshwater and marine environment, on the economic benefits of EU water policy and on the costs of its non-implementation. Available at:

Alternatively, a choice experiment carried out in Belgium⁶⁰ in 2011 related to the improvement of waterways in the Belgian region of Flanders estimated the value of improving water quality to be €12,899 per km, the value of improving the natural status of riverbanks to be €25,687, and finally the value of improving biodiversity was estimated at €47,956.

Either this study or one of those reported in **Table Water S3 - 3** could be used as the basis for a benefits transfer exercise, recognising the uncertainties associated with such an approach, due to differences in site characteristics, population characteristics, etc.

If such an approach is adopted, valuations should be adjusted for differences in purchasing power parity between the original country and the country to which the valuation is being transferred, as well as being updated to reflect current prices (see also Section 2.8 of this guidance).

Other potential sources of valuations exist and can be readily identified from searches of the literature. For example, Koundouri et al (2009)⁶¹ provide a summary of a range of valuation studies aimed at deriving estimates of willingness to pay or the market benefits of various changes related to the marine environment. Other sources include the Marine Ecosystem Services Partnership (MESp) database⁶² and the National Ocean Economics Program (NOEP) Non-market database from the Centre of the Blue Economy⁶³, the TEEB Ecosystem Services Valuation Database⁶⁴ and the EVRI valuation database.⁶⁵

However, the literature also highlights the need for caution in undertaking benefits transfer, in particular due to some of the methodological problems that exist in undertaking valuation of the services provided by freshwater and more particularly marine resources⁶⁶.

5.4.5 Step 3.3: Incorporating the estimates into the economic analysis

The resulting estimates from the above assessment should be incorporated into the economic analysis and calculation of either the Economic Net Present Value (ENPV) or the Economic Rate of Return (ERR), see Section 2.8.7 of this guidance. Note that the need to convert any transfer values to current prices or to adjust for purchasing power parity should also be considered (see Sections 2.8.5 and 2.8.6).

5.5 Step 4: Review and reporting

Step 4 is expected to be undertaken by the IP or intermediary, as part of their review process and reporting of the results of proofing.

This involves reviewing the assessment as undertaken and determining whether it demonstrates proofing for water (fresh and coastal/marine). This is expected to involve consideration of the following questions:

⁶⁰ De Nocker L., S. Broekx, I. Liekens (2011): Economische waardering van verbetering ecologische toestand oppervlaktewater op basis van onderzoeksresultaten uit Aquamoney, Rapport voor Vlaamse Milieu Maatschappij, Vito 2011/RMA/R/248

⁶¹ [Valuation of natural marine ecosystems an economic perspective](#)

⁶² <http://map.marineecosystems-services.org/databases>

⁶³ <http://www.oceaneconomics.org/non-market/>

⁶⁴ <http://www.teebweb.org/publication/tthe-economics-of-ecosystems-and-biodiversity-valuation-database-manual/>

⁶⁵ <https://www.evri.ca/>

⁶⁶ https://www.researchgate.net/publication/282903591_Economic_Valuation_of_Marine_and_Coastal_Ecosystems_Is_it_currently_fit_for_purpose

- 1) Has proofing been carried out because it was mandatory?
 - a. If yes, proofing was triggered by the requirement for an EIA, what other legislative compliance was required (e.g. under the WFD)? Is this information available for scrutiny, e.g. have the applicability assessment outputs been provided?
 - b. If no, and proofing was carried out as a result of the InvestEU screening process, what information has been provided by the project promoter?

- 2) For all projects, is there evidence that the mitigation hierarchy has been followed?
 - a. Have project promoters documented the measures taken for avoiding impacts?
 - b. Where relevant, what mitigation measures have been suggested?
 - c. Has consideration been given to rehabilitation/restoration if needed?
 - d. If the project needs to offset impacts on the water environment impacts, are these measures recorded?
 - e. Are costs available for the measures considered in the mitigation hierarchy?

- 3) Have project impacts been quantified?
 - a. Have impacts on the water environment been identified?
 - b. What are these impacts?
 - c. Have significant impacts been monetised?

- 4) Have significant impacts been monetised?
 - a. What are these monetary values?
 - b. How do they compare with project costs? What proportion of the total costs do these represent?
 - c. What would be the costs of any additional measures?

Reporting on the outcome of the assessment should follow the stepped approach described above. A summary should also be provided of the following as part of recording the results of the assessment:

- What impacts on the freshwater and marine environments were considered in the assessment and at what geographic scale (i.e. the scope of the assessment);
- What the general approach to the assessment was, including to the qualitative and quantitative elements of the assessment;
- What the sources of data were, including of any quantitative data used in the assessment and the associated human health and environmental impacts were;
- If monetary valuation was carried out, what monetary value estimates were used;
- If monetary valuation was carried out, what the total economic value of the negative or positive impacts over the life of the project are, including an indication of the time horizon over which these have been estimated; and
- What the key uncertainties in the assessment are and how significant these may be to the end conclusions regarding environmental impacts.

6 Land

6.1 Overview

6.1.1 Relevant projects

Environmental proofing for impacts on land may be relevant for a broad range of different project types. An indicative list of projects is provided in **Table 6-1**, although this list is not exhaustive.

Table 6-1: Indicative list of relevant projects

- Constructions of new facilities, leading to land use and loss of soil
- Transport infrastructure projects, including both expansion of infrastructure (road, rails) and improvements in public transport systems, require the use of land and changes in the landscape
- Energy infrastructure projects, such as electricity grid projects, with overhead lines having a visual impact to the landscape
- Waste management projects (such as landfilling) which require land use and also may lead to soil pollution
- Agricultural projects leading to changes in land use
- Projects which may lead to significant changes in soil quality, use of fertilizers or use of pesticides

6.1.2 Legislative context

Land represents natural capital which is likely to be significantly affected by a project undergoing EIA. According to the Commission's guidance, when assessing the environmental impacts of a project with respect to land, the following environmental issues should be taken into consideration:

- existing and planned land use;
- reduction of soil pollution;
- contribution to the improvement of soil quality;
- landfill; and
- nature and quantity of the land/soil used.

Use of land directly relates to the location of the project, which is one of the selection criteria for determining whether a project listed in Annex II of the directive should be subject to EIA. The following specific aspects are identified regarding the location of projects:

- the existing and approved land use;
- the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and its underground;
- the absorption capacity of the natural environment, paying particular attention to the following areas:

- wetlands, riparian areas, river mouths;
- coastal zones and the marine environment;
- mountain and forest areas;
- nature reserves and parks;
- areas classified or protected under national legislation; Natura 2000 areas designated by Member States pursuant to Directive 92/43/EEC and Directive 2009/147/EC;
- areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure;
- densely populated areas; and
- landscapes and sites of historical, cultural or archaeological significance.⁶⁷

Under Directive 2014/52/EU (EIA), public and private projects should *consider and limit their impact on land, particularly as regards land take, and on soil, including as regards organic matter, erosion, compaction and sealing; appropriate land use plans and policies at national, regional and local level are also relevant in this regard*. The EIA Directive also indicates that addressing the visual impact of a project is important for the preservation of historical and cultural heritage and the landscape.

The importance of the sustainable use of soil and land has been addressed in Commission Communication “Thematic Strategy for Soil Protection” and the Roadmap to a Resource-Efficient Europe (2011). In the Roadmap to a Resource-Efficient Europe the aim is set to achieve no net land take by 2050: *“By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track with an aim to achieve no net land take by 2050; soil erosion is reduced and the soil organic matter increased, with remedial work on contaminated sites well underway”*⁶⁸. Setting targets for limiting land take is addressed in the 7th Environment Action Programme.⁶⁹

The Habitats directive (92/43/EEC)⁷⁰ also addresses land use and indicates that Member States should, in their land use planning and development policies, aim to encourage the management of features of the landscape which are of major importance for wild fauna and flora.

Table 6-2 summarises the EU legislation that is relevant to land use impacts.

Table 6-2: EU legislation relevant to land use impacts		
Land	Communication (COM (2011) 571) – Roadmap to a Resource Efficient Europe	Sets the aim to achieve no net land take by 2050. Indicates that Member States should limit land take and soil sealing to the extent possible.
Soil	COM (2006) 231 – Thematic Strategy for Soil Protection	Aims at ensuring the sustainable use of soil and setting the level of Member States intervention in soil protection. The main indicated threats to soil: erosion, decline in organic matter and biodiversity, contamination, sealing, compaction, salinization, landslides and flooding.

⁶⁷ EIA Directive. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0052>

⁶⁸ Communication (Com (2011) 571) – Roadmap to a Resource Efficient Europe. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0571>

⁶⁹ https://ec.europa.eu/environment/land_use/index_en.htm

⁷⁰ Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01992L0043-20130701&from=EN>

Table 6-2: EU legislation relevant to land use impacts

		<p>The Strategy is accompanied with impact assessment (SEC (2006) 0620)⁷¹. Considered impacts (and their costs), e.g.:</p> <p>On-site costs: Yield losses due to eroded fertile land; On-site costs due to impact on tourism;</p> <p>Off-site costs: Costs of sediment removal, treatment and disposal; Costs due to infrastructure (roads, dams and water supply) and property damage caused by sediments run off and flooding; Costs due to necessary treatment of water (surface, groundwater); Costs due to damage to recreational functions; Economic effects due to erosion-induced income losses; Costs due to increased sediment load for surface waters (e.g. negative effects on aquatic species, difficulties for navigation); Costs of healthcare caused by higher exposure to dust and soil particles in the air; Costs related to an increased release of greenhouse gases from soil; Costs due to loss of biodiversity and biological activity in soil (affecting fertility, nutrient cycles and genetic resources)</p>
Soil	Directive (86/278/EEC) on Sewage Sludge	<p>Aims to protect soil when sewage sludge is used in agriculture. Establishes concentrations of heavy metals in sludge and the maximum annual quantities of such heavy metals which may be introduced into soil intended for agriculture.</p> <p>Concentrations limits in sewage sludge for use in agriculture (mg/kg of dry matter):</p> <p>Lead: 750-1,200 Cadmium: 20-40 Copper: 1,000-1,750 Nickel: 300-400 Mercury: 16-25 Zinc: 2,500-4,000</p> <p>Limit values for amounts of heavy metals which may be added annually to agricultural land, based on 10-year average (kg/ha/year):</p> <p>Cadmium: 0.15 Copper: 12 Nickel: 3 Lead: 15 Zinc: 30 Mercury: 0.1</p>
Soil	Directive (2010/75/EU) on industrial emissions (IED)	Sets the requirements for soil and groundwater protection from the industrial emissions.
Air	Directive (EU)2016/2284 on national emission ceilings	Sets national ceilings for emissions of certain air pollutants; indicates that Member States shall implement national air pollution control programmes. As part of the content of national air pollution control programmes, Annex III of the Directive establishes emission reduction measures, including measures to control ammonia emissions and emissions of fine particulate matter and black carbon, which covers the use of land and soil.
Forests	COM (2019) 307 – Stepping up EU Action to Protect and Restore the World’s Forests	Aims at protecting and improving the health of existing forests; reducing the footprint of EU consumption on land.

⁷¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006SC0620>

Table 6-2: EU legislation relevant to land use impacts		
Forests	Commission Delegated Regulation (EU) 2019/807 - the determination of high indirect land-use change-risk feedstock	Sets criteria for determining the high indirect land use change (ILUC) risk feedstock for which a significant expansion of the production area into land with high carbon stock is observed.
Forests	COM (2013) 659 - A new EU Forest strategy	Requires Member States to develop a conceptual framework for valuing ecosystem services which could be built on the Mapping and Assessment of the state of Ecosystems and of their Services. Highlights the potential of Forest Management Plans (FMPs) or equivalent instruments for a balanced delivery of goods and services.

6.1.3 Human health and environmental impacts

Activities related to land use can have various direct or indirect impacts. For environmental proofing purposes, this support document focuses on the following effects associated with the different impact categories:

- **Human health:**
 - Pollutants in soil (related to pesticides and fertilizers used in agriculture activities and contaminants discharged to soil due to landfilling) can reach water and spread further, also affecting people’s health⁷².
 - The land use and land cover changes – in particular related to the loss of large trees / deforestation – may lead to increase in dusts which negatively impact the human health.
 - Due to soil sealing the humidity and temperatures change, causing heat waves, which may affect more vulnerable groups of people (“urban heat island” affect)⁷³.
 - Air pollutants⁷⁴ (e.g. primary and secondary PM, NH₃) are the major environmental health problem according to the WHO and may result from agricultural activities (e.g. manure storage and treatment, fertiliser use, agricultural waste burning)⁷⁵.
- **Agriculture:** Land take for infrastructure, construction and urban projects often takes place in fertile land areas, leading to decreases in agricultural area (a food security issue).
- **Safety:** Land take, deforestation and soil usage lead to soil erosion which may cause landslides and floods, bringing risk to human safety.
- **Cultural and heritage objects:** Landscape fragmentation has an adverse visual impact on cultural and heritage objects. The use of land may also take place in yet undiscovered archaeological heritage objects, bringing damage to their preservation.

⁷² Source: From Land and soil in Europe: EEA signals 2019

⁷³ Source: EC Guidelines on best practice to limit, mitigate or compensate soil sealing (2012). Available at: https://ec.europa.eu/environment/soil/pdf/guidelines/pub/soil_en.pdf

⁷⁴ Note that more detail on air pollutants can be found within the Air section.

⁷⁵ Human Health and environmental impacts of air pollution are addressed in Section 4 *Air*. Under the Directive (EU)2016/2284 on national emission ceilings, the Member States shall implement national air pollution control programmes which include establishing emission reduction measures. Some of these measures are related to agricultural activities and are aimed at controlling ammonia emissions and emissions of fine particulate matter and black carbon in relation to specific use of land and soil. In cases when agricultural project has an impact on air pollution, environmental proofing provided in Section 4 *Air* has to be followed.

- **Biodiversity:** Landscape fragmentation by roads, railways, cities and other objects can contribute to the isolation, decline and loss of wildlife populations⁷⁶. Erosion of topsoil also affect biodiversity as it tends to contain the highest diversity and density of soil organisms. Soil pollution from pesticides and other contaminants may damage biodiversity.
- **Water resources:** Land take and soil use affect the ecosystems and the water related services (i.e., water absorption and water storage).

Activities related to land use may also have an adverse impact on climate change, e.g. in cases where carbon absorption capacity is decreasing due to deforestation and soil use, ammonia and GHG are released from certain agricultural activities⁷⁷. Climate change impacts and GHG emissions are not addressed in this guidance. Separate support documents should be referred to for assessing these impacts.

6.1.4 Existing guidance on proofing for investment financing purposes

There is a range of existing guidance on assessing the impacts of projects on land and soil quality. For example, the Natural Capital Protocol of the Natural Capital Coalition (NCC) proposes the use of the following indicators to quantify the impacts from land use:

- Land take:
 - Area of used land in hectares
 - Area of wetland (and other sensitive areas) in hectares
 - Area of forests in hectares
 - The length of land transformation / occupation
 - Land regeneration capacity
- Soil use:
 - Area of soil used in hectares
- Soil pollution:
 - Risk of spills
 - Amount of contaminants (kg) to be discharged in soil over a given period⁷⁸
- Soil quality / degradation:

⁷⁶ Source: https://ec.europa.eu/environment/resource_efficiency/targets_indicators/scoreboard/pdf/EU%20Resource%20Efficiency%20Scoreboard%202015.pdf

⁷⁷ Agricultural activities may also have a positive impact in relation to climate change, e.g. due to carbon sequestration practises. Carbon sequestration by farmers and foresters is indicated as an example of a new green business model for ensuring sustainable food production in “A Farm to Fork Strategy” (Com(2020) 381 Final): https://ec.europa.eu/info/sites/info/files/communication-annex-farm-fork-green-deal_en.pdf
In addition, the EU Taxonomy regulation indicates specific agricultural activities with significant potential to contribute to climate change mitigation and adaptation for which technical screening criteria are provided: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/2003_09-sustainable-finance-teg-final-report-taxonomy_en.pdf

⁷⁸ Source: Natural Capital Protocol, 2016. Natural Capital Coalition (NCC). Available at: www.naturalcapitalcoalition.org/protocol

- Changes in soil quality parameters (e.g. soil organic carbon level, species richness)
- Safety:
 - Risk level of floods and landslides
- Health:
 - Health benefits to access the green space
 - Water pollution cause by pollutants discharged to soil
 - Change in air quality (tonnes emitted per year or $\mu\text{m}/\text{m}^3$)⁷⁹.

The starting point of the NCC is the assumption that project development has defined the scope of the assessment and determined the impacts and/or dependencies. Information from land use maps and databases could be collected for determining the characteristics of land and soil and the estimates of land take proportions. For example, the Copernicus Land Monitoring Service (CLMS) provides *information on land cover and its changes, land use, vegetation state, water cycle and earth surface energy variables*⁸⁰. The probability of changes due to land cover may be predicted from soil and rainfall data, while remote sensing could provide information for measuring and modelling a range of parameters, e.g. carbon storage, productivity, water cycles. To determine the risk level of floods, the risk assessment based on historical events could be performed. Hydrological models could also be used to measure the risk factors of floods due to physical characteristics of the landscape and climate projections.⁸¹

Another document which provides a framework for the qualitative and quantitative analysis of impacts on land and soil is the Impact Assessment of the thematic strategy on soil protection.⁸² This considers the following impacts:

- Erosion
- Decline of soil organic matter (SOM)
- Compaction
- Salinisation
- Landslides
- Contamination
- Sealing
- Biodiversity.

6.1.5 The Approach

In order to identify and assess significant adverse effects, the InvestEU screening and proofing process is summarised below. Projects that fall under Annex I of the EIA Directive or that have been screened in under Annex II regardless of the total project costs should go through Steps 1 to 4.

For EIA Annex II screened out projects and any other projects outside the EIA Directive above the threshold, IPs (based on discussions with project promoters) will carry out InvestEU screening to identify possible impacts (Step 1), and take a decision on whether proofing is required (Steps 2 to 3, followed by Step 4). Where projects would lead to a reduction in current impacts on land use and soil

⁷⁹ In cases when a project, e.g. related to agricultural activities, has an impact on air pollution, environmental proofing provided in Section 4 *Air* has to be followed.

⁸⁰ Source: <https://www.copernicus.eu/en/services/land>

⁸¹ Source: NCC, 2016

⁸² https://ec.europa.eu/environment/archives/soil/pdf/SEC_2006_620.pdf

quality, then proofing may help ensure that these environmental benefits are taken into consideration when evaluating the project proposal.

- 5) **Step 1: Identify if the project needs to go through sustainability proofing.** If there is the potential for significant negative residual impacts, then proofing should progress to Step 2 and the assessment of impacts. This will be the case if the project will go through an EIA (so Annex 1 or Annex 2 screened in), and the InvestEU screening checklist can be used to identify which are the significant impacts to be assessed. Other projects (not going through an EIA) should go through InvestEU screening to identify if proofing should be undertaken, and for which impacts. Depending on the checklist responses and conclusions on whether there is the potential for significant impacts, the assessment should move to Step 2 to assess (and preferably quantify) the expected impacts and to describe their likely local/regional significance. Proofing should look at project impacts after any mitigation measures (as set by environmental decision making⁸³) have been taken into account.
- 1) **Step 2: Analysis of impacts** should be carried out for any significant impacts on the environment to provide the information required for proofing purposes. Project promoters may also wish to quantify “positive” impacts, especially where these may highlight trade-offs in environmental impacts (i.e. positive versus negative impacts). The assessment of impacts should involve a qualitative assessment and quantification where proportionate.
- 2) **Step 3: Monetary valuation of the negative and/or positive environmental impacts** (costs and benefits) delivered by the project is recommended where proportionate and appropriate, to enable a more comprehensive economic appraisal for the project to be prepared by the IP.
- 3) **Step 4: Due diligence and reporting.** Due diligence includes IPs and intermediaries reviewing the information resulting from Steps 1-3 to determine whether the proofing process has been followed as required and that aspects such as the mitigation hierarchy have been given due consideration. Reporting includes setting out assumptions underlying the assessment carried out and any associated uncertainties which may impact on the final conclusions.

6.2 Step 1: Identify if the project needs to go through sustainability proofing for land and soil

6.2.1 Overview

Step 1 comprises four components involving information gathering, consideration of the mitigation hierarchy, InvestEU screening, and the voluntary undertaking of screening to identify positive impacts:

- Step 1.1: Information gathering;
- Step 1.2: Consideration of the mitigation hierarchy;
- Step 1.3: Application of the screening checklist;
- Step 1.4: Voluntary screening for positive impacts on air.

⁸³ Please note that mitigation measures can also be set in cases of screened out projects.

6.2.2 Step 1.1: Information gathering

Step 1.1 involves collating the information required to assess whether the project could give rise to medium or high risk of significant impacts on land. It is assumed that environmental proofing is being undertaken in circumstances where:

- 1) The project is/will be subject to an EIA;
- 2) The project is not subject to an EIA, but the project is subject to InvestEU screening; or
- 3) The project promoter / developer is voluntarily completing the positive checklists.

Where situation (1) applies and the project has been subject to an EIA or SEA, then detailed information from the EIA or SEA on impacts to land should be collated. For projects that are still at an early stage, any available data on likely impacts on land should be collected. Information from other assessments may also be relevant, for example, from assessments carried out under the IED to gain operating permits.

Where situation (2) applies, the IP (or financial intermediary, both with assistance from the project promoter) will be undertaking InvestEU screening and further proofing, if necessary, to show how the project is expected to impact on land and soil, in which case the assessments or reports prepared in response to other legislative requirements should be collated.

For situation (3), the IP should ask the project promoter to collect information on the expected benefits for land, in preparation for completing the checklists in Step 1.3.

Table Land S1 - 1 in Annex 4 indicates the likely sources of data and information relating to impacts on land where proofing is being undertaken as a requirement (i.e. because the project is subject to an EIA). For projects where situation 2 applies and InvestEU screening is required, then the non-EIA alternative data sources are likely to be particularly relevant. If the information on impacts on land as described in **Table Land S1 - 1** indicates that the project would have no significant impacts on land and soil, then no further proofing will be required.

Information on the expected impacts of the project on land should be extracted from all relevant assessments prior to proceeding to Step 1.2.

6.2.3 Step 1.2: Consider the mitigation hierarchy

Step 1.2 requires consideration of the mitigation hierarchy. This should be considered before moving on to assess the likely impacts of the project on land since it may indicate that the project needs to be re-designed. **Table Land S1 - 2** in Annex 4 indicates the types of questions that should be posed for each level of the hierarchy.

For projects where proofing is compulsory and an EIA has been undertaken or is expected, then mitigation measures are likely to have been (or will be) built into the project already. This should be the case for other assessments as well, for example, under the IED where permitting will require the adoption of best available techniques (BAT). Where available, information should be extracted from the existing assessments to demonstrate that mitigation has been considered / adopted.

If there is insufficient information on mitigation, or mitigation has not yet been considered (for example, where the project falls outside the EIA Directive but still requires InvestEU screening), then the mitigation hierarchy should be reviewed prior to moving to Step 1.3. Following the hierarchy may

result in the project being re-designed or changed to the extent that proofing may need to return to Step 1.1 with additional information on likely impacts sought.

Once the mitigation hierarchy has been followed to the extent that (with the help of the project promoter) the IP is able to provide information on the way in which the proposed project is avoiding, minimising, rehabilitating or offsetting impacts on land, proofing should move to Step 1.3.

6.2.4 Step 1.3: Application of the screening checklist to identify the risk of any significant negative impacts

The aim of Step 1.3 is to ensure that information is available to IPs on any significant impacts on land and soil that will arise from the project. For projects subject to EIA, the aim is to identify any significant residual impacts post-mitigation and to focus the proofing required under Steps 2 to 4. For projects not subject to EIA and above the financing threshold, the checklist provides the basis for InvestEU screening to identify significant impacts and to focus any further proofing. The use of the same checklist for screening of projects subject to EIA and as the basis of InvestEU screening should ensure consistency.

Table Land S1 - 3 in Annex 4 sets out a series of questions designed to help identify whether or not a project may give rise to significant impacts on land and soil. It has been developed to reflect the types of questions used as part of screening under the EIA Directive. It may also be useful to refer to existing guidance documents or to the land and soil impact criteria suggested by the IPs in their guidance documents.

Where a “Yes” answer results for any of the checklist question provided in **Table Land S1 - 3**, then further proofing is required and the assessment should move to Step 3. If “No” is answered to all of the checklist questions, then this should be recorded and proofing for land can stop. In order to reach a decision on whether or not an impact may be significant, it may be useful to consider the types of questions that are used at the Screening stage in EIAs. These are reproduced in **Table Land S1 - 4** (Annex 4) from the Commission’s guidance on Screening in EIAs⁸⁴.

It is not possible to provide a generic indicator of what would constitute a “significant” impact on land and soil quality. It is clear though that, even if relatively small, it may not be environmentally sustainable to support a project that would result in an irreversible impact or which would result in irreparable damages to these natural capital resources.

6.2.5 Step 1.4: Voluntary screening to identify significant positive impacts

Table Land S1 - 5 in Annex 4 provides a checklist for voluntary screening to identify project characteristics that reduce impacts to land and soil. The checklist has been developed to help project developers, and thereby IPs, identify the environmental characteristics of a project that help ensure its environmental sustainability into the future. It should also help capture indirect environmental benefits.

⁸⁴ https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf

6.3 Step 2: Analysis of impacts

6.3.1 Introduction

If application of the screening checklist indicates that there is the potential for significant impacts, it will be important that further information is provided by project developers so that IPs can make an assessment as to their significance and to the potential for action to reduce impacts. This step therefore comprises two sub-steps:

- 1) Step 2.1: Identification of significant impacts on land and soil; and
- 2) Step 2.2: Providing key project information relevant to any significant impacts.

These are detailed further below.

6.3.2 Step 2.1: Identifying and quantifying significant impacts

The screening questions given in **Table Land S1 - 3** (and **Table Land S1 - 5** for positive impacts) will highlight what types of impacts are of concern and, hence, the information to be provided to allow a qualitative / semi-quantitative assessment of the impacts that may arise from the project.

Table Land S2 - 1 in Annex 4 sets out the types of data that should be collected and reported under Step 2.1⁸⁵ Such data should be readily available for all projects which have gone through an EIA, or which have required an environmental permit as part of gaining planning permissions under the IED.

Other examples of the types of data that should be provided can be found in guidance such as Greening Projects for Growth and Jobs⁸⁶ which highlights the types of indicators that may be relevant to determining the significance of the environmental impacts arising from projects (in the case of this guidance, positive impacts that projects are aspiring to).

6.3.3 Step 2.2: Providing key project information for significant impacts

Step 2.2 is aimed at providing context to any significant environmental impacts. The types of information to be provided, as set out in **Table Land S2 - 2** (Annex 4), have been developed to be similar to the types of information that would need to be reported in any event as part of a direct application for funding. The aim here is to ensure that specific consideration is given to the potential for impacts on land and soil. In particular, it will be important that there is adequate justification for any significant impacts to land and soil, and that despite these the project is consistent in general with EU resource efficiency and sustainable development policy.

6.4 Step 3: Monetary valuation of environmental impacts

6.4.1 Introduction

Quantification of the impacts to land in monetary terms enables the impacts to be combined with other economic impacts to provide an overall economic analysis for the project. There are, however,

⁸⁵ In cases when a project, e.g. related to agricultural activities, has an impact on air pollution, environmental proofing (and data collection aspects) regarding air pollution should be based on guidance provided in Section 4 *Air*.

⁸⁶ Interreg III C and GRDP (2006): Greening Projects for Growth and Jobs, GRDP, October 2006. At: www.grdp.org

various difficulties that arise when trying to place a monetary value on non-market goods, particularly in the context of land and soil resources.

Monetary valuation will in general require that further information is collected in addition to that obtained during the assessment approach set out in Steps 1 to 2 above. Monetary valuation will require further information on the area and potential populations affected, for example, as well as current levels of activity.

Monetary valuation draws on a range of techniques to derive economic valuations for changes in environmental goods and services where market values are not available. These include revealed preference methods (including avertive expenditure, replacement costs, the production function method, travel cost/recreational demand models and hedonic pricing methods), and stated preference or willingness to pay methods.

6.4.2 The approach

The approach set out below is relevant to assessing either positive or negative impacts on land and soil in monetary terms. The approach to monetary valuation will need to vary to a degree depending on the type of impact, the nature of the impact (small change in quality/large change in quality) and the population benefitting.

The valuation process will require:

- 1) Identifying relevant ecosystem services and the cause and effect mechanisms linking changes in land and soil status and economic impacts;
- 2) Establishing the most appropriate approach to monetary valuation and determining whether the available monetary valuations would be robust indicators of the economic welfare value of the effects from changes in land and soil status. This step includes identifying the additional data required for valuation and establishing whether or not it is feasible and would be proportionate to collect the additional data – if it would not then the assessment should stop here; and
- 3) Estimating the economic value of changes in land and soil status, carrying out sensitivity analysis on key assumptions underlying the valuation exercise, and incorporating the values into the economic analysis.

Note that impacts on biodiversity are included here and may also be considered in Section 7. Care should be taken to ensure no double-counting of impacts arises. This is particularly important when monetary valuations that cover more than one ecosystem service are used.

Table Land S3 - 1 provides details of some of the tools that are available to assist in both assessing changes in ecosystem services and valuation of those changes. In addition to these tools which are global or European in scope, there is also a series of national tools.

6.4.3 Example values

Overview

The following text provides some of the types of impact that may be relevant to land and be appropriate for monetisation. **Table Land S3 - 2** provides some example values identified from journal

articles and technical reports. When researching valuations, consideration should be given to how appropriate the values are for the specific change being valued.

Table 13.3 of the OECD 2018 *Cost-Benefit Analysis and the Environment: Further Developments and Policy Use* provides standardised per hectares monetary values for different types of ecosystem services including impacts on soil. Such values, while useful, need to be treated and used with care by analysts and do not absolve the analyst from a fuller consideration of the stages of the natural and economic production processes whereby these ecosystem services enter.

Where there is no clearly transferrable existing valuation that can be applied to the environmental changes which would result from the project, monetary valuation may not be appropriate as part of InvestEU environmental proofing for land impacts. Where the level of effort required would be disproportionate to the size/importance of the impact concerned, proofing should progress to Step 5.

Erosion

Soil erosion can be significantly accelerated by human activities if no remedial measures are taken and can result in on-site and off-site costs, borne respectively by the owner or user of the land and by third parties and the wider society.

On-site costs can be:

- Yield losses due to eroded fertile land; and
- On-site costs due to impact on tourism.

Examples of off-site costs are:

- Costs of sediment removal, treatment and disposal;
- Costs of infrastructure and property damage caused by sediments run off and flooding; and
- Costs of water treatment.

Decline of soil organic matter

The organic fraction of soil is very important for soil fertility, soil structure, buffering and water retention capacity and plays a major role in the carbon cycle of the soil. Monetisation of impacts on the soil organic matter is hampered by the lack of data but annual on-site costs may be quantified by estimating the loss in soil productivity.

Compaction

Compaction is an increase in bulk density and decrease in soil porosity in particular of the subsoil. Compaction may result in loss of soil fertility which may be monetised by considering yield losses (on-site costs). It may also result in increased leaching of soil nitrogen, which may entail costs for water treatment.

Salinisation

The accumulation of soluble sodium, magnesium and calcium salts can be accelerated by human activities and may result in loss of soil fertility (on-site costs which can be monetised by considering yield losses) and damage to water supply infrastructure (off-site costs).

Landslides

The consequences of landslides can be far reaching and their monetisation depends on the marginal change in the likelihood and severity due to the project.

Contamination

The potential for soil contamination may result in costly monitoring measures and impact assessment studies that must be carried out in order to assess the extent of contamination and the risk of further contamination of other environmental media (water, air). In addition, it may entail land property depreciation if land use restrictions are applied thus representing a loss of economic value of the industrial asset. On the basis of the population that may be exposed, monetisation of this impact may look at costs of increased health care, costs of water treatment, costs for insurance companies, costs of dredging and disposing of contaminated sediments, costs for the depreciation of surrounding land, costs for increased food safety controls borne by public administrations.

Sealing

Sealing is the covering of soil surface with an impermeable material. Impacts can be monetised by considering the opportunity costs due to restriction on land use and the costs of remediation of contamination due to runoff water from housing and traffic areas, which is normally unfiltered and potentially contaminated with dangerous chemicals.

Loss of soil biodiversity

Loss of soil biodiversity may result in loss of soil fertility and therefore yield losses, losses of ecosystem functions and reduced capacity to sequester carbon.

6.4.4 Incorporating the estimates into the economic analysis for the project

The monetised estimates of impacts result from a monetary valuation exercise should be incorporated into the economic analysis and calculation of either the Economic Net Present Value (ENPV) or the Economic Rate of Return (ERR), see Section 2.8.7 of this guidance. Note that the need to convert any transfer values to current prices or to adjust for purchasing power parity should also be considered (see Sections 2.8.5 and 2.8.6).

6.5 Step 4: Review and reporting

Step 5 is expected to be undertaken by the IP or intermediary, as part of their review process and reporting of the results of proofing.

This involves reviewing the assessment as undertaken and determining whether it demonstrates adequate proofing for impacts to land purposes. This is expected to involve consideration of the following questions:

- 1) Has proofing been carried out because it was mandatory?
 - a. If yes, proofing was triggered by the requirement for an EIA, what other legislative compliance was required? Is this information available for scrutiny, e.g. has the basis for environmental permitting or gaining planning permissions been provided?
 - b. If no, and proofing was carried out as a result of the InvestEU screening process, what information has been provided by the project promoter?

- 2) For all projects, is there evidence that the mitigation hierarchy has been followed?
 - a. Have project promoters / developers documented the measures taken for avoiding impacts?
 - b. Where relevant, what mitigation measures have been suggested?
 - c. Has consideration been given to rehabilitation/restoration if needed?
 - d. If the project needs to offset land use impacts, are these measures recorded?
 - e. Are costs available for the measures considered in the mitigation hierarchy?
- 3) Have project impacts been quantified?
 - a. Have impacts on land been quantified?
 - b. What are these impacts?
 - c. Have the damage costs arising from significant impacts been monetised?
- 4) Have significant impacts been monetised?
 - a. What was the source of the monetary values and what are the end estimates?
 - b. How do these present value damage costs compare with project costs? What proportion of the total costs do they represent?
 - c. What would be the costs of any additional measures aimed at further mitigation significant impacts?

Following due diligence, reporting should follow the stepped approach described above. A summary should also be provided of the following as part of recording the results of the assessment:

- What impacts on land (land take, erosion, soil resources/quality, safety, biodiversity, etc.) were considered in the assessment and at what geographic scale (i.e. the scope of the assessment);
- What the general approach to the assessment was, including to the qualitative and quantitative elements of the assessment;
- What the sources of data were, including of any quantitative data used in the assessment;
- If monetary valuation was carried out, what monetary value estimates were used, and what the total economic value of the negative or positive impacts over the life of the project are, including an indication of the time horizon over which these have been estimated; and
- What the key uncertainties in the assessment are and how significant these may be to the end conclusions regarding environmental impacts.

7 Biodiversity

7.1 Overview

7.1.1 Relevant projects

Environmental proofing for impacts on biodiversity could be important for several different project types. It is likely to be most important for the types of projects listed in the table below, although this list is not exhaustive. It should also be noted that thresholds apply, thus even if a project fits within the descriptions below, proofing may not be required (as discussed further below).

Table 7-1: Indicative list of relevant projects

- Blue and green infrastructure projects, such as those aiming to connect existing habitats or develop wildlife corridors
- Projects aiming to link designated sites to increase their resilience (this could include projects focusing on specific protected species)
- Infrastructure projects, where land that is recognised for its biodiversity value is likely to be affected (e.g. through positioning of a new transport hub)
- Agricultural projects that may affect biodiversity on land currently used for agriculture e.g. through intensification or change in management
- Agricultural projects that may affect land that is not currently used for agriculture, or could have implications for neighbouring land that is designated for biodiversity reasons (e.g. through leaching of chemicals)
- Aquaculture projects that may affect the quality or condition of the habitat surrounding the project (e.g. through input of chemical treatments/food)
- Fisheries projects that could have implications for the surrounding biodiversity (e.g. recreational fishing facility stocking non-native species)
- Forestry projects that may result in the loss or degradation of specific habitats in a local area, or replacement of existing forest with specific species

7.1.2 Legislative context

Biodiversity as a component of natural capital relates to both the range of species present in an area, the population sizes of these species, the habitats in which these species live and the ecosystems to which they contribute.

For environmental proofing, biodiversity should be considered where projects may affect (directly or indirectly) habitats and the species that live in them, especially when a site is designated at the local, national or international level. This includes:

- Sites designated at the international level as part of the Natura 2000 network;
- Sites that are nationally or locally designated for biodiversity; and
- Sites that are not designated for biodiversity but may be valued or recognised as being important for biodiversity within their local area or region.

This section focuses on identifying the impacts on biodiversity that could result from activities at a specific site or across a set of sites (e.g. through construction of transport infrastructure). The extent of the impacts is expected to vary by the species present, their conservation status, the area of habitat(s) affected and the level of designation (if any).

Proofing for some types of projects may also require consideration of the water, land and air components of natural capital.

As per the Commission’s guidance, when assessing the environmental impacts of a project with respect to biodiversity, the following issues should be considered:

- Potential threats from projects to terrestrial and marine biodiversity and ecosystems; and
- A project’s contribution to sustainable agricultural, forest management, fisheries and aquaculture practices.

The following table provides an overview of EU level biodiversity legislation. The key legislation includes the Habitats Directive and the Birds Directive. Sites designated under these directives form part of the Natura 2000 network, with Natura 2000 sites specially selected to protect core areas for a species or habitat that is identified in the Habitats and Birds Directives⁸⁷. An overview of data on existing biodiversity designations (EU and some national level designations) can be found on the EEA’s website at: <https://www.eea.europa.eu/themes/biodiversity>. National level biodiversity designations vary by member state, but could include sites designated for their habitats, a particular species or set of species, or their rarity within the member state. There may also be local designations which aim at protecting biodiversity or green space within an administrative area.

The WFD and MSFD may also be of relevance, but they are omitted here since they are covered in detail in the water section (see Section 5 of this support document). It should be noted, however, that the WFD does set objectives that may affect biodiversity. Any one waterbody may therefore have objectives under both the WFD and the Birds and Habitats Directives. An example is provided by a water-dependent Natura 2000 site, which is designated under the Birds and Habitats Directives, but requires water status to be maintained or improved (WFD related objectives) to ensure protection of the habitat or species. Where a waterbody is linked to more than one objective, the most stringent objective is the one that applies⁸⁸.

Table 7-2: Legislation for “biodiversity” relevant to environmental proofing	
Habitats Directive (92/43/EEC)	Establishes, among others,: (1) a Natura 2000 network of protected areas including sites designated pursuant to the Habitats and Birds Directives; (2) a system of protection and management of these sites; (3) a system of strict species protection; (4) a system of reporting and monitoring the conservation status of protected habitats and species.
Birds Directive (2009/147/EEC)	Establishes, among others,: (1) a network of special protection areas (SPAs) for birds, which forms an integral part of the Natura 2000 network; (2) a system of protection of bird habitats, including outside SPAs; (3) a system of management of huntable species; (4) a system of strict bird species protection for all other species; (5) a system of reporting and monitoring the conservation status of birds.
Environmental Impact Assessment Directive (2014/52/EU)	Requires assessment of impacts on biodiversity for infrastructure developments

⁸⁷ For further information on Natura 2000 sites, see: DG Environment (2020): Frequently asked questions on Natura 2000, accessed at: https://ec.europa.eu/environment/nature/natura2000/faq_en.htm#1-0 on 6th June 2020.

⁸⁸ Brooke (2017): Delivering Water Framework Directive-compliant projects, Jaspers Network presentation, 30 November 2017, accessed at: www.jaspersnetwork.org/download/attachments/19464342/WFD%20compliance%20-%20a%20checklist%20tool.pdf?version=1&modificationDate=1434121070000&api=v2 on 17th June 2020.

7.1.3 Human health and environmental impacts

There are acknowledged links between human health and impacts on biodiversity. The World Health Organisation notes that biodiversity underpins the functioning of ecosystems and the provision of goods and services that are required for human health⁸⁹. The EEA also acknowledges this point, highlighting that biodiversity is necessary for human wellbeing, but also for ecosystem services⁹⁰. The EU's Biodiversity Strategy for 2030 recognises that biodiversity and ecosystems provide food, health and wellbeing⁹¹. The strategy aims to establish protected areas for at least 30% of the land in Europe and 30% of the sea in Europe, as well as restoring degraded ecosystems⁹².

7.1.4 Existing guidance on proofing for investment financing purposes

There are various existing reporting requirements and procedures relating to the impacts of projects on biodiversity.

Habitats and Birds Directives

Article 17 of the Habitats Directive⁹³ requires Member States to report on progress (status and trends) every six years. Article 11 requires the conservation status of habitats and species of Community interest to be monitored. Since reporting focuses on specific habitats and species, it goes beyond the Natura 2000 network, thus biodiversity outside of the network has to be considered. Information from Member State reports is collated by the Commission to form a "State of Nature in the EU" report. Article 12 of the Birds Directive imposes similar regular reporting requirements on Member States.

The Habitats Directive triggers several other reporting requirements including:

- Article 6 (4), compensatory measures, where Member States have to inform the Commission where they implement compensation measures for projects that have a significant negative impact on Natura 2000 sites; and
- Articles 12-16, derogation reporting, where Member States can make exceptions from specific species protection provisions.

Article 6(3) indicates that any plan or project that may have a significant effect on the site (but is not connected to its management) should be subject to an Appropriate Assessment. The subsequent paragraph, 6(4), notes that where a plan or project is to be carried out for reasons of overriding public interest (e.g. social/economic interest), then compensatory measures should be implemented to protect the overall coherence of Natura 2000. It should be clarified that compensation measures,

⁸⁹ World Health Organisation and Secretariat of the Convention on Biological Diversity (2015): Connecting Global Priorities: Biodiversity and Human Health, A State of Knowledge Review, accessed at: <https://www.cbd.int/health/SOK-biodiversity-en.pdf> on 17th August 2020.

⁹⁰ EEA (2020): Biodiversity – Ecosystems, accessed at: <https://www.eea.europa.eu/themes/biodiversity/intro> on 17th August 2020.

⁹¹ European Commission (2020): EU Biodiversity Strategy for 2030, Webpage, accessed at: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/eu-biodiversity-strategy-2030_en on 17th August 2020.

⁹² Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (2020): EU biodiversity strategy for 2030, Bringing nature back into our lives, COM (2020)380 final, accessed at: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0380&from=EN> on 18th August 2020.

⁹³ DG Environment (2020): Habitats Directive reporting, accessed at: https://ec.europa.eu/environment/nature/knowledge/rep_habitats/index_en.htm on 20th June 2020.

which are aimed at compensating damage that may have occurred, are different to mitigation measures, which intent to avoid or reduce impacts⁹⁴.

The form for submission of information relating to Article 6(4) to the Commission is available on DG Environment's webpage⁹⁵. The form requests information on the plan or project; an assessment of the negative effects; identification of alternative solutions; information on imperative reasons of overriding public interest (i.e. why the project should go ahead despite the negative effects); and information on compensatory measures. Acceptable reasons for derogation reporting are laid out in the Directive within Article 16 and include, for example, "*(c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment*". Reports supplied by Member States to the Commission to update on derogations applied should include the species affected and the reasons for the derogation with reference to scientific data and any alternative options that were not used.

The Habitats Directive therefore requires an Appropriate Assessment of "*any plan or programme likely to have a significant effect on the conservation objectives of a site which has been designated or is designated in future*"⁹⁶. The process to be followed to determine whether such an assessment should take place is summarised in existing guidance provided on DG Environment's webpage on the Management of Natura 2000 sites:

https://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

Note that specific guidance documents are available for different types of project, for example, guidance on inland waterway transport and Natura 2000.

EIA

There are links between EIA and the Habitats Directive in that Article 2(3) of the EIA Directive indicates that there should be a joint or coordinated procedure between the two⁹⁷. Information to be provided for EIA screening includes the use of natural resources, particularly biodiversity. However, where an EIA considers all significant environmental effects, the Appropriate Assessment required under the Habitats Directive should focus on conservation objectives and the integrity of the Natura 2000 network.

Note that the WFD and MSFD may also be relevant, but these are considered within the water chapter.

⁹⁴ European Commission (2018): Commission notice: Managing Natura 2000 sites, The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, accessed at:

https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_6_nov_2018_en.pdf on 21st August 2020

⁹⁵ European Commission, Habitats Committee (2012): Form for submission of information to the European Commission according to Art. 6(4) of the Habitats Directive, accessed at: https://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm on 21st August 2020.

⁹⁶ The 10th recital of the Habitats Directive.

⁹⁷ European Commission (2017): Environmental Impact Assessment of Projects, Guidance on Screening, accessed at: <https://ec.europa.eu/environment/eia/eia-support.htm> on 21st June 2020.

Other guidance documents for assessing biodiversity impacts

There is also a range of available guidance on assessing the impacts of projects on biodiversity. **Table 7-3** provides a summary of existing guidance documents that are relevant to biodiversity. Of particular note is the Commission staff working document on integrating ecosystems and their services into decision-making. This outlines a set of guiding principles which are already applied with legislation such as the EIA Directive. Proofing for biodiversity should start from the first principle: “Prioritise measures that improve ecosystem condition while contributing to well-being and prosperity for net societal gain”.

Table 7-3: Existing guidance documents relevant to the biodiversity element of environmental proofing	
EBRD (nd)	Guidance Note: EBRD Performance Requirement 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources
European Commission (2014)	Common Framework for Biodiversity-Proofing of the EU Budget
WWF and IISD (2017)	Biodiversity and Infrastructure: A better nexus? Policy Paper on mainstreaming biodiversity conservation into the infrastructure sector – CBD SBSTTA 21
European Union (2020)	EU Guidance on integrating ecosystems and their services into decision-making. Summary for policymakers in government and industry. Draft 1.0 – 18 June 2020
European Commission (2001)	Assessment of plans and projects significantly affecting Natura 2000 sites, Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC
European Commission (2018)	Commission notice, Managing Natura 2000 sites, The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC
Natural Capital Coalition (2016)	Natural capital protocol
European Commission (2013)	Guidance on integrating climate change and biodiversity into environmental impact assessment https://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf

7.1.5 Approach

In order to identify and assess significant adverse effects, the InvestEU screening and proofing process is summarised below. Projects that fall under Annex I of the EIA Directive or that have been screened in under Annex II regardless the total project costs should go through Steps 1 to 4.

For EIA Annex II screened out projects and any other projects outside the EIA Directive above the threshold, IPs (based on discussions with project promoters) will carry out InvestEU screening to identify possible impacts on biodiversity (Step 1), and take a decision on whether proofing is required (Steps 2 to 3, followed by Step 4). Where projects would lead to positive biodiversity impacts, proofing may help ensure that these benefits are taken into consideration when evaluating the project proposal.

- 5) Step 1: Identify if the project needs to go through sustainability proofing.** If there is the potential for significant negative residual impacts, then proofing should progress to Step 2 and the assessment of impacts. This will be the case if the project will go through an EIA (so Annex 1 or Annex 2 screened in), and the InvestEU screening checklist or the results of an Appropriate Assessment under the Habitats Directive can be used to identify which are the significant impacts to be assessed. Other projects (not going through an EIA) should go through InvestEU screening (taking into account the results of an Appropriate Assessment

under the Habitats Directive) to identify if proofing should be undertaken, and for which impacts. Depending on the checklist responses and conclusions on whether there is the potential for significant impacts, the assessment should move to Step 2 to assess (and preferably quantify) the expected impacts in terms of area, type and number of habitats affected, etc. and to describe their likely significance. Proofing should look at project impacts after any mitigation measures (as set by environmental decision making^{98,99}) have been taken into account.

- 1) **Step 2: Analysis of impacts** should be carried out for any significant impacts on the environment to provide the information required for proofing purposes. Project promoters may also wish to quantify “positive” impacts, especially where these may highlight trade-offs in environmental impacts (i.e. positive versus negative impacts). The assessment of impacts should involve a qualitative assessment and quantification where proportionate.
- 2) **Step 3: Monetary valuation of the negative and/or positive environmental benefits** (costs and benefits) delivered by the project is recommended where proportionate and appropriate, to enable a more comprehensive economic appraisal for the project to be prepared by the IP.
- 6) **Step 4: Review and reporting.** This includes IPs and intermediaries reviewing the information resulting from Steps 1-3 to determine whether the proofing process has been followed as required and that aspects such as the mitigation hierarchy have been given due consideration. Reporting includes setting out assumptions underlying the assessment carried out and any associated uncertainties which may impact on the final conclusions.

Relationship to Appropriate Assessment and CIS guidance

The screening criteria for environmental proofing are based on the types of questions that are also used to determine whether a project requires an EIA. However, as indicated earlier, there are other pieces of legislation that are relevant to biodiversity. This chapter therefore draws on the following guidance documents when setting out the process to assess biodiversity impacts:

- Assessment of plans and projects significantly affecting Natura 2000 sites (Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC);
- Commission notice (C(2018) 7621 final), Managing Natura 2000 sites, The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC¹⁰⁰;
- The CIS Guidance Document No. 36¹⁰¹; and
- The JASPERS Project assessment checklist tool¹⁰².

⁹⁸ Please note that mitigation measures can also be set in cases of screened out projects.

⁹⁹ EU Guidance on integrating ecosystems and their services into decision making, Summary for policymakers in government and industry, Draft 1.0 – 18 June 2020.

¹⁰⁰ Documents on managing Natura 2000 sites are available on DG Environment’s website at: https://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm (as of 21st August 2020).

¹⁰¹ CIS guidance documents are available on DG Environment’s website at: https://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm (as of 28th August 2020).

¹⁰² JASPERS: Water Framework Directive, Project assessment checklist, accessed at: www.jaspersnetwork.org/plugins/servlet/documentRepository/downloadDocument?documentId=441 on 21st June 2020

Note that a project may trigger more than one assessment, thus information for proofing may be available from several sources. Streamlining of assessments is mandatory (where appropriate) when an EIA is required alongside an Appropriate Assessment under the Habitats Directive¹⁰³. WFD related assessments may also be carried out at the same time, however, the specific requirements of each directive do need to be met otherwise they may be considered to be unfulfilled. Guidance on streamlining can be obtained from the following sources:

- European Commission (2016): Commission Notice (20-16/C 273/01), Commission guidance document on streamlining environmental assessments conducted under Article 2(3) of the Environmental Impact Assessment Directive (Directive 2011/92/EU of the European Parliament and of the Council, as amended by Directive 2014/52/EU): <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C:2016:273:FULL&from=EN>
- Guidance Document No. 36 Exemptions to the Environmental Objectives according to Article 4(7) indicates where assessments for EIA, the Habitats Directive and WFD could be streamlined.

7.2 Step 1: Identify if the project needs to go through proofing for impacts on biodiversity

7.2.1 Overview

Step 1 comprises four components involving information gathering, consideration of the mitigation hierarchy, InvestEU screening, and the voluntary undertaking of screening to identify positive impacts:

- Step 1.1: Information gathering;
- Step 1.2: Consideration of the mitigation hierarchy;
- Step 1.3: Application of the screening checklist;
- Step 1.4: Voluntary screening for positive impacts on biodiversity.

7.2.2 Step 1.1: Information gathering

Step 1.1 involves collating the information required to assess whether the project could give rise to a medium or high risk of impacts on biodiversity. It is assumed that InvestEU screening and/or environmental proofing in circumstances where:

- 1) The project is/will be subject to an EIA;
- 2) The project is not subject to an EIA, but is subject to InvestEU screening; or
- 3) The project promoter is voluntarily completing the positive checklists.

Where situation (1) applies and the project has been subject to an EIA, then detailed information from the EIA on impacts to biodiversity should be collated. For projects that are at an earlier stage, any available data on likely biodiversity impacts should be collected. Information from other assessments

¹⁰³ Common Implementation Strategy for the Water Framework Directive and the Floods Directive, Guidance Document No. 36 Exemptions to the Environmental Objectives according to Article 4(7), accessed at: https://circabc.europa.eu/sd/a/e0352ec3-9f3b-4d91-bdbb-939185be3e89/CIS_Guidance_Article_4_7_FINAL.PDF on 18th June 2020.

may also be relevant, for example, if an Appropriate Assessment has been undertaken under the Habitats Directive (for Natura 2000 sites).

Where situation (2) applies, the IP (or financial intermediary, both with support from the project promoter) will be undertaking InvestEU screening and further proofing, if necessary, to show how the project is expected to impact on biodiversity, in which case the assessments or reports prepared in response to the need for an Appropriate Assessment or other legislative requirements should be collated. Situation (2) may also cover projects that are compliant with the legislative requirements in that they are not affecting designated sites, but they could still have detrimental effects on wider biodiversity (e.g. a project affecting an urban forest). Such projects should collate any information on the likely impacts for biodiversity, but also consider the mitigation hierarchy discussed in Step 1.2 below, in particular whether the project should be re-designed or planned as part of the first mitigation measure (avoid).

For situation (3), the IP (via the project promoter) should collect information on the expected benefits of the project for biodiversity, in preparation for completing the checklists in Step 1.4.

Table Biodiversity S1 - 1 in Annex 5 indicates the likely sources of data and information relating to biodiversity impacts where proofing is being undertaken as a requirement (i.e. because the project is subject to an EIA). For voluntary proofing, these data sources are expected to be less relevant.

Note that the table includes the SEA Directive. A Strategic Environmental Assessment (SEA) is required in two situations. These include when plans or programmes are produced for particular sectors and these plans or programmes provide the framework for consenting future development under the EIA Directive; or when it has been determined that an assessment under the Habitats Directive is necessary for the plan or programme concerned¹⁰⁴. In these cases, information on the impacts for biodiversity may be included within the SEA documentation.

Drawing on **Table Biodiversity S1 - 1**, information on the expected impacts of the project on biodiversity should be extracted from all relevant assessments. In line with principle 2 from the guidance on integrating ecosystems and their services into decision making¹⁰⁵, consideration should be given to inter-dependencies and trade-offs. The information collected therefore needs to include details on:

- Whether the proposed project leads to increased pressures on ecosystems or stakeholders;
- Identified trade-offs; and
- Ways in which any trade-offs are being addressed.

Where an EIA has been carried out, the above issues are likely to have already been considered. For example, the Guidance on Integrating climate change and biodiversity into Environmental Impact Assessment¹⁰⁶ identifies questions that could be asked during the screening and scoping stage. These include whether the proposed project will damage ecosystem processes and services, particularly those on which local communities rely. Following collation of the information, proofing should proceed to Step 1.2.

¹⁰⁴ DG Environment (2019): Strategic Environment Assessment – SEA, accessed at: <https://ec.europa.eu/environment/eia/sea-legalcontext.htm> on 21st August 2020.

¹⁰⁵ European Union (2020): EU Guidance on integrating ecosystems and their services into decision-making. Summary for policymakers in government and industry. Draft 1.0 – 18 June 2020.

¹⁰⁶ European Commission (2013): Guidance on Integrating climate change and biodiversity into Environmental Impact Assessment

7.2.3 Step 1.2: Consider the mitigation hierarchy

Step 1.2 requires consideration of the mitigation hierarchy. This should be considered before moving on to assess the likely impacts of the project for biodiversity since it may indicate that the project needs to be re-designed. **Table Biodiversity S1 - 2** in Annex 5 provides the types of questions to be posed for each level of the hierarchy, with avoiding impacts being the primary mitigation measure.

For projects where proofing is compulsory and an EIA has been undertaken or is expected, then mitigation measures are likely to have been built into the project already. This should be case for other assessments as well, for example, an Appropriate Assessment should look at alternative solutions that avoid any negative impacts on the designated site and evaluate these alternatives¹⁰⁷. Where available, information should be extracted from the existing assessments to demonstrate that the hierarchy has been followed.

If there is insufficient information on mitigation, or mitigation has not yet been considered (for example, where a project falls outside of the EIA Directive but is subject to InvestEU screening), then the mitigation hierarchy should be reviewed prior to moving to Step 1.3. Following the hierarchy may result in the project being re-designed or changed to the extent that proofing may need to return to Step 1.1 with additional information on likely impacts sought.

Once the mitigation hierarchy has been followed to the extent that the IP is able to provide information on the way in which the proposed project is avoiding, minimising, rehabilitating or offsetting impacts on biodiversity, proofing should move to Step 1.3.

7.2.4 Step 1.3: Application of the screening checklist to identify a medium or high risk of significant negative impacts

For projects that have to undertake proofing (i.e. projects that are or will be subject to EIA), Step 1.3 is carried out to ensure that information is available from project promoters to IPs on any significant impacts on biodiversity impacts that will arise from the project, and which are not otherwise captured through a formal assessment procedure. This step draws on the checklists used in the Appropriate Assessment process complemented with other checklists related to the WFD, MSFD and EIA requirements where projects are expected to affect waterbodies. It may also be useful to refer to the biodiversity impact criteria suggested by the IPs in their guidance documents and listed in **Annex 5**.

For projects not subject to EIA and above the financing threshold, the checklists provide the basis for InvestEU screening to identify significant impacts and to focus any further proofing.

Where impacts on biodiversity have been identified through completion of the checklist as part of proofing for water, land or air, there may be a need to return to Step 1.2 of this biodiversity chapter and re-consider the mitigation hierarchy.

Checklists within the Appropriate Assessment (Habitats Directive) process

Guidance on the information requirements and a checklist for considering the integrity of a site as part of an Appropriate Assessment can be found in the European Commission's publications:

¹⁰⁷ See European Commission (2018): Commission notice: Managing Natura 2000 sites, The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, accessed at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_6_nov_2018_en.pdf on 21st August 2020.

Assessment of plans and projects significantly affecting Natura 2000 sites (Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC)¹⁰⁸; and Commission notice (C(2018) 7621 final): Managing Natura 2000 sites, The provisions of Article 6 of the Habitats Directive¹⁰⁹.

For screening, consideration should be given to whether impacts are likely to be direct, indirect or knock-on impacts, and the extent of the site they are likely to affect. Where screening suggests that there are likely to be impacts on a protected site, then the assessment should move to Step 2 and environmental proofing. Note, however, that if the WFD or MSFD are relevant (for water dependent habitats), the checklists below should also be considered prior to moving to Step 2.

WFD related checklist

If the site is a water dependent protected area, the WFD requirements are relevant and the JASPERS checklist tool should also be applied. Note that this is for water dependent protected sites only; assessments for waterbodies that are not linked to protected sites should follow the process outlined in the proofing approach for water detailed in this support document.

Table Biodiversity S1 - 3 in Annex 5 provides a summary of the types of information that will be required by the JASPERS checklist. A key source for this information will be the RBMP(s) for the waterbody(bodies) which could be impacted by the project. These should be available from national authorities, with data also available from the European Environment Agency's WISE Water Framework Directive Database.

Based on the project's characteristics, the assessment involves determining if the project could affect the status of a water-dependent EU protected area; see also Section 5. This requires the assessor (i.e. the project promoter) to establish whether cause and effect mechanisms exist, using a series of checklist tables, covering the different WFD elements (hydromorphological, physicochemical, biological, chemical (priority and priority hazardous) status, and EU protected areas). Separate tables exist for surface waters, lakes, transitional waters, coastal waters and groundwater bodies (see also the CIS Guidance Document for practical examples). As detailed in Section 5, the JASPERS checklist tool should be used for this purpose.

Where there is the potential for effects, then further data will need to be collected and/or investigations carried out in order to provide information on the nature, magnitude and significance of those effects. Note that such data may also be required as part of an EIA or an assessment under the Habitats Directive. If this is the case, then proofing should proceed.

¹⁰⁸ European Commission (2001): Assessment of plans and projects significantly affecting Natura 2000 sites (Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC), accessed at:

https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf on 21st June 2020

¹⁰⁹ European Commission (2018): Commission notice: Managing Natura 2000 sites, The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, accessed at:

https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_6_nov_2018_en.pdf on 21st August 2020

MSFD checklists

The MSFD does not have an assessment requirement for project promoters¹¹⁰, but additional screening may be required to ensure that a project does not conflict with achievement of the MSFD objectives that are linked to a designated site. **Table Biodiversity S1 - 4** in Annex 5 sets out the equivalent types of information that should be collected for screening in relation to the MSFD. **Table Biodiversity S1 - 5** in Annex 5 provides a checklist of a similar nature to that provided in the JASPERS checklist tool to act as the basis for the screening assessment. As for the JASPERS checklist tool, the significance of any effects is not relevant at this stage, only the potential for such impacts. Consideration is given to the extent of the impacts in the following section which draws on the proofing checklist from the EIA Directive.

Screening checklist for the EIA Directive and negative impacts

Table Biodiversity S1 - 6 in Annex 5 sets out a series of questions designed to help identify whether or not a project not requiring an Applicability Assessment under the WFD or an assessment under the MSFD may give rise to significant impacts on biodiversity. It has been developed to reflect the types of question used as part of screening under the EIA Directive.

Where a “Yes” answer results for any of the checklist question provided in **Table Biodiversity S1 - 6**, then further proofing is required and the assessment should move to Step 2. If “No” is answered to all of the checklist questions, then this should be recorded and proofing for biodiversity can stop. In order to reach a decision on whether or not an impact may be significant, it may be useful to consider the types of questions that are used at the Screening stage in EIAs. These questions can be found in the Guidance on Screening¹¹¹.

7.2.5 Step 1.4: Voluntary screening to identify significant positive impacts

Step 1.4 enables IPs (with assistance from project promoters) to highlight any significant positive impacts resulting from the project. This relates to the first principle laid out in the EU Guidance on integrating ecosystems and their services into decision making:

- Prioritise measures that improve ecosystem condition and contribute to wellbeing.

Table Biodiversity S1 - 7 in Annex 5 provides a checklist for voluntary screening to identify project characteristics that reduce impacts on biodiversity. The checklist has been developed to enable IPs (and project promoters) to identify the environmental characteristics of a project that helps ensure its environmental sustainability into the future. Completion of the table will allow IPs to demonstrate what a project includes to improve biodiversity and thus enhance ecosystem condition and wellbeing.

7.3 Step 2: Analysis of impacts

7.3.1 Introduction

¹¹⁰ Note that the MSFD does require Member States to undertake an assessment of their marine waters (Article 8). Where environmental targets or good status cannot be achieved, Member States should identify such instances and provide an explanation to the Commission (Article 14)

¹¹¹ European Commission (2017): Environmental Impact Assessment of Projects, Guidance on screening, accessed at: https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf on 21st June 2020.

If the outcome of any of the above assessments indicates that there is the potential for significant impacts, it will be important that further information is provided by project promoters to IPs for environmental proofing purposes. In general, this step involves:

- Step 3.1: Identifying significant impacts of concern; and
- Step 3.2: Providing key project information relevant to significant impacts of concern.

7.3.2 Step 3.1 Identifying significant impacts relevant to biodiversity

The checklists from Step 1.3 (and 1.4) will have indicated the impacts that require further investigation due to their significance for biodiversity. The methodological guidance on the provisions of Article 6(3) and (4) provides further information on ways to determine the extent of the impacts of a project on biodiversity as part of an Appropriate Assessment. Example methods include direct measurement, quantitative predictive models, GIS and information from previous projects. Further details can be found in the methodological guidance¹¹². Project promoters should provide the relevant studies and associated reports to IPs for proofing purposes.

When considering specific habitats, the Commission has developed an “Interpretation manual of European Union Habitats”¹¹³, which provides a reference guide for habitats that are listed in the Habitats Directive. Where projects may affect Natura 2000 sites, this manual may assist with habitat description. Where non-designated sites are affected, the manual may be helpful for identifying and describing potentially impacted habitats in standard terms.

Drawing on the guidance for Appropriate Assessments, **Table Biodiversity S2 - 1** in Annex 5 identifies the information that should be provided as a result of applying the checklists (Step 1.3) and quantifying the impacts (Step 2.1, this step).

Quantification of impacts relevant to the WFD or MSFD (where water dependent designated sites are affected) should be carried out according to the proofing approach set out for water in this support document (see Step 2 within the water section).

Note that whilst sites subject to multiple objectives arising from more than directive are subject to the most stringent objectives, the differing requirements of the directives in terms of process and reporting still apply.

7.3.3 Step 2.2: Providing key project information for significant impacts of concern

Step 2.2 ensures that significant impacts of concern for biodiversity are highlighted and carried forwards to Step 3 (or Step 4 where monetisation is not taking place). The step covers reporting the information identified in **Table Biodiversity S2 - 1** along with highlighting the most significant impacts.

¹¹² See European Commission (2001): Assessment of plans and projects significantly affecting Natura 2000 sites (Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC), accessed at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf on 21st June 2020.

¹¹³ DG Environment (2013): Interpretation manual of European Union Habitats, accessed at: https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/int_Manual_EU28.pdf on 21st June 2020.

7.4 Step 3: Monetary valuation of environmental impacts

7.4.1 Introduction

Ideally, any impacts on biodiversity would be quantified in monetary terms to enable the impacts to be combined with other economic impacts into an overall cost-benefit analysis or other economic appraisal methods chosen for the project. However, there are various difficulties that arise in trying to place a monetary value on non-market goods.

Monetary valuation will in general require that further information is collected in addition to that required by the assessment approach set out in Steps 1 and 2 above. It will require further information on the populations affected, for example, as well as current levels of activity.

Monetary valuation draws on a range of techniques to derive economic valuations for changes in environmental goods and services where market values are not available. These include revealed preference methods (including avertive expenditure, replacement costs, the production function method, travel cost/recreational demand models and hedonic pricing methods), and stated preference or willingness to pay methods.

7.4.2 The approach

The approach set out below is relevant to assessing either positive or negative impacts on biodiversity in monetary terms.

The valuation process will require:

- 1) Identifying specific changes likely to occur as a result of the project. These changes could include the following and should be identified from the quantification of impacts undertaken in Step 2:
 - Change in habitat area e.g. loss of x ha of woodland;
 - Change in population of a particular species;
 - Change in condition of a habitat affecting its ability to provide a particular ecosystem service or services; or
 - Change in provision of an ecosystem service where the service can be linked to a specific habitat.
- 2) Establishing the most appropriate approach to monetary valuation and determining whether the available monetary valuations would be robust indicators of this change (i.e. do the values capture one ecosystem service provided by the habitat, or several. If the latter, which services are included?). This step includes identifying the additional data required for valuation, then establishing whether or not it is feasible and proportionate to collect these data. If not, valuation is unlikely to be appropriate, thus the assessment should stop here; and
- 3) Estimating the economic value of the anticipated changes through applying the chosen valuations. This may require additional data such as population information to apply willingness-to-pay values. These calculations should be followed by a sensitivity analysis on the key assumptions underlying the valuation exercise and the results incorporated into the economic analysis for the project.

Where proofing for other aspects e.g. water is also carried out, care should be taken to avoid double counting, particularly where valuation is based on the change in ecosystem service provision and the values used capture multiple services.

Example valuation tools are provided in **Table Biodiversity S3 - 1** (Annex 5).

7.4.3 Example values

Potential valuations for biodiversity including habitats and species can be identified from a range of sources. **Table Biodiversity S3 - 2** in Annex 5 provides some example values the monetisation of biodiversity identified from journal articles and technical reports. **Table Biodiversity S3 - 3** in Annex 5 presents an extract from a valuation exercise covering ecosystem services and assets in the Netherlands.

When researching valuations, consideration should be given to how appropriate the values are for the specific change being valued.

Where there is no clearly transferrable existing valuation that can be applied to the environmental changes which would result from the project, monetary valuation may not be appropriate as part of InvestEU environmental proofing for biodiversity. Where this is the case, or where the level of effort required would be disproportionate, proofing should progress to Step 5.

7.4.4 Incorporating the estimates into the Cost-Benefit Analysis / economic appraisal for the project

The monetised estimates of impacts resulting from the above monetary valuation exercise should be incorporated into the economic analysis and calculation of either the Economic Net Present Value (ENPV) or the Economic Rate of Return (ERR), see Section 2.8.7 of this guidance. Note that the need to convert any transfer values to current prices or to adjust for purchasing power parity should also be considered (see Sections 2.8.5 and 2.8.6).

7.5 Step 4: Review and reporting

Step 4 is expected to be undertaken by the IP or intermediary, as part of their review process and reporting of the results of proofing.

This involves reviewing the assessment as undertaken and determining whether it demonstrates proofing for biodiversity. This is expected to involve consideration of the following questions:

- 1) Has proofing been carried out because it was mandatory?
 - a. If yes, proofing was triggered by the requirement for an EIA, what other legislative compliance was required? Is this information available for scrutiny, e.g. has the Appropriate Assessment report been provided?
 - b. If no, and proofing was carried out based on the results of the InvestEU screening process, what information has been provided by the project promoter?

- 2) For all projects, is there evidence that the mitigation hierarchy has been followed?
 - a. Have project promoters documented the measures taken for avoiding impacts?
 - b. Where relevant, what mitigation measures have been suggested?
 - c. Has consideration been given to rehabilitation/restoration if needed?

- d. If the project needs to offset biodiversity impacts, are these measures recorded?
 - e. Are costs available for the measures considered in the mitigation hierarchy?
- 3) Have project impacts been quantified?
 - a. Have impacts on biodiversity been identified?
 - b. What are these impacts?
 - c. Have significant impacts been monetised?
 - 4) Have significant impacts been monetised?
 - a. What are these monetary values?
 - b. How do they compare with project costs? What proportion of the total costs do these represent?
 - c. What would be the costs of any additional measures?

Following due diligence, reporting should follow the stepped approach described above. A summary should also be provided of the following as part of recording the results of the assessment:

- What environmental changes were considered in the analysis (e.g. change in habitat area or habitat quality) and at what geographic scale;
- What the general approach to the assessment was, including to the qualitative and quantitative elements of the assessment;
- What the sources of data were, including of any quantitative data used in the assessment of impacts;
- What monetary value estimates were taken to estimate the negative or positive externalities, including the source of the economic value estimates and other key assumptions (e.g. the populations assumed to be relevant for any transfer of willingness-to-pay estimates);
- What the total value estimate of the negative or positive externalities over the life of the project is, including an indication of the time horizon over which these have been estimated; and
- What uncertainties impact on the end present value estimate of the negative or positive externalities.

8 Cross-Cutting Impacts

8.1 Overview

8.1.1 Relevant impacts and projects

There is a range of environmental impacts which do not fall neatly into the categories of air, water, land and biodiversity and that may arise for infrastructure and non-infrastructure projects. These types of impacts would traditionally be considered as part of any EIA carried out for large infrastructure projects, alongside the assessment of impacts on the four components of natural capital:

- Noise and vibration
- Odour,
- Light, and
- Safety.

Environmental proofing for these cross-cutting impacts may be important for a wide range of different project types, as indicated in **Table 8-1**. Note that this table is not intended to be comprehensive.

Visual amenity is considered as part of the “Land” natural capital component (Section 6), as is cultural heritage. Congestion with respect to its environmental impacts in terms of air emissions is covered under Section 4; it is assumed that any impacts that a project would have on time savings related to improved transport infrastructure are captured in the economic assessment and do not form part of environmental proofing.

With respect to safety, although the focus here is on risks related to the proposed investment project, it may also be important to consider whether or not particular types of projects would be located in proximity to major hazard facilities (e.g. proposed locations for new schools, hospitals, etc.).

Table 8-1: Indicative list of relevant projects

- Infrastructure projects involving increased capacity or new construction of industrial plant, other manufacturing activities or warehousing, which may result in increases in noise emissions, odours from processing activities or increased accident risks due to the presence of large quantities of hazardous substances
- Similarly, the construction of new facilities, including warehousing, may lead to increased levels of night-time activities, leading to noise and light pollution
- Certain types of projects, including waste processing facilities and landfills, sewage treatment works, chemical manufacturing and food production facilities may lead to odour issues for nearby residents
- Transport infrastructure projects, in particular rail projects, may lead to both noise and vibration impacts, as well as light pollution; airports and fuel storage facilities may lead to health and environmental safety risks
- Energy infrastructure projects may give rise to a range of different impacts, with noise, light and safety issues (e.g. dam failure, major hazard fires, etc.)
- Waste disposal and treatment projects which may give rise to a range of impacts, with odour often a concern
- Agricultural warehouses used to store agricultural inputs, such as phosphate fertilisers containing ammonium nitrate in quantities above certain storage volumes

8.1.2 Legislative context

Assessment of these above types of cross-cutting impacts is required under the EIA Directive (and will therefore be mandatory for and Annex I or Annex II screened-in projects). Other legislative requirements within the EU may also be relevant. These include the legislation set out in **Table 8-2**.

Directive 2002/49/EC is the main EU instrument to identify noise pollution and to trigger action at the Member State level. It requires Member States to appoint competent authorities to draw up “strategic noise maps” for major roads, railways, airports and agglomerations using harmonised noise indicators. Although the directive does not set any limit values or prescribe measures to be adopted, it requires competent authorities to draw up action plans to reduce noise where necessary and to maintain environmental noise quality where it is good. A full list of EU legislation related to limitation of noise emissions can be found in *Environmental Noise in Europe – 2020*¹¹⁴.

Directive 2002/44/EC applies to minimum health and safety requirements at work due to vibration, with no legislation other than the EIA Directive covering vibration assessments more generally. ISO standards are applied as part of infrastructure development to assess potential impacts on building vibration.

There is no specific EU legislation on odour or light, other than requirements for its assessment as part of a formal EIA and requirements under the Industrial Emissions Directive which may place odour limits on specific types of activities as part of the definition of BAT. At the national level, limits may also be placed on odour from waste treatment plants (e.g. biological treatment plants), livestock rearing activities, etc.

The Seveso-III Directive (2012/18/EU) aims at the prevention of major accidents involving dangerous substances. However, as accidents may nevertheless occur, it also aims at limiting the consequences of such accidents not only for human health but also for the environment. The Directive covers establishments where dangerous substances may be present (e.g. during processing or storage) in quantities exceeding certain threshold. Excluded from the Directive are certain industrial activities which are subject to other legislation providing a similar level of protection (e.g. nuclear establishments or the transport of dangerous substances). Depending on the amount of dangerous substances present, establishments are categorised into a lower or upper tier, with the latter being subject to more stringent requirements.

Table 8-2: EU legislation relevant to cross cutting impacts		
Noise	<p>Directive 2002/49/EC – Environmental Noise Directive</p> <p>Source specific requirements also exist for roads, railways, aircraft, industry and outdoor equipment</p>	<p>Requires Member States to prepare and publish, every 5 years, noise maps and noise management action plans for:</p> <ul style="list-style-type: none"> • agglomerations with more than 100,000 inhabitants • major roads (more than 3 million vehicles a year) • major railways (more than 30.000 trains a year) • major airports (more than 50.000 movements a year, including small aircrafts and helicopters) <p>The two most important indicators are:</p> <ul style="list-style-type: none"> • 55 dB Lden: the day, evening, and night-level indicator designed to assess annoyance; • 50 dB Lnight: the night-level indicator designed to assess sleep disturbance.

¹¹⁴ See Annex 1 of the report, available at: <https://www.eea.europa.eu/publications/environmental-noise-in-europe>

Table 8-2: EU legislation relevant to cross cutting impacts

	Environmental Impact Assessment Directive Directive 2010/75/EU - Industrial Emissions Directive	Requires assessment of noise impacts as part of infrastructure developments to limit impacts on people Sets BAT for which will require prevention or minimisation noise and vibration impacts as part of plant permitting
Vibration	Environmental Impact Assessment Directive EN ISO 2631, EN ISO 6897 and EN ISO 8041; and ISO 14837	Requires assessment of vibration impacts as part of infrastructure developments to limit impacts on the buildings and people Set allowable vibration limits for buildings and offshore structures, and provide approaches for assessing impacts on people, including from railways and other transport infrastructure
Odour and light	Environmental Impact Assessment Directive Directive 2010/75/EU - Industrial Emissions Directive	Requires assessment as part of infrastructure developments, using qualitative and in some cases modelling-based techniques Sets BAT for potentially odorous processes and will require prevention or minimisation of odours emissions as part of plant permitting
Safety	Directive 2012/18/EU	Sets varying safety assessment and reporting requirements for facilities meeting criteria for being “major hazards”, depending on the amounts of dangerous substances present at a site in order to prevent major accidents and to limit their consequences for human health and the environment

8.1.3 Human health and environmental impacts

For environmental proofing purposes, this support document focuses on the following effects associated with the different impact categories:

- **Environmental noise:** Noise impacts may lead to mental health effects, annoyance, cognitive impairment and impacts on wildlife. These are to be assessed in terms of either the population affected by noise levels greater than 55 decibels (dB) for day-evening-night levels and 50 decibels for night levels and the level of annoyance associated with equivalent continuous sound levels (L_{Aeq}) for transport schemes such as rail projects);
- **Vibration:** It is assumed that vibration effects on built infrastructure will be addressed as part of any civil engineering design works and during the permitting process. The focus here is therefore on human annoyance and sleep disturbance.
- **Odour:** It is expected that odour-related impacts will be addressed during the planning consent process and/or as part of site permitting under either the EIA and potentially IED. However, smaller projects may not be subject to the same rigorous requirements and the potential for odorous emissions should be considered.
- **Light:** It is expected that light-related impacts will be addressed during the planning consent process and/or as part of site permitting under either the EIA and potentially IED.
- **Safety:** safety as considered here relates to human safety considerations, including risks to life and to health, as well as environmental risks due to accidental releases of hazardous substances.

Noise and vibration

Noise pollution is a major contributor to the EU's burden of disease, with a recent WHO report (2011) indicating that at least 1 million healthy life years are lost every year in western Europe due to the health effects arising from noise exposure to road traffic alone. In addition, transport projects in particular may lead to changes in vibration, both in the short and longer-term, that can have impacts on people's health and wellbeing. It is therefore essential that projects are designed and implemented in a manner which reduces the potential for any increase in noise and vibration impacts.

The EU's [7th EAP, 'Living well, within the limits of our planet'](#), highlights that the majority of Europeans living in major urban areas are exposed to high levels of noise likely to have frequent adverse effects on health. It sets the objective that, by 2020, noise pollution in the EU will have significantly decreased, moving closer to WHO recommended levels. To achieve this objective will mean implementing an updated EU noise policy, aligned with the latest scientific knowledge, and measures to reduce noise at source, including improvements in city design.

Odour

The assessment of odour is a highly complex due to the subjective nature of what constitutes a nuisance. People's reaction to odours will depend on how strong it is, what it smells like, how often and when it occurs. It may also be related to a single substance or to a combination of substances and mixtures and change with the level of dilution.

The impacts range from annoyance, to nuisance and to actual harm. With respect to the latter, a wide range of symptoms may be experienced by people exposed to offensive odours including respiratory problems, nausea and vomiting, drowsiness, eye complaints, nose and throat irritation, headache, etc. Health effects such as headache and nausea can have a significant impact on a person's daily activities and the long-term effect of such symptoms is unknown. These symptoms can arise at concentrations well below those associated with toxic effects.¹¹⁵ Susceptible populations include the elderly and people with asthma and other respiratory illnesses, as well as children.

There are several industrial, agricultural and domestic activities that can give rise to odours. Some of these activities may be regulated under the Industrial Emissions Directive (IED), such as major process industries, waste management and the intensive farming of poultry and pigs, and therefore be subject to the use of Best Available Techniques to limit the release of odorous substances to air. Other processes may fall under national legislation and national permitting processes, including for example waste management activities and from sewage treatment works. It will therefore be essential that promoters of projects that may give rise to odour emissions are aware of both national requirements with regard to their control as well as any measures that may be required under the IED.

Table 8-3 provides examples of the types of industrial activities that may give rise to offensive emissions, together with indicative criteria for identifying whether or not the odour may be offensive, based on studies originally undertaken in the Netherlands¹¹⁶. A guidance document produced by the Scottish Environmental Protection Agency both provides a list of substances which may give rise to odorous emissions exceeding the different threshold criteria, if in doubt¹¹⁷.

¹¹⁵ See also: Institute of Air Quality Management's Guidance on the assessment of odour for planning, Version 1.1, July 2018. At: <https://iaqm.co.uk/text/guidance/odour-guidance-2014.pdf>

¹¹⁶ See IAQM for further discussion.

¹¹⁷ See also the following report which details existing regulations on odour and odour impact criteria for different EU Member States:

Table 8-3: Industrial activities and indicative criteria of significant odour pollution	
Relative offensiveness of odour	Indicative criterion of significant pollution¹
More offensive odours: Activities involving putrescible wastes Processes involving animal or fish remains Brickworks Creamery Fat & Grease Processing Waste water treatment Oil refining Livestock feed Factory	1.5 OUE/m ³ (1.0 OUE /m ³) ^{note 2}
Odours which do not obviously fall within a high or low category: Intensive Livestock rearing Fat Frying (food processing) Sugar Beet Processing	3 OUE/m ³ (2.5 OUE /m ³) ^{note 3}
Less offensive odours (but not inoffensive): Chocolate Manufacture Brewery Confectionary Fragrance and Flavourings Coffee Roasting Bakery	6 OUE/m ³ (5.5 OUE /m ³) ^{note 3}
1: Odour Units (OUE) as 98 th percentile of hourly averages 2: Local adjustment for hypersensitive populations (odour generated a high level of complaint) Source: https://www.sepa.org.uk/media/154129/odour_guidance.pdf . Note this source also provides descriptors for commonly used substances which may give rise to odour emissions.	

Major Accident Risks and Safety Considerations

Safety as considered here relates to human safety considerations, including risks to life and to health, as well as environmental risks due to accidental releases of hazardous substances. More specifically, the focus is on activities as regulated by the Seveso III Directive and the avoidance of major accidents and accidental releases of hazardous substances with consequent impacts on the environment.

The Directive applies to more than 12 000 industrial establishments in the European Union where dangerous substances are used or stored in large quantities, mainly in the chemical and petrochemical industry, as well as in fuel wholesale and storage (including LPG and LNG) sectors. The directive applies to “chemical processing operations and storage related to those operations which involve dangerous substances”.

Under Seveso, it is the presence of a substance and its tonnage that defines whether an establishment falls under its scope. An establishment falls under the Seveso Directive if specific named substances or substances belonging to a certain hazard category (based on their classification according to CLP) are present above a specified tonnage (the so called “qualifying quantities”). These substances and categories, as well as qualifying quantities, are included in the Directive’s Annex I.

These same establishments may also fall under the IED, with safety regulated through application of technologies described in reference documents (BREFs) which in addition to preventing emissions

<https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5c7d98d4b&appId=PPGMS>

might also provide specific measures that at the same time contribute to achieving safe risk levels. Whilst not all Seveso establishments fall under the scope of IED (and vice versa), this does not prevent operators from using relevant aspects of BREFs.

Table 8-4 sets out a list of projects relevant to Seveso III, although it is more difficult in this case as a wide range of different types of facilities may fall under the Directive due to quantities of hazardous substances being used or stored on-site determining requirements under the Directive (although certain types of activities are also excluded from the scope of the Directive, i.e. military establishments, nuclear establishments and the transport of dangerous substances, as they fall under other legislation). In total around 50 different types of activities may fall within scope of the Directive, so project promoters unclear on whether or not they may fall under the Directive should check the Commission's website.¹¹⁸

Table 8-4: Indicative list of relevant projects

Projects involving the following activities make up around 50% of establishments falling under Seveso III:

- Fuel storage (including heating, retail sale, etc.)
- Wholesale and retail storage and distribution (excluding LPG)
- LPG storage
- General chemicals manufacture (not otherwise listed here), including plastics and rubber
- Production of basic organic chemicals
- Processing of metals
- Production and storage of pesticides, biocides and fungicides
- Power generation, supply and distribution, and
- LPG production, bottling and bulk distribution.

Depending on the amount of dangerous substances present, establishments are categorised into a lower or upper tier, with the latter subject to more stringent requirements. Projects falling under the Seveso Directive upon completion will have to meet either the lower or upper tier requirements, including preparation of a major accident prevention policy where required by the Member State.

In particular, site operators have a general obligation to take all necessary measures to prevent major accidents, to mitigate their consequences and to take recovery measures. They should provide competent authorities with sufficient information to enable identification of the establishment, the dangerous substances present and the potential dangers. In most Member States, this will include developing a major-accident prevention policy (MAPP) setting out the operator's overall approach and measures, including appropriate safety management systems, for controlling major-accident hazards, including, consideration of the dangerous substances which may be generated during a severe accident within the establishment.

The OECD (2019)¹¹⁹ notes that there are also hundreds of smaller-scale but recurrent chemical accidents every year that cause severe harm to workers, communities, municipalities, businesses and the environment. Further information on the range of potential impacts can be found from a review of the information available on the [Minerva portal of the Major Accident Hazards Bureau](#) at the European Commission's Joint Research Centre. This portal provides a collection of technical information and tools supporting the major accident hazards policy. It also hosts the eSPIRS database with the establishments covered by the Seveso Directive and the eMARS database. Information on

¹¹⁸ For relevant links go to: <https://ec.europa.eu/environment/seveso/legislation.htm>

¹¹⁹ OECD (2019 draft): Guidance on the Benefits of Regulations for Chemical Accidents Prevention, Preparedness and Response, in publication.

the types of accidents that may occur at facilities regulated by the Seveso Directive, and their associated impacts, is available from the eMARS database¹²⁰. This provides access to chemical accident reports from investigations, with the aim of raising awareness of the potential failures that could cause major accidents on sites using dangerous substances. The eMARS site includes statistics on accidents by industry type and lessons learned, which may help project promoters identify both the potential types of impacts relevant to their project and measures for minimising the risks of an event.

Other databases that exist and may be useful sources of information on potential accidents are given in **Table CC - 1** in Annex 6.

8.1.4 The Approach

Projects that fall under Annex I of the EIA Directive or that have been screened in under Annex II regardless the total project costs should go through Steps 1 to 4, as appropriate.

For EIA Annex II screened out projects and any other projects outside the EIA Directive above the threshold, IPs (based on discussions with project promoters) will carry out InvestEU screening to identify possible impacts (Step 1), and take a decision on whether proofing is required (Steps 2 to 3, followed by Step 4).

Given the differences in the types of impacts covered in this section, the Steps set out below may not all be appropriate. In the case of noise and vibration, the impact pathway approach provides the basis for the full environmental proofing of projects. The overall approach is therefore similar to that for “Air” (Section 4), for example, with full screening and proofing following the steps set out below. For odour and light, as more qualitative approaches are appropriate, screening and proofing involves only following Steps 1 and 2 followed by Step 4, drawing on the outputs of an EIA or IED permit (or application for one). With respect to safety, it is also likely that only Steps 1 and 2 followed by Step 4 will be relevant (although monetary valuation of safety risks could be carried out in some cases).

The steps are as follows:

- 1) **Step 1: Identify if the project needs to go through sustainability proofing.** If there is a medium or high risk of negative residual impacts, then proofing should progress to Step 2 and the assessment of impacts. This will be the case if the project will go through an EIA (so Annex 1 or Annex 2 screened in), and the InvestEU screening checklist can be used to identify which are the significant impacts to be assessed. Other projects (not going through an EIA) should go through InvestEU screening to identify if proofing should be undertaken, and for which impacts (also taking into account any assessments under the Industrial Emissions or Seveso Directives, or transport legislation)¹²¹. Depending on the checklist responses and conclusions on whether there is the potential for significant impacts, the assessment should move to Step 2 to assess (and preferably quantify) the expected volumes of emissions to air (kg per year) and to describe their likely local/regional significance. Project impacts should be considered after any mitigation measures have been taken into account following the mitigation hierarchy of avoid, minimise, rehabilitate/restore and offset.

¹²⁰ <https://emars.jrc.ec.europa.eu/en/emars/content>

¹²¹ Note that if a project relates to measures under the national air pollution control programme (as required under MS implementation of Directive 2016/2284/EU¹²¹), the Directive leaves it to MS to decide which measures under their national programme are subject to EIA and SEA.

- 2) **Step 2: Analysis of impacts** should be carried out for any significant impacts on the environment to provide the information required for proofing purposes. Project promoters may also wish to quantify “positive” impacts, especially where these may highlight trade-offs in environmental impacts (i.e. positive versus negative impacts). The assessment of impacts should involve a qualitative assessment and quantification where proportionate.
- 3) **Step 3: Monetary valuation of the negative and/or positive environmental impacts** (costs and benefits) delivered by the project is recommended where proportionate and appropriate, to enable a more comprehensive economic appraisal for the project to be prepared by the IP.
- 4) **Step 4: Due diligence and reporting.** Due diligence involves IPs and intermediaries reviewing the information resulting from Steps 1-3 to determine whether the proofing process has been followed as required and that aspects such as the mitigation hierarchy have been given due consideration. Reporting includes setting out assumptions underlying the assessment carried out and any associated uncertainties which may impact on the final conclusions.

Given that the process is the same for all of these cross-impact categories, they are discussed together below.

8.2 Step 1: Identify if the project needs to go through proofing

8.2.1 Overview

Step 1 comprises four components involving information gathering, consideration of the mitigation hierarchy, InvestEU screening, and the voluntary undertaking of screening to identify positive impacts:

- Step 1.1: Information gathering;
- Step 1.2: Consideration of the mitigation hierarchy;
- Step 1.3: Application of the screening checklist;
- Step 1.4: Voluntary screening for positive impacts.

8.2.2 Step 1.1: Information gathering

Step 1.1 involves collating the information required to assess whether the project could give rise to medium or high risk of significant cross-cutting impacts. It is assumed that Step 0 has been completed and environmental proofing is being undertaken because:

- 4) The project is/will be subject to an EIA;
- 5) The project is not subject to an EIA, but to InvestEU screening to identify potential impacts; or
- 6) The project promoter is voluntarily completing the positive checklists.

Where situation (1) applies and the project has been subject to an EIA, then detailed data on the different cross-cutting effects should be collated. For projects that are still at the scoping stage, any available data on the different cross-cutting impacts should be collected. Information from other assessments may also be relevant, for example, from assessments carried out under the IED to gain operating permits.

Where situation (2) applies, the IP (or financial intermediary, both potentially with support from the project promoter) will be undertaking InvestEU screening, and further proofing if necessary, to show

how the project is expected to lead to potentially significant cross-cutting impacts. In these cases the assessments or reports carried out in response to other legislative requirements should be collated.

For situation (3), the IP should ask the project promoter to collect information on the expected benefits in terms of reduced impacts, in preparation for completing the positive checklist in Step 2.

Table CC S1 - 1 in Annex 6 indicates the likely sources of data and information relating to the different cross-cutting impacts where proofing is being undertaken due to the project being subject to an EIA. For projects not requiring a full EIA, the non-EIA data sources listed in this table may be particularly relevant.

If the information on the different cross-cutting impacts indicates that the project would give rise to no significant residual impacts, then no further proofing will be required.

Where impacts may occur and mitigation measures have been included in the project, then the expected impacts of the project should be extracted from all relevant assessments prior to proceeding to Step 1.2.

8.2.3 Step 1.2: Consider the mitigation hierarchy

Step 1.2 requires consideration of the mitigation hierarchy. This should be considered before assessing the significance of the project for cross-cutting impacts, as it may indicate that the project needs to be re-designed. Key questions are set out in **Table CC S1 - 2** in Annex 6.

For projects where proofing is compulsory and an EIA has been undertaken or is expected, then mitigation measures are likely to have been built into the project already. This may be the case for projects that are not subject to EIA as well, for example, under the IED where permitting will require the adoption of best available techniques (BAT). Where available, information should be extracted from the existing assessments to demonstrate that mitigation has been considered / adopted.

If there is insufficient information on mitigation, or mitigation has not yet been considered (for example, where proofing is being undertaken voluntarily), then the mitigation hierarchy should be reviewed prior to moving to Step 1.3. Following the hierarchy may result in the project being re-designed or changed to the extent that proofing may need to return to Step 1.1 with additional information on likely impacts sought.

8.2.4 Step 1.3: Application of screening checklist to identify medium or high risk of significant negative impacts

The aim of Step 1.3 is to ensure that information is available to IPs on any significant cross-cutting impacts that will arise from the project. For projects subject to EIA, the aim is to identify any significant residual impacts post-mitigation and to focus the proofing required under Steps 2 and 3. For projects not subject to EIA and above the financing threshold, the checklists provide the basis for InvestEU screening to identify significant impacts and to focus any further proofing.

Table CC S1 - 3 in Annex 6 sets out a series of questions that may help in identifying whether or not a project may give rise to significant impacts that should be subject to further proofing, together with thresholds for identifying effects. Note that Separate sets of questions have been developed for the different types of impacts:

- noise and vibration;

- odour;
- light; and
- major hazard related.

It may also be useful to also refer to existing national and other guidance documents. In particular, it may be most appropriate to look at guidance that is specific to the type of project being proposed/promoted (e.g. railway infrastructure, airport infrastructure, wind turbine projects, etc.). Where a “Yes” answer would be result for any of the checklist questions, then further proofing is required and the assessment should move to Step 2.

If “No” is answered to all of the checklist questions, then this should be recorded and proofing for cross-cutting impacts can stop.

In order to reach a decision on whether or not an impact may be significant, it may be useful to consider the types of questions that are used at the Screening stage in EIAs. **Table CC S1 - 4** in Annex 6 provides a list of questions for assessing significance, drawing on the list of relevant considerations set out in the Commission’s Guidance on Screening.¹²² Note that these questions relate only to noise and vibration, odour and light, as there are specific criteria for major hazards under the Seveso Directive for identifying sites or activities that could give rise to significant impacts.

8.2.5 Step 1.4: Voluntary screening to identify significant positive impacts

Table CC S1 - 5 in Annex 6 has been developed to help project promoters carry out voluntary screening to identify the characteristics of their project that help ensure its environmental sustainability into the future. Again, this table sets out a checklist covering all four of the main cross-cutting types of impacts.

8.3 Step 2: Analysis of impacts

8.3.1 Introduction

If application of the screening checklists indicates the potential for significant impacts, it will be important that further information is provided on the significance of the impacts and the potential for action to reduce impacts. This step therefore comprises two sub-steps:

- 1) Step 2.1: Identification of significant impacts of concern; and
- 2) Step 2.2: Providing key project information relevant to significant impacts of concern.

8.3.2 Step 2.1: Identifying and quantifying significant impacts of concern

The screening questions given in **Table CC S1 - 3** (and **Table CC S1 - 5** for positive impacts) will highlight what types of cross-cutting impacts may arise.

Table CC S2 - 1, **Table CC S2 - 2** and **Table CC S2 - 3** in Annex 6 set out the types of data that should be collected and reported under Step 2.1, to provide a semi-quantitative assessment of these impacts. This information should be readily available for all projects which have gone through an EIA, or which have required an environmental permit as part of gaining planning permissions. Other examples of the types of data that may be relevant and could be provided can be found in EIA guidance documents.

¹²² https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf

Noise and Vibration

Thresholds for identifying significant impacts, where no national thresholds exist:

- Environmental noise: noise levels greater than 55 decibels (dB) for day-evening-night levels (Lden); noise levels greater than 50 decibels for night levels and (Lnight); noise levels greater than the above as an equivalent continuous sound levels (LAeq) for transport schemes such as rail projects.
- Vibration: The potential for an increase in human annoyance and sleep disturbance, as measured by the change in the percentage population of highly annoyed/disturbed, annoyed/disturbed and slightly annoyed/disturbed.

Odour

With respect to odour examples of the types of data that could be provided can be found in other guidance documents, such as IAQM Guidance¹²³ or the D-NOSES report¹²⁴.

With respect to health effects, the SEPA document *Odour Guidance 2010*¹²⁵ provides an Annex (2) which summarises the thresholds at which different health effects may arise from emissions of a wide range of odorous substances. These range from irritation to visual disturbance to severe irritation to irreversible effects.

Light

The International Commission on Illumination (CIE) has identified five qualitative environmental zones which reflect differing levels of light pollution which can affect an area. It is assumed that an assessment based on these or a similar approach would have acted as the basis for the EIA and conclusions regarding light pollution.

Major Hazards

Project promoters should have checked national planning requirements related to hazardous substances, and the guidance available from their national authority for gaining consents/permits prior to project development. National authorities will also have produced guidance on the obligations that apply to operators of facilities within their Member State, with there being some variations across the EU.

Guidance is also available on the Commission's CIRABC website¹²⁶, which includes information on the different obligations placed on operators.

The Minerva portal provides a linkage to the Accident Damage Analysis Module (ADAM)¹²⁷, which is a software tool developed by the Joint Research Centre (JRC) to assess physical effects and associated damages of an industrial accident resulting from an unintended release of a hazardous substance. It enables calculation of the physical effects of an industrial accident in terms of thermal radiation, overpressure or toxic concentration resulting from an unintended release of a dangerous substance. The focus is on human health related impacts associated with thermal radiation from chemical fires,

¹²³ <https://iaqm.co.uk/text/guidance/odour-guidance-2014.pdf>

¹²⁴ <https://dnoses.eu/wp-content/uploads/2019/10/D2.2-Analysis-of-existing-regulation-in-odour-pollution-odour-impact-criteria-1.pdf>

¹²⁵ https://www.sepa.org.uk/media/154129/odour_guidance.pdf

¹²⁶ <https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp>

¹²⁷ <https://adam.jrc.ec.europa.eu/en/adam/content>

blast effects of vapour cloud explosions, and inhalation of toxic chemical vapours. Environmental consequences, which involve other vulnerable receptors, are beyond the scope of the current version of ADAM. Unfortunately, at present it is only available to governmental organisations.

8.3.3 Step 2.2: Providing key project information for significant impacts

Step 2.2 is aimed at providing context to any significant environmental impacts. The types of information to be provided, as set out in **Table CC S2 - 4** in Annex 6, is similar to the types of information required by an EIA, but is also like to already be required by IPs from project promoters as part of a direct application for funding. The aim here is to ensure that specific consideration is given to the potential for impacts on air quality.

In particular, it will be important that there is adequate justification for any significant impacts and that despite these the project is consistent in general with EU environmental / sustainable development policy.

8.4 Step 3: Monetary valuation of environmental impacts

8.4.1 Introduction

Ideally, significant changes in cross-cutting impacts would be valued in monetary terms assessed using an impact pathway approach. At present this is only recommended for noise where feasible and proportionate, although it may also be possible for odour.

Due to a lack of readily available and representative transfer values, monetary valuation is not considered proportionate for: vibration related effects, odour impacts, light impacts or major hazard accidents. As valuation may be possible for odour impacts, and an approach is set out below which could be applied where feasible and proportionate.

Work is also on-going at the OECD level to produce guidance related to major hazard accidents and that might provide the basis for monetary valuation of changes in the risk of an accident in the future.

8.4.2 Approach to monetary valuation for noise

The impact pathway approach for noise is as follows:

- 1) Identification of the activities/changes in equipment that could lead to a change in both daytime and night-time noise levels;
- 2) Estimation of the change in daytime and night-time noise levels, in terms of a unit change in noise pollution as measured by a change in dB;
- 3) Drawing on available noise maps for the local area and combining these with cause-effect relationships and population data to predict the impact of changes in noise levels at specific locations; and
- 4) Valuation of the predicted outcomes either through the use of appropriate monetary valuations and/or through the use of life years lost, disability adjusted life years (DALYs), or monetary valuation monetary value.

The first three steps outlined above may have been carried out by the project promoter as part of an EIA or as an assessment undertaken as part of project preparation work or a permitting process.

In some Member States, such modelling is mandatory for certain types of schemes as part of planning permissions, e.g. for transport and energy infrastructure projects. The output from these first three steps forms the basis for the monetary valuation of noise impacts, to provide estimates of economic impacts that can be combined with other impacts as part of preparing a comprehensive cost-benefit analysis for the project.

In the absence of member state specific methodologies for undertaking the monetary valuation of noise impacts, there are two key references:

- DG Move *Handbook on the external costs of transport, Version 2019*¹²⁸ which provides ready to use valuations for the impacts caused by changes in traffic;
- EEA report on *Environmental Noise in Europe - 2020* provides a useful reference source for undertaking the monetary valuation of noise impacts¹²⁹.

DG Move Handbook

The DG Move Handbook provides total, average (including at the EU member state level) and marginal noise costs. The average and marginal noise cost values will be the most relevant, with the marginal noise cost valuations accounting for differences in the project location, traffic densities and the time of day for increases in traffic levels leading to noise emissions. A snippet example of the data that are available from the Handbook is given in **Table CC S3 - 1** in Annex 6 for road transport, in €cents per pkm (passenger km), vkm (light commercial vehicle km) or tkm (freight km). Additional figures are given for rail transport and for aviation. These costs include all relevant health effects and annoyance costs.

Note that the values given in the Handbook should be used for all transport projects, adjusted to reflect current prices for incorporation into the economic analysis.

EEA Report on Environmental Noise in Europe

The EEA report provides data on noise exposures within the EU, as well as the dose-response relationships for moving from predictions of increases in noise to the levels of impact. It relies on estimates of the burden of disease due to annoyance, sleep disturbance, reading impairment in children and the population-attributable fraction of ischaemic heart disease to act as the basis for valuation of the costs of changes in noise levels.

Section 3.3 of the EEA report sets out the methodology, with Table 3.4 of that report providing the relationships (as risk ratios) between noise and health effects which can be used to predict the level of effects for different noise sources (road, rail, air and industry) and for different types of impacts. These relationships when combined with estimates of the numbers of people experiencing increased noise levels will provide quantitative estimates of the number of cases of health effects resulting from the change in noise levels.

The resulting number of people estimated to be affected by each environmental health outcome is then used to estimate the burden of disease due to environmental noise in the disability-adjusted life-years (DALYs)¹³⁰. The EEA report converts DALYs from noise impacts to a monetary measure of health

¹²⁸ <https://ec.europa.eu/transport/sites/transport/files/studies/internalisation-handbook-isbn-978-92-79-96917-1.pdf>

¹²⁹ https://www.eea.europa.eu/publications/environmental-noise-in-europe/at_download/file

¹³⁰ Where DALYs equate to the sum of the years of life lost from premature mortality and the years lived with disability for people living with the disease or health condition or its consequences.

impacts based on a cost of EUR 78 500 per DALY, which provides a reasonable monetary valuation for any noise assessment carried out following these guidelines¹³¹.

It will be more difficult to use the approach set out in this report than the DG Move Handbook. As a result, valuation of increases in noise levels for non-transport projects may not be proportionate.

8.4.3 Approach to monetary valuation for odour impacts

At this point in time, monetary valuation of odour impacts is not mandatory. If project promoters wish to undertake a further level of assessment, then this may be feasible for some types of odours depending on their sources. This may be particularly of value where one of the aims of a project would be to reduce odorous emissions, or where this would be a significant positive outcome from the project. However, it is only likely to be feasible for a subset of odours, as discussed below.

As for other types of impacts, an impact pathway approach should be followed. In this case, such an approach could use the data set out in Table A1.4 in SEPA's *Odour Guidance 2010*. This set of tables provides an indication of the health effects associated with emissions from a range of chemical compounds based on odour detection thresholds and emission concentrations above these (as measured either in terms of ppm or mg/m³).

The approach would involve:

- 1) Identification of the activities/changes in equipment that could lead to a change in emissions of substances above the odour threshold;
- 2) Estimation of the change in emissions in terms of ppm or mg/m³ before and after the project, and the change in impact (e.g. reduction in number of cases involving impacts on breathing, soreness of eyes, etc.). This will need to take into account frequency of odour events, together with their duration and intensity;
- 3) Determining the relevant receptor population and identifying the at-risk population (e.g. 10% based on the IAQM and SEPA guidelines);
- 4) Identification of relevant disability weights from burden of disease studies to act as the basis for quantifying impacts in terms of Disability Adjusted Life Years (DALYs); and
- 5) Monetary valuation of the predicted outcomes through the conversion of DALYs to a monetary value.

The first three steps outlined above may have been carried out by the project promoter as part of an EIA or as an assessment undertaken as part of project preparation work or a permitting process. However, a significant level of effort may be required for Step 4, in order to ensure that the disability weights and other assumptions used in the derivation of DALYs (e.g. years of life lived in disability) are relevant to the intensity, frequency and duration of noise events. If this is possible, then monetary valuation could be carried out as for noise impacts, based on a figure of EUR 78 500 per DALY.

8.4.4 Incorporating the estimates into the economic analysis

The resulting estimates from the above assessment should be incorporated into the economic analysis and calculation of either the Economic Net Present Value (ENPV) or the Economic Rate of Return (ERR), see Section 2.8.7 of this guidance. Note that the need to convert any transfer values to current prices or to adjust for purchasing power parity should also be considered (see Sections 2.8.5 and 2.8.6).

¹³¹ Although this figure would be at the lower end of valuations implied by conversion from a value of a life year or value of a statistical life based on more recent willingness to pay studies.

8.5 Step 4: Review and reporting

Step 4 is expected to be undertaken by the IP or intermediary, as part of their review process and reporting of the results of proofing. Due diligence involves reviewing the assessment and determining whether the available information demonstrates adequate proofing for cross-cutting impacts. This is expected to involve consideration of the following questions:

- 1) Has proofing been carried out because it was mandatory?
 - a. If yes, proofing was triggered by the requirement for an EIA, what other legislative compliance was required? Is this information available for scrutiny, e.g. has the basis for environmental permitting or gaining planning permissions been provided?
 - b. If no, but based on the results of the InvestEU screening further proofing was carried out what information has been provided by the project promoter?
- 2) For all projects, is there evidence that the mitigation hierarchy has been followed?
 - a. Have project promoters documented the measures taken for avoiding impacts?
 - b. Where relevant, what mitigation measures have been suggested?
 - c. Has consideration been given to rehabilitation/restoration if needed?
 - d. If the project needs to offset air emissions, are these measures recorded?
 - e. Are costs available for the measures considered in the mitigation hierarchy?
- 3) Have project impacts been quantified?
 - a. Have impacts on air quality been quantified in terms of tonnes/kg emitted or avoided?
 - b. What are these impacts?
 - c. Have the damage costs arising from significant impacts been monetised?
- 4) Have significant impacts been monetised?
 - a. What was the source of the monetary values and what are the end estimates?
 - b. How do these present value damage costs compare with project costs? What proportion of the total costs do they represent?
 - c. What would be the costs of any additional measures aimed at further mitigation significant impacts?

Following due diligence, reporting should follow the stepped approach described above. A summary should also be provided of the following as part of recording the results of the assessment:

- What cross-cutting impacts were considered in the analysis (e.g. noise, vibration, odour, etc.);
- What geographic boundaries or locations were considered in the analysis;
- What the general approach to the assessment was, including to the qualitative and quantitative elements of the assessment;
- What the sources of data were, including of any quantitative data (or dose-response relationships in the case of noise) used in the assessment of impacts were;
- What monetary value estimates were taken to estimate the negative or positive impacts for noise (and odour if valuation was undertaken), including the source of the economic value estimates and other key assumptions (e.g. the populations assumed to be relevant for any transfer of willingness-to-pay estimates);
- What the total economic value of the negative or positive impacts over the life of the project are, including an indication of the time horizon over which these have been estimated; and
- What the key uncertainties are and how significant these may be to the end conclusions.

Annex 1 Legal Compliance Check

Checklist 3 - 1: Standard template questions for compliance checks with EU environmental legislation¹³²		
Consistency of the operation with environmental and climate policy and the planning framework		
Questions	Yes/No	Comments/Justification
1. Is an operation consistent with the overall EU policy framework (e.g. a transition towards low carbon economy)?		
If the operation results from a plan/programme (e.g. a plan/programme prepared for a specific sector, spatial plan):		
1. Are there any environmental implications stemming from a plan/programme or its corresponding strategic environmental assessment or a planning decision, that should be considered in the operation's compliance checks?		
2. Is a plan/programme up-to-date, in accordance with EU requirements, if applicable?		
If the operation does not result from a plan or programme (e.g. a plan/programme prepared for a specific sector, spatial plan):		
1. Should such a plan be in place, in accordance with EU requirements, if applicable, to provide a necessary framework for an operation?		
Cumulation with other existing or planned projects		
1. Might the operation lead to significant environmental effects because of its cumulations with other existing or planned projects?		

Checklist 3 - 2: Standard template questions for compliance checks with the EIA Directive		
Questions	Yes/No	Comments/Justification
Applicability test (answer 'no' to a question from 1 to 3 implies that a project falls under the revised EIA Directive)		
1. If this is an Annex II project, was the screening initiated before 16 May 2017?		
2. If this is an Annex I project or screened-in Annex II project, was the scoping initiated before 16 May 2017?		
3. If this is an Annex I or screened-in Annex II project, was the EIA report provided before 16 May 2017?		
For Annex II project screened-out (no need for EIA)		
1. Was the screening decision made available to the public? (not a new requirement)		

¹³² The checklists in the Annexes of this report are for voluntary use of project promoters and IPs as extra aid to perform the sustainability proofing according to the requirement of the Commission's Sustainability Proofing Guidance (which shall prevail).

Checklist 3 - 2: Standard template questions for compliance checks with the EIA Directive

Questions	Yes/No	Comments/Justification
2. Does the screening decision (positive or negative) state the main reasons for requiring or not an EIA?		
3. Does the negative screening decision state any features of the project and/or measures envisaged to avoid or prevent significant adverse effects on the environment?		
For Annex I projects and for screened-in Annex II projects (with EIA)		
4. Was the EIA report prepared in accordance with Art. 5(1) and Annex IV (including: <ul style="list-style-type: none"> • a description of reasonable alternatives; • baseline scenario and an outline of the likely evolution thereof without implementation of the project; • description of the likely significant effects on environment resulting from inter alia, the construction and existence of the project, including, demolition works, impact on climate and the vulnerability of the project to climate change; • cumulation with other existing and/or approved projects; • features and measures to avoid, prevent, reduce or offset any significant adverse effects, etc.)? 		
5. Were the environmental, local and regional authorities consulted on the EIA report?		
6. Was the information under Art. 6 electronically accessible to the public?		
7. Was the EIA report subject to a public consultation, and if relevant, with other MSs, for at least 30 days?		
8. Does the decision to grant development consent incorporate all the elements as per Art. 8a(1) (including reasoned conclusion)?		
9. For projects with significant adverse effects, are procedures for monitoring determined?		
10. Does the decision to grant development consent meet the requirements of Art. 9(1), namely: the public was informed about the decision and the following information was made publicly available: <ul style="list-style-type: none"> • the content of the decision and any conditions attached thereto, • the main reasons and considerations on which decision is based, including information about the public participation and summary of the results of the consultations and how these results have been addressed? 		

Checklist 3 - 3: Standard template questions for compliance checks with the Habitats and Birds Directives

Questions	Yes/No	Comments/Justification
Option 1: If the project has been screened out from carrying out an appropriate assessment, i.e. the project is not likely to have significant negative effects on Natura 2000 site/s:		
<p>1. Explain whether a 'screening decision' (a separate one or integrated into an EIA screening decision) is valid and provides information about:</p> <ul style="list-style-type: none"> • distance to a nearest Natura 2000 site(s); • species and habitats subject to protection on the Natura 2000 site(s) concerned; • site-specific conservation objectives for relevant Natura 2000 site(s); • reasons why the project is unlikely to have significant effects on the site(s) (due to its location, technology, timing of works etc.). <p>Note 1: In cases where there is insufficient level of justification in a screening decision, refer to any other relevant documentation, e.g. EIA documentation (if carried out), Natura 2000 management plan, Special Areas of Conservation (SAC) designation act, etc.).</p> <p>Note 2: Attention must be paid to ensure that the conclusion of the screening by the MS with regard to the lack of significant impacts does not result from taking account of project specific mitigation measures (unless the measures are an integral part of the original project itself and are not imposed by competent authority in the screening decision).</p> <p>Note 3: In case of doubts, cross-check the information at the Natura 2000 Network viewer and/or Natura 2000 Standard Data Forms¹³³ and if needed contact the Commission services.</p>		
Option 2: If the project has been subject to an appropriate assessment, which resulted in a positive conclusion, that the project will not have significant effects on Natura 2000 site/s (under Article 6(3) of the Habitats Directive):		
<p>1. Do an appropriate assessment and a decision of the competent authority (i.e. key elements of the procedure carried out in accordance with Art. 6.3. of the Habitats Directive) include information about:</p> <ul style="list-style-type: none"> • a baseline situation; • site-specific conservation objectives; • expected impacts in the light of the site-specific conservation objectives; 		

¹³³ The completed forms are available at <http://nature.eea.europa.eu/Natura2000/Default.aspx> or via [Natura 2000 Network viewer](#) (click on an icon with binoculars).

Checklist 3 - 3: Standard template questions for compliance checks with the Habitats and Birds Directives

Questions	Yes/No	Comments/Justification
<ul style="list-style-type: none"> • data sources and methodology used in the assessment; • mitigation measures, including their effectiveness, and monitoring? <p>Note 1: In case of doubts, cross-check the information at the Natura 2000 Network viewer and/or Natura 2000 Standard Data Forms¹³⁴.</p>		
<p>Option 3: If the project has been subject to an appropriate assessment, resulting in a negative conclusion, i.e. the project has significant negative effects on Natura 2000 sites (under Article 6(4) of the Habitats Directive):</p>		
<p>1. Has a standard notification form "Information to the European Commission according to Article 6(4) of the Habitats Directive " has been transmitted to the Commission (DG Environment) and assessed positively by the Commission?</p> <p>Note 1: In case of doubts, cross-check the information at the Natura 2000 Network viewer and/or Natura 2000 Standard Data Forms¹³⁵.</p>		
<p>2. In case of projects having significant effects on the priority habitats and/or species and justified by imperative reasons of overriding public interest other than human health and public safety or beneficial consequences of primary importance for the environment, was an opinion of the Commission under Article 6(4) of the Habitats Directive was requested and issued?</p>		

Checklist 3 - 4: Standard template questions for compliance checks with the Water Framework Directive

Questions	Yes/No	Comments/Justification
<p>If a project does not involve a new modification to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, which deteriorate the status of a water body or cause failure to achieve good water status/potential:</p>		
<p>1. Is there sufficient evidence in the submitted documentation?</p>		
<p>If a project involves a new modification to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater which deteriorate the status of a water body or cause failure to achieve good water status/potential:</p>		

¹³⁴ The completed forms are available at <http://nature.eea.europa.eu/Natura2000/Default.aspx> or via [Natura 2000 Network viewer](#) (click on an icon with binoculars).

¹³⁵ The completed forms are available at <http://nature.eea.europa.eu/Natura2000/Default.aspx> or via [Natura 2000 Network viewer](#) (click on an icon with binoculars).

Checklist 3 - 4: Standard template questions for compliance checks with the Water Framework Directive

Questions	Yes/No	Comments/Justification
<p>1. Have all the conditions under Article 4.7¹³⁶ have been fulfilled:</p> <ul style="list-style-type: none"> • all practicable mitigation measures are taken to mitigate the negative impacts • the benefits of the project outweigh the benefits of achieving the WFD objectives and/or the project is of overriding public interest • there are no significantly better environmental options to achieve the project's objective which are technically feasible and not disproportionately costly • the project and the above mentioned justifications are included in River Basin Management Plan (RBMP)? 		
<p>2. Have the results of the assessment under article 4(7) been reflected in the development consent (either as part of an EIA/environmental decision or on the basis of a separate water permit, etc.) granted by the competent authority?</p>		
<p>3. Has the assessment of the impact of an operation taken into account the cumulative effects with other projects within the same river basin?</p>		
<p>4. How the project, if relevant¹³⁷, fits with the objectives set in the River Basin Management Plan/s for the affected water bodies and/or relevant national/regional strategy?</p>		

¹³⁶ Article 4(7) of the Water Framework Directive:

“Member States will not be in breach of this Directive when:

- *failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activity and all the following conditions are met:*
 - (a) *all practicable steps are taken to mitigate the adverse impact on the status of the body of water;*
 - (b) *the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;*
 - (c) *the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and*
 - (d) *the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.”*

¹³⁷ This question makes a link to broader water planning at the river basin level. This should reflect if the project's objectives contribute to the River Basin Management Plan/s, which is very relevant in projects related to drinking water, urban wastewater treatment, hydropower, or other specific water uses included in the River Basin Management Plan.

Annex 2 Resources to Air

Table Air - 1: JASPERS guidance documents for assessing investment projects

- Guidance on Appraising the Economic Impacts of Rail Freight Measures
- The Use of Transport Models in Transport Planning and Project Appraisal
- Evaluation of Economic Benefits of Polluted Site Remediation Projects: only indirectly refers to airborne emissions with respect to human health benefits (but should be referred to for potential impacts on water and land)
- Key Considerations in planning waste-to-energy facilities: provides a summary of the key air emissions and the factors that may influence levels of emissions¹³⁸
- Guideline for Major Projects Application Form in waste management projects

Table Air - 2: Air pollutants relevant to environmental proofing

Directive 2004/107/EC	<ul style="list-style-type: none"> • Arsenic • Cadmium • Mercury • Nickel • Polycyclic aromatic hydrocarbons
Directive 2008/50/EC	<ul style="list-style-type: none"> • Sulphur dioxide, nitrogen dioxide and oxides of nitrogen and carbon monoxide • Benzene • Particular matter (PM10, PM2,5) and lead • Ozone and related NO and NO2, and volatile organic compounds
Directive EU 2016/2284	<ul style="list-style-type: none"> • SO2, NOx, NMVOC, NH3, CO • PM10, PM2,5, Total suspended particles and black carbon • Heavy metals (Cd, Hg, Pb) and AS, Cr, Cu, Ni, Se, Zn and their compounds • POPs (total PAHs, HCB, PCBs, dioxins/furans)
Industrial Emissions Directive (2010/75/EU)	<ul style="list-style-type: none"> • Sulphur dioxide and other sulphur compounds • Oxides of nitrogen and other nitrogen compounds • Carbon monoxide • (Non-methane) Volatile organic compounds • Metals and their compounds • Dust including fine particulate matter • Asbestos (suspended particulates, fibres) • Chlorine and its compounds • Fluorine and its compounds • Arsenic and its compounds • Cyanides • Substances and mixtures which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air • Polychlorinated dibenzodioxins and polychlorinated dibenzofurans
Medium Combustion Plant Directive (EUJ)2015/2193	<ul style="list-style-type: none"> • Emissions of SO2, NOX and dust to air. • Monitoring of carbon monoxide (CO) emissions.

¹³⁸ A summary of GHG emissions from waste management activities can be found in the UNEP document on “Waste and Climate Change - Global Trends and Strategy Framework” (2010). More information on calculation of GHG emissions in waste and waste to energy projects could be found under JASPERS staff working paper released on March 2013.

Table Air - 2: Air pollutants relevant to environmental proofing

Ecodesign Directive 2009/125/EC and Energy Labelling Regulation (EU) 2017/1369	<ul style="list-style-type: none">• In various implementing measures (e.g. on boilers and stoves) emission limits are set for relevant air pollutants such as PM10 and NO2.
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Table Air S1 - 1: Documentation of available information on emissions to air and air quality impacts		
Legislative driver	Air quality impacts	Available detail
SEA Directive	<i>If the project is being carried out as a result of a national plan or programme, was air quality considered in the strategic environmental assessment? Is the project being carried out specifically to address air quality issues?</i>	<i>Please indicate what air quality issues were considered and at what level the contribution of individual projects or groups of projects to changes in air quality was assessed. Please indicate if there is quantitative data available from the SEA which is relevant to understanding how the project may contribute to cumulative reductions or increases in emissions to air.</i>
EIA Directive	<i>Please indicate what air pollutants, if any, were assessed as part of the EIA and whether any mitigation measures were adopted to minimise/reduce impacts. This should cover all relevant project phases and activities, including changes in emissions resulting from the choice of location, infrastructure type or transport mode.</i>	<i>Please indicate what detailed assessment reports are available and whether the assessment was based on modelling and whether there is quantitative data on atmospheric emissions, e.g. expressed as kg or tonnes per year</i>
Waste Framework Directive	<i>If the project falls into the waste management sector, please indicate whether it will have any net impact on emissions to air, and what aspects of the project will lead to these changes (e.g. an increase in recycling should reduce demand for energy as part of virgin materials production, increase in incineration, etc).</i>	<i>Please indicate whether a detailed assessment has been carried out on air quality impacts with respect to the projects contribution towards the objectives of the WasteFD, and whether there is any quantitative data on changes in emissions, e.g. expressed as kg or tonnes per year.</i>
Industrial Emissions Directive	<i>Please indicate what air pollutants, if any, were assessed as part of the permitting process under the IED, and whether the project when operational will comply with the emission limit values set out in that Directive. Please detail any mitigation measures that were adopted in order to achieve BAT and to minimise/reduce emissions to air.</i>	<i>Please indicate what detailed assessment reports are available from the permitting process and whether the assessment was based on modelling. Also indicate whether there is quantitative data on atmospheric emissions, e.g. expressed as kg or tonnes per year.</i>
National Emissions Ceilings (NEC) Directive	<i>Does the project relate to a measure proposed under the National Air Pollution Control program developed under the NEC Directive? If yes, please provide details of the measures that will have to be put in place, and provide an indication of the impact that they will have on emissions to air. If the project could lead to reduction or avoidance of air pollutant emissions falling under Directive (EU) 2016/2284, but no specific measures have been put in place or have been identified at this point in time by national authorities please provide details.</i>	<i>Please indicate whether any detailed assessment reports are available with respect to the impact on emissions to air that will result from the project. Also indicate whether this includes quantitative data on changes in atmospheric emissions, e.g. expressed as kg or tonnes per year.</i>

Table Air S1 - 1: Documentation of available information on emissions to air and air quality impacts		
Legislative driver	Air quality impacts	Available detail
<p>Ecodesign Directive and/or Energy Labelling Regulation</p>	<p><i>Would the project include appliances covered by implementing measures¹³⁹ under the Ecodesign Directive and Energy Labelling Regulation, and which are relevant directly or indirectly to emissions to air (e.g. due lower energy consumption)? If yes, provide details of the choice of appliances to make sure they are best in class, or are complying with best in class in measures already adopted but not in force yet (because of a transition time).</i></p>	<p><i>Please provide details of the Life Cycle Assessment relevant to the appliance and which provides data on emissions to air for the selected appliance compared to other appliances, and which demonstrates that they are best in class.</i></p>

¹³⁹ Covering boilers and stoves with direct emissions of air pollutants, but also industrial components such as pumps and fans with an indirect emission component (less energy consumption resulting in lower emissions).

Table Air S1 - 2: Applying the mitigation hierarchy	
Mitigation measure	Questions to consider
Avoid	Could negative impacts on air quality and the achievement of regional / national objectives be avoided by implementing the project elsewhere? By implementing a different project? By using a different approach or method?
Minimise	Could the project be designed to include measures to minimise the impact on air quality? Examples include carrying out the work at a particular time of year, using a particular method, or implementing the project differently. What measures could be implemented to avoid indirect impacts or cumulative impacts on air quality? Could lessons be learnt from similar projects nearby?
Rehabilitate/restore	How could the project be designed to enable rehabilitation or restoration of air quality issues? What measures need to be taken before the project starts? What measures need to be taken once the project is implemented?
Offset	What could be done to compensate for any negative impacts on local or regional air quality? Could air quality in other areas be improved? Where could this occur?

Table Air S1 - 3: Checklist for identifying potentially significant negative impacts to Air		
<i>See Table Air - 2 for a list of potential pollutants, making sure to consider those listed under all the Directives</i>		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
1) Will construction or decommissioning of the project involve actions which will cause impacts on air quality, e.g. due to dust emissions, energy consumption, emissions from manufacturing processes, or significant changes in transportation modes or infrastructure?		
2) Will the project release pollutants or any hazardous, toxic or noxious substances to air?		
3) Are there any areas on or around the location which are densely populated or built-up, and which could be affected by a localised increase in air pollution?		
4) Are there any transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the project?		
5) Are there any areas on or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, which could be affected by changes in atmospheric emissions the project?		
6) Is the project located in an Air Quality Zone which does not meet the targets set under the regional/national Air Quality Plan? Would emissions from the project relate to those same targets?		

Table Air S1 - 3: Checklist for identifying potentially significant negative impacts to Air
See Table Air - 2 for a list of potential pollutants, making sure to consider those listed under all the Directives

Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
7) Are there any other factors which should be considered such as consequential development which could lead to impacts on air quality or the potential for cumulative impacts with other existing or planned activities in the locality (e.g. through increases in other industrial manufacturing activity as part of the creation of a manufacturing cluster)?		
8) Would any other activities be required as a consequence of the project, which could lead to an increase in atmospheric emissions?		

Table Air S1 - 4: Checklist for identifying project characteristics reducing impacts to Air

Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
1) Will the project result in improvements in energy efficiency? These could result from: - reduced energy intensity of manufacturing activities - reduced energy intensity of transport requirements reduced transport / energy demand - etc.		
2) Will the project result in the use of renewable energy sources?		
3) Will the project result involve the capture of energy in waste materials?		
4) Will the project increase the potential for re-use or recycling of end products, thereby reducing the energy consumption associated with the production of virgin materials?		
5) Have production technologies been selected so as to minimise the potential for air emissions at source?		
6) Have production technologies been selected in line with the Ecodesign Directive and the Energy Labelling Regulations?		
7) Have production technologies and chemical inputs been selected so as to minimise the use of hazardous substances that would be emitted to air in waste gases, or through process emissions?		
8) Have other actions been taken as part of project design to limit emissions to air?		

Table Air S1 - 4: Checklist for identifying project characteristics reducing impacts to Air		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
9) Other aspects that demonstrate environmental good practice in project operation as well as delivery? E.g. increase awareness of residents and other businesses, take advantage of an opportunity within a growing environmental sector		

Table Air S2 - 1: Data to be reported on significant emissions of concern				
Source of emissions (activities and project phase)	Pollutant	Quantities or volumes emitted / reduced / avoided	Frequency and duration of emissions	Population which may be affected

Table Air S2 - 2: Data for reporting on impacts on air quality		
Project objectives	Identify any specific project objectives relevant to the potential for emissions to air or impacts on air quality	
Project socio-economic and environmental context	Provide information on the current situation in terms of any constraints on the project's activities and its outputs that are relevant to its impacts on air	
Environmental criteria used in identifying the project options	Provide information on the current baseline air quality and any measures required at the national level to reduce emissions to air that are relevant to the project.	
Key factors underlying demand for the project relevant to air emissions	Identify the design aspects that result in emissions to air and indicate what steps were taken to minimise emissions, or what constraints exist on the ability to reduce emissions	
Methodology (the methodology applied for quantification of externalities and the related assumptions and unitary values)	If the project assessment has included quantification of changes in emissions, describe the methodology used for these purposes and provide any national or other guidance followed when undertaking the assessment. Key assumptions and per unit emissions values should be detailed.	
Cumulative effects (potential for increase in emissions from the project when combined with other recent infrastructure developments to lead to cumulative impacts)	Indicate whether there have been other infrastructure developments in the local area that could also lead to impacts on air quality.	

Table Air S3 - 1: Example table of damage costs per tonne of emissions for 2020 (2005 prices)

Table A1.8 Damage (EUR) per tonne emission estimates for PM_{2.5} in 2010 and 2020 (2005 prices)

Country code	Country	Primary PM _{2.5} 2010		Primary PM _{2.5} 2020	
		Low VOLY	High VSL	Low VOLY	High VSL
AL	Albania	19 809	55 447	20 892	58 479
AT	Austria	29 737	83 236	30 902	86 499
BA	Bosnia and Herzegovina	17 809	49 851	19 298	54 018
BE	Belgium	43 179	120 862	50 623	141 700
BG	Bulgaria	19 270	53 938	18 898	52 899
BY	Belarus	11 425	31 979	12 811	35 859
CH	Switzerland	37 057	103 726	39 825	111 473
CY	Cyprus	12 926	36 182	10 777	30 167
CZ	Czech Republic	20 846	58 350	22 494	62 962
DE	Germany	44 612	124 873	50 957	142 635
DK	Denmark	10 925	30 581	13 140	36 781
EE	Estonia	7 129	19 954	7 959	22 278
EL	Greece	18 214	50 982	20 551	57 524
ES	Spain	19 391	54 277	20 170	56 459
FI	Finland	7 134	19 968	6 862	19 207
FR	France	30 388	85 058	32 330	90 495
HR	Croatia	26 839	75 125	28 079	78 596
HU	Hungary	29 372	82 216	29 199	81 731
IE	Ireland	15 230	42 629	16 229	45 426
IT	Italy	35 604	99 661	34 697	97 122
LT	Lithuania	9 706	27 168	8 793	24 611
LU	Luxembourg	32 179	90 071	35 212	98 562
LV	Latvia	9 689	27 122	9 559	26 757
MD	Moldova	21 708	60 763	21 529	60 262
MK	the former Yugoslav Republic of Macedonia	11 765	32 933	13 123	36 732
MT	Malta	15 828	44 303	15 238	42 652
NL	Netherlands	39 864	111 583	45 991	128 733
NO	Norway	7 964	22 291	8 290	23 205
PL	Poland	20 446	57 230	22 268	62 332
PT	Portugal	23 972	67 102	23 574	65 986
RO	Romania	20 864	58 399	18 605	52 077
SE	Sweden	11 208	31 371	11 383	31 863
SI	Slovenia	21 852	61 166	25 250	70 678
SK	Slovakia	20 587	57 625	22 853	63 968
TR	Turkey	19 113	53 499	21 454	60 051
UA	Ukraine	20 974	58 708	22 346	62 549
UK	United Kingdom	24 632	68 948	32 764	91 710

Source: European Environment Agency (EEA), "Revealing the costs of air pollution from industrial facilities in Europe", 2019.

Table Air S3 - 2: Air pollution damage cost values for use in proofing of transport projects from the “Handbook on external costs of transport”

Table 14 - Air pollution costs: average damage cost in €/kg emission, national averages for transport emissions in 2016 (excl. maritime) (All effects: health effects, crop loss, biodiversity loss, material damage)

€2016/kg	NH ₃	NM VOC	SO ₂	NO _x transport city*	NO _x transport rural*	PM _{2.5} transport metropole*	PM _{2.5} transport city*	PM _{2.5} transport rural*	PM ₁₀ average*
Austria	27.8	2.3	16.2	41.4	24.3	466	151	87	30.9
Belgium	38.2	3.6	17.1	26.1	15.1	479	155	114	47.2
Bulgaria	5.6	0	4.2	10	5.9	191	61	30	5.4
Croatia	17.9	0.9	8	18.5	11.4	292	95	54	8.2
Cyprus	3.8	-0.4	7.8	8.1	4.5	n.a.**	71	17	20.1
Czech Republic	27.4	1.1	11.6	24.8	14.8	361	116	72	39.6
Denmark	14.0	1.5	9.6	16.2	9.6	470	151	59	15
Estonia	10.5	0.3	5.2	5.4	3.4	n.a.**	102	35	4.9
Finland	7.0	0.4	4.6	5.3	3.5	366	118	32	11.9
France	15.4	1.5	13.9	27.2	16.2	407	131	87	5.9
Germany	28.1	1.8	16.5	36.8	21.6	448	144	93	24.7
Greece	4.8	0.3	5.9	5.1	3.1	267	86	33	24.8
Hungary	18.9	0.8	9.9	26.8	15.8	317	102	59	8.5
Ireland	4.1	1.7	11.8	17.6	10.1	568	183	68	12.2
Italy	21.6	1.1	12.7	25.4	15.1	409	132	79	19
Latvia	8.7	0.4	4.8	7.2	4.4	251	81	28	17.2
Lithuania	7.9	0.6	6.4	12.1	7.1	300	98	38	27
Luxembourg	60.0	6.2	29.3	66.8	38.4	n.a.**	278	191	8
Malta	6.4	0.4	4.3	2.3	1.4	n.a.**	72	18	63.9
Netherlands	30.0	2.8	20.2	26.5	15.3	458	148	101	5.6
Poland	14.4	0.7	8.2	14.7	8.9	282	91	52	5.2
Portugal	4.3	0.5	4.1	2.8	1.7	292	94	39	47.3
Romania	9.4	0.5	7.3	19.4	11.2	272	88	42	16.1
Slovakia	24.4	0.7	10.1	24.8	14.7	328	105	59	12.3
Slovenia	23.8	1.2	9.2	22.3	13.7	n.a.**	93	52	12
Spain	6.4	0.7	6.8	8.5	5.1	348	112	46	10.2
Sweden	10.6	0.7	5.5	9.5	6	374	120	38	15.2
United Kingdom	17.6	1.4	10	13.6	7.9	380	122	65	16.2
EU28	17.5	1.2	10.9	21.3	12.6	381	123	70	22.3

Notes:

- * PM₁₀ cost factors can be used for the non-exhaust emission of particles PM, e.g. from brake and tyre abrasion.
- ** Metropole only applies to cities larger than 0.5 million inhabitants. Some countries do not have such cities hence these damage values are hence not being reported. This is the case for Slovenia, Malta, Luxembourg, Estonia and Cyprus.
- Rural area: outside cities; metropolitan area: cities/agglomeration with more than 0.5 million inhabitants.

Source: <https://ec.europa.eu/transport/sites/transport/files/studies/internalisation-handbook-isbn-978-92-79-96917-1.pdf>

Annex 3 Resources to Water

Table Water S1 - 1: Documentation of available information for impacts on the water environment		
Legislative driver	Water environment impacts	Available detail
EIA Directive	<i>Please indicate what impacts on the water environment were considered within the EIA, highlighting separately those on the freshwater and coastal environments. Also identify whether an assessment was carried out under either the WFD or in relation to marine waterbody objectives.</i>	<i>Please indicate what detailed assessment reports are available; the extent to which the assessment was based on monitoring data versus modelling results and the key uncertainties and assumptions</i>
SEA Directive	<i>If the project is being carried out as a result of a national plan or programme, were impacts on the water environment considered as part of the strategic environmental assessment? Is the project being carried out specifically to address water-related issues?</i>	<i>Please indicate what data sources were used within the SEA</i>
Water Framework Directive	<i>Please indicate the waterbody (or waterbodies) concerned, the current status of those waterbodies and the likely effects of the project on that status in the future and the achievement of the good status in the future</i>	<i>Please indicate what detailed assessment reports are available; the extent to which the assessment was based on monitoring data versus modelling and the key uncertainties and assumptions</i>
Marine Strategy Framework Directive	<i>Please indicate the waterbody (or waterbodies) concerned, the indicators of good environmental status affected by the project and the likely effects of the project</i>	<i>Please indicate what assessments are available and the data sources used (monitoring data; modelling results, etc.)</i>
Habitats Directive	<i>If the project is subject to an Appropriate Assessment, please indicate any water environment-related conservation objectives for the sites, the habitats and species considered, and the effects of the project on natural habitats and species and the associated water-ecology, as well as what alternatives and/or compensatory measures have been considered¹⁴⁰</i>	<i>Please indicate what detailed assessment reports are available from the Appropriate Assessment, what data sources have been used for these (e.g. surveys), what information on other plans and projects has been identified for the assessment</i>
Industrial Emissions Directive	<i>Please indicate what water pollutants, if any, were assessed as part of the permitting process under the IED, and what limits will apply to the project on discharges to the water environment. Please detail any mitigation measures that were adopted in order to achieve BAT and to minimise/reduce discharges to the water environment.</i>	<i>Please indicate what detailed assessment reports are available from the permitting process and whether the assessment was based on modelling. Also indicate whether there is quantitative data on discharges to water, e.g. expressed as kg or tonnes per year</i>

¹⁴⁰ Drawn from the overview of an Appropriate Assessment provided in European Commission (nd): Appropriate Assessment, accessed at: https://ec.europa.eu/inea/sites/inea/files/download/events/2014/may_ENER_info_day/cef_2352014_hab_dir_art_6_aa_env_extra.pdf on 21st August 2020.

Table Water S1 - 2: Applying the mitigation hierarchy	
Mitigation measure	Questions to consider
Avoid	Could negative impacts on the waterbody be avoided by implementing the project elsewhere? By implementing a different project? By using a different approach or method?
Minimise	Could the project be designed to include measures to minimise the impact on biodiversity? Examples include carrying out the work at a particular time of year, using a particular method, or implementing the project bit by bit. What measures could be implemented to avoid indirect impacts or cumulative impacts? Could lessons be learnt from similar projects nearby?
Rehabilitate/restore	How could the project be designed to enable rehabilitation or restoration of the waterbody following the project? What measures need to be taken before the project starts to enable restoration afterwards? What measures need to be taken once the project is implemented?
Offset	What could be done to compensate for negative impacts on the waterbody? Could improvements in the status of other waterbodies offset the impacts of the project? Where could this occur?

Table Water S1 - 3: WFD related information as required by the JASPERS checklist (Step 1)	
Base information required for screening	
<ul style="list-style-type: none"> • Project details, including the alternatives considered • Details of physical modifications /alterations to surface waterbodies or other activities leading to a change in groundwater • Identification of the water bodies (surface and groundwater) that would be affected by the project, and details of their size, scale, location and main characteristics • Identification of potentially relevant water-dependent protected areas and ecosystems, including details of the current future status of the protected areas • Details of the current ecological and chemical status of each potentially affected waterbodies, including of elements failing to meet status objectives 	
Information also needed for next step	
<ul style="list-style-type: none"> • Identification of the planned future status of the protected areas • Details of the future ecological and chemical status for each potentially affected waterbodies • Details of any existing Article 4(4) or 4(5) exemptions and associated deadlines • Details of the measures identified in the RBMP as being in place or required to meet future objectives. • Identification of planned, proposed or already under construction projects, activities etc. that could affect water body status. 	

Table Water S1 - 4: MSFD related information consistent with the JASPERS checklist

Base information required for MSFD screening
<ul style="list-style-type: none"> • Project details, including the alternatives considered • Details of physical modifications / alterations (quality, litter, energy) to the regional waterbodies or relevant shoreline areas • Identification of the areas in the regional waterbodies that would be affected by the project, and details of their size, scale, location and main characteristics • Identification of potentially relevant water-dependent protected areas and ecosystems, including details of the current and planned future status of the protected areas (see also Section 6) • Details of the current status of each marine waterbody across the relevant descriptors
Information also needed for the next step
<ul style="list-style-type: none"> • Identification of the planned future status of the affected marine water bodies, at the descriptor level • Details of any exceptions to achievement of GES and the type of exception together with an indication of the spatial coverage of those exceptions and the specific descriptors that fall under • Details of the measures identified as being in place or required to meet good environmental status • Identification of other projects, activities etc. that could affect water body status

Table Water S1 - 5: Marine Strategy Framework Directive compliance assessment cause-and-effect mechanisms

Descriptors (see also Annex I of the MSFD)	Is there a possible causal mechanism for a direct effect on achievement of good environmental status? (refer to Table 2, Annex III of the MSFD)	Is there a possible causal mechanism for an indirect effect on achievement of good environmental status? (refer to Table 2, Annex III of the MSFD)
Biodiversity – Descriptor 1	Yes/No/Uncertain <i>If yes, what sub-region?</i>	Yes/No/Uncertain <i>If yes, what sub-region?</i>
Non-indigenous species – Descriptor 2	Yes/No/Uncertain <i>If yes, what sub-region?</i>	As above
Commercially exploited fish and shellfish – Descriptor 3	<i>As above</i>	<i>As above</i>
Food webs - Descriptor 4	<i>As above</i>	<i>As above</i>
Eutrophication – Descriptor 5	<i>As above</i>	<i>As above</i>
Sea-floor integrity – Descriptor 6	<i>As above</i>	<i>As above</i>
Hydrographical changes – Descriptor 7	<i>As above</i>	<i>As above</i>
Contaminants and chemical pollution – Descriptor 8	<i>As above</i>	<i>As above</i>
Contaminants in fish and other seafood – Descriptor 9	<i>As above</i>	<i>As above</i>
Marine litter – Descriptor 10	<i>As above</i>	<i>As above</i>
Introduction of energy – Descriptor 11	<i>As above</i>	<i>As above</i>

Table Water S1 - 6: Checklist for identifying potentially significant negative impacts on the Water environment

Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
1) Are there any inland, coastal, marine or underground water bodies (or features of the marine environment) on or around the location that could be affected by the Project?		
2) Will construction or decommissioning of the project involve actions which will cause impacts on surface waters, groundwaters or marine waters or a temporary nature?		
3) Will construction or decommissioning of the project involve actions which will cause impacts on surface waters, groundwaters or marine waters of a permanent nature?		
4) Could the project itself, during its operational phase, have an impact on surface waters, groundwaters or marine waters? For example, will water be abstracted directly from water bodies or supplied by public/private sector operators, or could there be run-off from the project site?		
5) Will the Project lead to risks from contamination of the water environment from discharges of pollutants into surface waters, groundwater, coastal waters or the sea? Or, will it lead to significant discharges to waste water treatment works?		
6) Will the Project involve the use, storage, transport, handling or production of substances/mixtures (including biocides and pesticides) which could be harmful to the water environment? When answering this question, please take into account their hazard classification as well as any other classification under REACH (e.g. as a SVHC due to PBT/vPvB or Endocrine Disrupting properties)		
7) Are there any other areas on or around the location that are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other waterbodies, or the coastal zone that could be affected by the project?		
8) Are there any wetlands, watercourses or other waterbodies, or coastal zone areas on or around the location that are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the project?		

Table Water S1 - 6: Checklist for identifying potentially significant negative impacts on the Water environment

Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
9) Are there any routes or facilities on or around the water bodies which may be affected by the project and that are used by the public for access to recreation or other facilities?		
10) Are there any areas or features of historic or cultural importance on or around the location that could be affected by the project due to changes in water quality, quantity or water body morphology?		
11) Are there any areas within or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, that could be affected by the Project?		
12) Are there any other factors which should be considered such as consequential development which could lead to impacts on air quality or the potential for cumulative impacts with other existing or planned activities in the locality (e.g. through increases in other industrial manufacturing activity as part of the creation of a manufacturing cluster)?		
13) Are there any areas within or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, that could be affected by the Project?		
14) Is the project location susceptible erosion, flooding or drought conditions, which could give rise to impacts on the water environment?		

Table Water S1 - 7: Questions for assessing significance as part of screening in EIAs

Questions to be Considered

1. Will there be a large change in environmental conditions?
2. Will new features be out-of-scale with the existing environment?
3. Will the effect be unusual in the area or particularly complex?
4. Will the effect extend over a large area?
5. Will there be any potential for transfrontier impact?
6. Will many people be affected?
7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected?
8. Will valuable or scarce features or resources be affected?
9. Is there a risk that environmental standards will be breached?
10. Is there a risk that protected sites, areas, features will be affected?
11. Is there a high probability of the effect occurring?
12. Will the effect continue for a long time?
13. Will the effect be permanent rather than temporary?
14. Will the impact be continuous rather than intermittent?
15. If it is intermittent will it be frequent rather than rare?
16. Will the impact be irreversible?
17. Will it be difficult to avoid, or reduce or repair or compensate for the effect?

Source: https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf

Table Water S1 - 8: Checklist for identifying project characteristics reducing impacts on the water environment

Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
1) Will the project result in improvements in water efficiency? These could result from: - changes in production technologies to more efficient technologies - installation of other water saving measures - increased re-use or recycling of water resources?		
2) Will the project result in reduced abstractions from water environment in areas suffering from over-abstraction (seasonal or annually)? e.g. construction of a winter storage reservoir		
3) Will the project result in reductions in discharges to the water environment, either via sewer or direct?		
4) Will the project increase the potential for re-use or recycling of end products, thereby reducing the demand for high water intensity virgin materials?		
5) Have production technologies and chemical inputs been selected so as to minimise the potential for releases of hazardous substances to the water environment?		

Table Water S1 - 8: Checklist for identifying project characteristics reducing impacts on the water environment		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
6) Have other actions been taken as part of project design to limit impacts on the water environment?		
7) Other aspects that demonstrate environmental good practice in project operation as well as delivery? E.g. increase awareness of residents and other businesses, take advantage of an opportunity within a growing environmental sector?		

Table Water S2 - 1: Baseline data for assessing impacts on water bodies	
WaterFD/MarineSFD information	status Water body name and ID
	Water body location (map, GIS data)
	Current status / expected future status without the project across the different elements comprising good status
	Waterbody length / area
Water quality	
Type of discharge	Point / diffuse
Key contaminants	biological, chemical, thermal, etc.
Water resources	
Resource status	Water availability / scarcity
Current levels of abstraction	m ³ /Ml per day or year / average year environmental flow regime / potential for droughts
Source of water	River / lake / groundwater / public water supply
Hydromorphology	
Existing structures	Canalisation / bridges / weirs / fish passes / ports & navigations / other
Activities	Dredging / channel straightening / flood defence works / coastal erosion / beach renourishment / other
Flood and Erosion Risk	
Existing structures / soft defences	Levees / embankments / off-take channels / etc.
Existing level of protection	1 : 25 / 1 : 50 / etc. flood return probability
Nature of protected assets	Residential or commercial property / infrastructure / agricultural land / sensitive habitat areas
Value of protected assets	Monetary value or quality / importance assessment
Main characteristics of the project location	Length of river or coast / area of water body that would be impacted
	Relevant uses of the water body (natural fisheries, angling, other recreation, amenity, abstractions, heritage/landscape (national/regional/local park, etc.))
	Biodiversity importance of the water body (Ramsar site, Special Protection Area, Special Area of Conservation, designated nature reserve, designated wildlife reserve, other

Table Water S2 - 2: Data for reporting on impacts on the WFD water bodies		
Project objectives	Identify any specific project objectives relevant to the potential for impacts on the water environment	
Project socio-economic and environmental context	Provide information on the relevant water bodies within the RBMP, and any constraints on the project's activities that are relevant to its impacts on water	
Environmental criteria used in identifying the project options	Provide information on the current and planned future status for the water bodies that may be affected and details of how these would be affected	
Key factors relevant to air emissions	Identify the activities that will lead to the impacts and what measures are proposed to minimise impacts or to offset or compensate for them	
Methodology (the methodology applied for quantification of externalities and the related assumptions and unitary values)	If detailed investigations have been carried out involving the quantification of changes in key elements, describe the methodology used for these purposes and detail any national or other guidance followed when undertaking the assessment, as well as agreements with national competent authorities	
Cumulative effects (potential for the project when combined with other developments to lead to cumulative impacts)	Indicate whether there have been other projects that could also impact on the water bodies of concern	
Mitigation measures designed into the project and remaining residual effects	Describe the mitigation measures that could be applied to the project and that have been designed into the project, or any that have been considered and that were not technically feasible or were disproportionately costly, or how adaptive management might be applied	

Table Water S2 - 3: Data to be reported on significant impacts on MSFD regions/sub-regions				
Source of impacts (activities and project phase)	Good environmental status element	Qualitative description of impact	Frequency and duration of impacts / quantitative data (e.g. level of introduced noise energy)	Area affected

Table Water S2 - 4: Data to be reported on significant impacts to the water environment				
Source of impacts (activities and project phase)	Modification / Alteration /	Elements / descriptors impacted and extent (quantified if possible)	Duration	Deterioration in status/ preventing achievement of good status
Hydromorphological				
Physico-chemical				
Biological				
Chemical				
Other (litter, noise, etc.)				

Table Water S2 - 5: Example list of information to be reported for projects impacting on water quality
<ol style="list-style-type: none"> 1) The volume of effluent to be discharged and whether this will be a continuous (e.g. daily) or intermittent discharge (e.g. only occurring following particular maintenance activities). The length of time over which discharges will take place should also be recorded (e.g. months or years for construction of a capital project); 2) The pollutant contaminants to be discharged and the associated annual load for each of these; in particular, any discharges of priority or priority hazardous substances should be detailed; 3) The level of dilution within the receiving water body; 4) The impacts of the discharge on surface water body status: <ul style="list-style-type: none"> • Whether it would lead to a temporary impact on status, e.g. result in a water body deteriorating from good status to moderate status for the duration of the works? • Whether it would lead to a change in status for some but not all elements, such that a water body may not achieve good status into the future? If so, what elements of water body status would be affected? 5) The potential for the discharge to result in a significant increase in flows in a river or into lake (which may have negative or positive impacts), thereby impacting on achievement of good status. 6) The impacts of the project on groundwater body status: <ul style="list-style-type: none"> • Will there be discharges to groundwaters and if so what quantities will be discharged? Is it subject to a permitting regime? • What will the impact be on quantitative or chemical status? • Could the discharge indirectly affect surface waters due to hydrologic linkages? 7) Impacts on the capacity and ability of the receiving sewage/hazardous waste treatment works to meet its discharge permit requirements: <ul style="list-style-type: none"> • Could effluents from the project significantly affect the effluent loadings to the treatment works? Could it significantly affect quantities of run-off entering into the sewage treatment system? • Has the treatment works operator confirmed its ability to satisfactorily treat the increased / types of loads? • Will the works still have the necessary capacity to meet other future pressures (e.g. due to population growth, increased demand from other industrial/light industry dischargers, etc)?

Table Water S3 - 1: Ecosystem services classifications for the water environment, including valuation methods and associated data requirements					
CICES Division or Group	Class	Example services	Example goods and benefits	Valuation methods	Additional data requirements
Provisioning services – Biotic and Abiotic					
Biomass - Food	Terrestrial and aquatic plants grown for nutritional purposes	Harvested cultivated crops	Irrigated crops, in-situ aquaculture (watercress, etc)	Market price ¹ based on change in yields minus any subsidies	Yield-response relationships; crop and crop area affected
Biomass - Raw materials	Fibres and other material for direct processing and as sources of energy	Harvested cultivated crops	Wood, biofuels, plant oils paper, etc.	Market price based on change in yields minus any subsidies	Yield-response relationships; crop and crop area affected
Genetic materials/resources	Plants, wild animals, individual genes	Plant, algae or other species with novel characteristics	Generic resource for new product developments, e.g. pharmaceutical industry	Option values associated with potential future use	Value of novel medicines or other products
Surface water used for nutrition, materials or energy	Surface water for drinking and non-drinking purposes	Volume and quality characteristics of water	Potable water	Market price- based / treatment costs; cost of a replacement supply	Volume of water, change in treatment requirements with change in quality
	Freshwater surface waters, coastal and marine waters used as an energy source	Hydropower Wave or tidal power	Renewable energy supply	Market price-based; cost of a replacement supply	Energy production e.g. (kWh), availability and value
Ground water for used for nutrition, materials or energy	Ground (and subsurface) water for drinking	Drinking and non-drinking water supply	Potable and non-potable water supplies	Market price-based / treatment costs; cost of a replacement supply	Volume of water, change in treatment requirements with change in quality
Regulation and Maintenance					
Waste transformation / assimilation	Filtration, sequestration, storage, accumulation	Aquatic plants sequestering wastes/toxicants in sediment	Reduction in treatment costs or in health effects	Market price based approaches, e.g. costs of alternative treatment method; replacement costs	Data on current assimilation/transformation capacity; linkage between change in status and treatment requirements
Regulation of baseline flows and extreme events	Control of erosion rates	Stabilisation of sediments	Reduction in physical damages and risks to lives; reduction in	Market price based approaches; replacement costs; willingness to pay	Physical property and infrastructure at risk; predictions of damages due to

Table Water S3 - 1: Ecosystem services classifications for the water environment, including valuation methods and associated data requirements					
CICES Division or Group	Class	Example services	Example goods and benefits	Valuation methods	Additional data requirements
			costs of erosion and flood protection measures	or stated preferences valuations for morbidity or mortality	an event (assets, area, etc.); change in probability of an event
	Hydrological cycle and water flow regulation (including flood control, coastal protection)	Capacity of vegetation to retain water and release it slow, to mitigate storm effects	Reduction in physical damages and risks to lives; reduction in costs of erosion and flood protection measures	Market price based approaches; replacement costs; willingness to pay or stated preferences valuations for morbidity or mortality, mental health (flooding)	Physical property and infrastructure at risk; predictions of damages due to an event (assets, area, etc.); change in probability of an event
Lifecycle maintenance, habitat and gene pool protection	Maintaining nursery populations and habitats	Support of nursery habitats in estuaries, etc.	Sustainable commercial and natural populations	Market price based on change in future catch rates / harvests ²	Yield-response relationships; fisheries and shellfisheries affected together with current harvest rates
Water conditions	Regulation of chemical condition of freshwaters by living processes	Buffer strips to reduce run-off to water bodies	Reduced damage and costs of nutrient runoff from agriculture	Market price based for treatment costs, maintenance costs, etc.	Impacts of nutrient levels on other uses
Cultural services					
Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	Aquatic plants and wildlife	Informal recreation, in-stream recreation, amenity value	Market-based methods (formal recreation); willingness to pay / stated preferences; travel cost (recreation); hedonic pricing (amenity related to quality or quantity)	Number of recreational users and their characteristics (including location, type of visit, activity, etc.); number and value of properties affected; impacts of a change in quality/ecological/quantity status on goods
Intellectual and representative interactions with natural environment	Characteristics of living systems that enable aesthetic experiences; elements of living systems that have symbolic meaning	Natural waterbodies, designated areas, etc.	Tourism, recreation, non-use related values	Market-based methods (tourism expenditure), willingness to pay/ stated preferences (use and non-use values); travel cost (recreation); hedonic	Number of recreational users and their characteristics (including location, type of visit, activity, etc.); number and value of properties affected; proportion of the population holding bequest,

Table Water S3 - 1: Ecosystem services classifications for the water environment, including valuation methods and associated data requirements					
CICES Division or Group	Class	Example services	Example goods and benefits	Valuation methods	Additional data requirements
				pricing (amenity related to quality or quantity)	existence and option values; impacts of a change in quality/ecological/quantity status on goods
<p>Notes:</p> <p>1: Supporting services are not included in the table as they are fundamental to all of the other ecosystem services. As a result, their inclusion would be likely to lead to double-counting.</p> <p>2: EIB, EBRD and JASPERS require the adjustment of market prices for subsidies and taxes to ensure that the cost-benefit analysis reflects economic impacts rather than financial impacts</p> <p>3: Care is required to ensure that there is no double-counting between regulating and provisioning services with regard to the value of nurseries</p>					
Based on TEEB and CICES V5.1					

Table Water S3 - 2: Environmental/ecosystem service valuation tools

Ref	Tool	Area covered	Description/services covered	Countries covered
1	Co\$ting Nature	Natural capital, ecosystem services, terrestrial, aquatic and coastal (not marine) habitats	<p>Co\$ting Nature is a web based policy support tool for natural capital accounting and analysing the ecosystem services provided by natural environments (i.e. nature's benefits), identifying the beneficiaries of these services and assessing the impacts of human interventions. Services covered by model:</p> <ul style="list-style-type: none"> - Timber (softwood, hardwood) - Fuelwood (softwood, hardwood) - Grazing/fodder - Non-wood forest products - Water provisioning (quantity, quality) - Fish catch - Carbon - Natural hazard mitigation (flood, drought, landslide, coastal inundation) - Culture-based tourism - Nature-based tourism - Environmental and aesthetic quality services - Wildlife services (pollination, pest control) - Wildlife dis-services (crop raiding, pests) - Biodiversity - Pressure and threat <p>All required data for global analysis, plus the ability to upload your own datasets.</p>	Global
2	InVEST - Integrated Valuation of Environmental Services and Tradeoffs	Ecosystem services	<p>InVEST is a suite of open-source software models used to map and value the goods and services from nature that sustain and fulfil human life. It explores how changes in ecosystems are likely to lead to changes in benefits that flow to people. InVEST models are spatially explicit, using maps as information sources and producing maps as outputs. InVEST returns results in either biophysical terms, whether absolute quantities or relative magnitudes (e.g., tonnes of sediment retained or % of change in sediment retention) or economic terms (e.g., the avoided treatment cost of the water affected by that changed in sediment load. Supporting ecosystem services:</p> <ul style="list-style-type: none"> - Habitat quality - Habitat risk assessment - Pollinator abundance - crop pollination <p>Final ecosystem services:</p> <ul style="list-style-type: none"> - Forest carbon edge effect - Carbon storage and sequestration 	Global, Europe

Table Water S3 - 2: Environmental/ecosystem service valuation tools

Ref	Tool	Area covered	Description/services covered	Countries covered
			<ul style="list-style-type: none"> - Coastal blue carbon - Annual water yield - Nutrient delivery ratio - Sediment delivery ratio - Unobstructed views - scenic quality provision - Visitation – Recreation and tourism - Wave energy production - Offshore wind energy production - Marine finfish aquacultural production - Fisheries - Crop production - Seasonal water yield <p>Urban ecosystem services:</p> <ul style="list-style-type: none"> - Urban cooling model - Urban flood risk mitigation model 	
3	ARIES - Artificial Intelligence for Ecosystem Services	Ecosystem services, Maps/GIS databases	<p>ARIES is an artificial intelligent modeler rather than a single model or collection of models. ARIES chooses ecological process models where appropriate, and turns to simpler models where process models do not exist or are inadequate. Based on a simple user query, ARIES builds all the agents involved in the nature/society interaction, connects them into a flow network, and creates the best possible models for each agent and connection. The result is a detailed, adaptive, and dynamic assessment of how nature provide benefits to people.</p> <p>Currently support queries:</p> <ul style="list-style-type: none"> - Carbon storage - Outdoor recreation - Pollination - Sediment retention - Riverine flood regulation - Water availability (based on hydrological calculations) - Crop yield production - Forest timber production - Valuation of other forest services - MicroHydro renewable energy 	Europe

Table Water S3 - 2: Environmental/ecosystem service valuation tools

Ref	Tool	Area covered	Description/services covered	Countries covered
			<ul style="list-style-type: none"> - Mariculture suitability - Biodiversity value - Grassland and livestock 	
4	BeST - Benefits Estimation Tool	Sustainable Urban Drainage Systems (SUDS), ecosystem services	<p>BeST (developed by susdrain) provides guidance to help practitioners estimate the benefits of SuDS. Estimates are based on overall drainage system performance without the need for full scale economic inputs. It uses ecosystem services to understand the overall benefits that SuDS provide over conventional piped drainage. Using values input by the user, it provides support to quantify and monetise the benefits of a SuDS scheme for a given area over a specified time period. The benefits are presented as a series of graphs and charts that are based on the ecosystem service and Triple Bottom Line (accounting) frameworks.</p> <p>BeST is based on research evidence from the ecosystem services and Triple Bottom Line (accounting) frameworks, which consider the social, financial and environmental bottom line. The tool uses an 'impact-pathway' approach which looks at which ecosystems services are affected by the SuDS scheme and how these changes impact on the environment and contribute to human welfare. Where possible it estimates the economic value of the changes. The tool can be applied for new developments (i.e. to compare the benefits of a SuDS option versus a conventionally drained option) or for retrofitting existing infrastructure (i.e. to compare the benefits that could be achieved with a SuDS design versus an existing baseline). The accompanying 'W045b BeST Options Comparison' tool also enables the user to compare simulations from more than one BeST model. It was last updated in early 2019.</p> <p>The tool is based on an Excel spreadsheet. The user answers a set of screening questions to qualitatively assess which benefit categories or 'models' should be run. Based on the choices made, the user will enter site-specific data onto the relevant benefit assessment sheets for the SuDS options used (e.g. green roofs, trees, swales).</p>	Global
5	EVRI - Environmental Valuation Reference Inventory	Inventory	<p>The EVRI is a searchable online database of empirical studies on the economic value of environmental benefits and human health effects. These summaries provide detailed information about the study location, the specific environmental assets being valued, the methodological approaches and the estimated monetary values along with proper contextualization. The EVRI database now contains over 4,000 summaries of valuation studies and information from new studies is being added on an ongoing basis. It has been developed as a tool to help policy analysts use the benefits transfer approach. Using the EVRI to do a benefits transfer is an alternative to doing new valuation research. Searches can be carried on various environmental assets such as air, animals, human health, land, man-made</p>	Global, Europe

Table Water S3 - 2: Environmental/ecosystem service valuation tools				
Ref	Tool	Area covered	Description/services covered	Countries covered
			environment/infrastructure, micro-organisms, plants and water. A range of economic measures are also available; compensating surplus, compensating variation, consumer surplus, cost of injury/replacement, equivalent surplus, equivalent variation, price, willingness to accept, or willingness to pay.	
6	TEEB	Ecosystem services, habitat types	The goal of the Ecosystem Services Valuation Database is to stop the structural undervaluation of nature in economic assessments (leading to continued biodiversity loss and landscape degradation) by providing better data on the 'true value', or welfare effect, of nature conservation, ecosystem restoration and sustainable land management. Within the context of the TEEB-project (2008-2010) the authors of the global overview of the "Estimates of monetary values of ecosystem services", supported by many ESP-members (esp. the Biome Expert leads) and TEEB researchers developed a database on monetary values of ecosystem services which now contains over 4,000 value records distributed across all biomes, services and geographic regions from over 600 studies.	Global, Europe
<p>Tools available at:</p> <ol style="list-style-type: none"> 1) http://www.policysupport.org/costingnature 2) http://publications.naturalengland.org.uk/publication/5890643062685696 3) http://aries.integratedmodelling.org/ 4) https://www.susdrain.org/resources/best.html 5) https://drive.google.com/drive/folders/0B_v9QO2jyC4eNIVUbzY1UUstZU0 6) https://www.evri.ca/en/home 7) http://es-partnership.org/services/data-knowledge-sharing/ecosystem-service-valuation-database/ 				

Table Water S3 - 3: Willingness to pay studies identified from the Blue2 study as providing potential benefits transfer values

Annex B: Literature review WTP studies

Country	System	Descriptors	Current status	Values GES	Bad	Poor	Moderate	Good	Excellent	Pressures**	Source
Estonia	Baltic sea	Eutrophication, concentrations of c	Good (contaminants),	30.0	0	10.02	20.03	30.0	40.1	GS	Tuhkanen et al (
Ireland	Marine	Biodiversity and healthy marine eco	Unknown	101.3		0.00	50.65	101.3	151.9	GS	Norton (2014)
Portugal	Basin	Water quality	Moderate	5.9			0.00	5.9	10.3	EU, CT	Norton (2018)
Portugal	Estuary	Water quality	Moderate	5.5			0.00	5.5	9.5	EU, CT	Norton (2018)
Ireland	Lake	Aquatic ecosystem health, water cla	Unknown (value comp)	111.2		0.00	55.59	111.2	166.8	GS	Doherty (2014)
Ireland	Sea	Aquatic ecosystem health, water cla	Unknown (value comp)	98.9		0.00	49.47	98.9	148.4	GS	Doherty (2014)
Ireland	River	Aquatic ecosystem health, water cla	Unknown (value comp)	118.3		0.00	59.16	118.3	177.5	GS	Doherty (2014)
Europe	Lake	Drinking water, maintaining populat	Poor/Bad	0.0		0.00				GS	Reynaud (2017)
Europe	Lake	Drinking water, maintaining populat	Poor/Bad	12.4		0.00	12.40	24.8	37.2	GS	Reynaud (2017)
Denmark	Odense river	Suitable for fish, plants, bird species	Moderate	29.6			0.00	29.6	59.3	GS	Aquamoney (20
Denmark	Baltic sea	Emission of nutrients	Poor/Bad	54.0		0.00	27.01	54.0	81.0	EU	Ahtialinen (2012)
Estonia	Baltic sea	Emission of nutrients	Poor/Bad	18.1		0.00	9.03	18.1	27.1	EU	Ahtialinen (2012)
Finland	Baltic sea	Emission of nutrients	Poor/Bad	77.9		0.00	28.93	57.9	86.8	EU	Ahtialinen (2012)
Germany	Baltic sea	Emission of nutrients	Poor/Bad	28.5		0.00	14.24	28.5	42.7	EU	Ahtialinen (2012)
Latvia	Baltic sea	Emission of nutrients	Poor/Bad	4.4		0.00	2.20	4.4	6.6	EU	Ahtialinen (2012)
Lithuania	Baltic sea	Emission of nutrients	Poor/Bad	6.6		0.00	3.29	6.6	9.9	EU	Ahtialinen (2012)
Poland	Baltic sea	Emission of nutrients	Poor/Bad	8.9		0.00	4.46	8.9	13.4	EU	Ahtialinen (2012)
Russia	Baltic sea	Emission of nutrients	Poor/Bad	6.0		0.00	3.02	6.0	9.1	EU	Ahtialinen (2012)
Sweden	Baltic sea	Emission of nutrients	Poor/Bad	115.2		0.00	57.62	115.2	172.9	EU	Ahtialinen (2012)
Spain	Guadiana river basin	Recreational opportunities, fish, bar	Unknown	34.3		0.00	17.17	34.3	51.5	GS	Ramajo-Hernanc
Ireland	Boyne river catchment	River life (fish, insects, plants), cond	Moderate to Poor (199	25.3			0.00	25.3	50.6	GS	Sitthou (2012)
England/W	River basin	Obtaining good status	Poor/Moderate	34.2		0.00	17.12	34.2	51.4	GS	Metcalfe et al (2
Austria	Danube river	Water quality	Moderate/Good	14.6			0.00	14.6	21.0	EU, CT	Brouwer et al (2
Hungary	Danube river	Water quality	Poor/Moderate	2.1			0.00	2.1	4.8	EU, CT	Brouwer et al (2
Romania	Danube river	Water quality	Poor/Moderate	1.8			0.00	1.8	4.1	EU, CT	Brouwer et al (2
France	Coastline	Obtaining good status	Bad	9.0	0	3.01	6.02	9.0	12.0	GS	Poirer (2010)
France	River Touques	Obtaining good status	Moderate	5.1			0.00	5.1	10.1	GS	Poirer (2010)
France	River Dives	Obtaining good status	Bad	10.5	0	3.50	7.00	10.5	14.0	GS	Poirer (2010)
France	River Vie	Obtaining good status	Poor	3.1		0.00	1.54	3.1	4.6	GS	Poirer (2010)
Germany	River Spree, Havel, Dame	Water quality	Poor/Moderate	39.4		0.00	13.02	39.4	46.8	EU, CT	Meyerhoff (201
UK	River Wear and Clyde	River ecology (fish, plants, invertebr	Fair	31.2		0.00	15.59	31.2	46.8	GS	Hanley (2006)
Portugal	Mondego river basin	Buffer strips and reduction nutrients	Moderate	2.4			0.00	2.4	4.1	GS	Pinto (2016)
Netherlands	River Meuse and Rhine	Obtaining good status	Unknown	124.1		0.00	62.03	124.1	186.1	GS	Brouwer (2004)

Source: Schasfoort et al (2019): Freshwater and Marine Benefits Concept and Model Assessment tool, Task B4 of the Blue2 project “Study on EU Integrated policy assessment for the freshwater and marine environment, on the economic benefits of EU water policy and on the costs of its non-implementation. Available at:

Annex 4 Resources to Land

Table Land S1 - 1: Documentation of available information on impacts on land and soil		
Legislative driver	Impacts on Land and soil	Available detail
SEA Directive	<i>If the project is being carried out as a result of a national plan or programme, was land considered in the strategic environmental assessment? Is the project being carried out specifically to address land use and soil issues?</i>	<i>Please indicate what land use and soil issues were considered and at what level the contribution of individual projects or groups of projects impacting land and soil was assessed. Please indicate if there is quantitative data available from the SEA in relation to land and soil use.</i>
EIA Directive	<i>Please indicate what impacts to land and soil were assessed as part of the EIA and whether any mitigation measures were adopted to minimise/reduce impacts.</i>	<i>Please indicate what detailed assessment reports are available; whether the assessment was based on modelling or monitoring data and whether there is quantitative data on impacts on land and soil.</i>
Waste Framework Directive	<i>If the project falls into the waste management sector, please indicate whether it will have any net impact on land and soil, and what aspects of the project will lead to these changes.</i>	<i>Please indicate whether a detailed assessment has been carried out on impacts related to land with respect to the projects contribution towards the objectives of the WasteFD, and whether there is any quantitative data on those impacts.</i>
Industrial Emissions Directive	<i>Please indicate what aspects related to land and soil were addressed as part of the permitting process under the IED. Please detail any mitigation measures related to land and soil that were adopted in order to achieve BAT and to minimise/reduce impacts.</i>	<i>Please indicate what detailed assessment reports are available from the permitting process and whether the assessment was based on modelling. Also indicate whether there is quantitative data in relation to impacts to land and soil.</i>
National Emissions Ceilings (NEC) Directive	<i>Does the project relate to a measure proposed under the National Air Pollution Control program developed under the NEC Directive? Does this measure include the use of land and soil? If yes, please provide details of the measures related to land and soil use that will have to be put in place, and provide an indication of the impact that they will have.</i>	<i>Please indicate whether any detailed assessment reports are available with respect to the impact on land and soil that will result from the project. Also indicate whether this includes quantitative data.</i>
EU Taxonomy regulation	<i>Do project activities related to land and soil use fall under the EU Taxonomy regulation? Have those project activities qualified as environmentally sustainable economic activities under EU Taxonomy? If yes, under which criteria?</i>	<i>Please indicate whether any detailed assessment reports are available; also indicate whether this includes quantitative data in relation to land and soil.</i>

Table Land S1 - 2: Applying the mitigation hierarchy	
Mitigation measure	Questions to consider
Avoid	Could negative impacts on land be avoided by implementing the project elsewhere? By implementing a different project? By using a different approach or method?
Minimise	Could the project be designed to include measures to minimise the impact on land and soil? Examples include carrying out the work at a particular time of year, using a particular method, or implementing the project differently. What measures could be implemented to avoid indirect impacts or cumulative impacts on land and soil? Could lessons be learnt from similar projects nearby?
Rehabilitate/restore	How could the project be designed to enable rehabilitation or restoration of land and soil issues? What measures need to be taken before the project starts? What measures need to be taken once the project is implemented?
Offset	What could be done to compensate for any negative impacts to land? Could land and soil in other areas be improved? Where could this occur?

Table Land S1 - 3: Checklist for identifying potentially significant negative impacts to land and soil		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
1) Will construction, operation or decommissioning of the project involve actions which may cause erosion? This may result from: - soil disturbance e.g. ploughing up-and-down slopes - Removal of vegetative soil cover and/or hedgerows - Inappropriate use of heavy machinery		
2) Will construction, operation or decommissioning of the project involve actions which may cause decline in soil organic matter? This may result from: - conversion of land use - Drainage of wetlands - Deforestation		
3) Will construction, operation or decommissioning of the project involve actions which may cause compaction? This may result from: - Inappropriate use of heavy machinery - High livestock densities - Large construction works		
4) Will construction, operation or decommissioning of the project involve actions which may cause salinization? This may result from: - Poor irrigation technology - Inappropriate drainage - Overexploitation of groundwater		
5) Will construction, operation or decommissioning of the project involve actions which may cause landslides? This may result from: - Rupture of topography due to construction works - Land use changes, e.g. deforestation - Extraction of materials		
6) Will construction, operation or decommissioning of the project involve actions which may cause soil contamination? This may result from: - industrial installations		

Table Land S1 - 3: Checklist for identifying potentially significant negative impacts to land and soil		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
- Mining installations - Storage of chemicals - Atmospheric deposition of dangerous chemicals		
7) Will construction, operation or decommissioning of the project involve actions which may cause sealing? This may result from: - urban sprawl - increased transport		
8) Will construction, operation or decommissioning of the project involve actions which may cause loss of soil biodiversity?		
9) Are there any other areas on or around the location that are important or sensitive for reasons of their ecology e.g. wetlands, forests or woodlands, that could be affected by the Project?		
10) Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the Project?		
11) Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the Project?		
12) Is the Project in a location in which it is likely to be highly visible to many people?		
13) Are there any areas or features of historic or cultural importance on or around the location that could be affected by the Project?		
14) Is the Project located in a previously undeveloped area where there will be loss of greenfield land?		
15) Are there existing land uses within or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying that could be affected by the Project?		
16) Are there any areas on or around the location which are densely populated or built-up, and which could be affected by a Project land take?		
17) Are there any areas within or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, that could be affected by the Project?		
18) Are there any areas on or around the location which are already subject to pollution (e.g. air, water, soil) or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?		

Table Land S1 - 3: Checklist for identifying potentially significant negative impacts to land and soil		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
19) Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the Project to present environmental problems?		
20) Are there any other factors which should be considered such as consequential development which could lead to impacts on land take and the potential for cumulative impacts with other existing or planned activities in the locality (e.g. through increases in other industrial manufacturing activity as part of the creation of a manufacturing cluster)?		
21) Would any other activities be required as a consequence of the project, which could lead to land and soil use?		

Table Land S1 - 4: Questions for assessing significance as part of screening in EIAs
<hr/> <p>Questions to be Considered</p> <hr/> <ol style="list-style-type: none"> 1. Will there be a large change in environmental conditions? 2. Will new features be out-of-scale with the existing environment? 3. Will the effect be unusual in the area or particularly complex? 4. Will the effect extend over a large area? 5. Will there be any potential for transfrontier impact? 6. Will many people be affected? 7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected? 8. Will valuable or scarce features or resources be affected? 9. Is there a risk that environmental standards will be breached? 10. Is there a risk that protected sites, areas, features will be affected? 11. Is there a high probability of the effect occurring? 12. Will the effect continue for a long time? 13. Will the effect be permanent rather than temporary? 14. Will the impact be continuous rather than intermittent? 15. If it is intermittent will it be frequent rather than rare? 16. Will the impact be irreversible? 17. Will it be difficult to avoid, or reduce or repair or compensate for the effect? <hr/> <p>Source: https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf</p>

Table Land S1 - 5: Checklist for identifying project characteristics reducing impacts to Land and Soil		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
1) Will the project contribute to stop erosion? These could result from: - reforestation		
2) Will the project improve the soil organic matter quality and quantity?		
3) Will the project reduce or stop salinization?		
4) Will the project reduce the hydrogeological risk?		
5) Will the project contribute to the remediation of contaminated sites?		
6) Will the project restore industrial/urban sites to natural sites?		
7) Will the project enrich soil biodiversity?		
8) Will the project contribute to the protection of sensitive natural areas?		
9) Will the project contribute to the high landscape or scenic value on or around the location of the project?		
10) Will the project create or protect routes or facilities on or around the location which are used by the public for recreation?		
11) Will the project protect areas or features of historic or cultural importance on or around the location of the project?		
12) Will the project improve the quality or increase the quantity of scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries?		
13) Will the project improve the quality of air or contribute to compliance with national emission ceilings for air pollutants?		
14) Does the project qualify as environmentally sustainable under the EU Taxonomy Regulation? This means that the project is contributing substantially to at least one of the objectives: - climate change mitigation; - climate change adaptation; - sustainable use and protection of water and marine resources; - transition to a circular economy; - pollution prevention or control; - protection and restoration of biodiversity and ecosystems. In addition, the project activities also enable other activities to make a substantial contribution and do not significantly harm any of the environmental objectives.		

Table Land S2 - 1: Data to be reported on significant impacts				
Impact	Impact cause (activities and project phase)	Magnitude	Frequency and duration	Population which may be affected
Erosion				
Loss of soil		Tons/ha/year ¹⁴¹		
Loss of soil fertility due to disrupted nutrient cycles				
Damage to infrastructures due to excessive sediment load				
Diffusion pollution of surface water				
Negative effects on aquatic ecosystems and thereby biodiversity				
Restrictions on land use hindering future redevelopment and reducing the area of productive and valuable soil available for other activities (agricultural and forestry production, recreation etc.)				
Land value depreciation				
Reduced water retention capacity, hence higher flood risk				
Human health problems due to dust and particles in the air				
Air pollution				
Impact on emissions of air pollutants (e.g; NH3 and PM2.5 in tonnes/year)				
Decline of soil organic matter (SOM)				
Release of greenhouse gases				
Effects on biodiversity, including soil biodiversity				
Reduced water infiltration due to changes in soil structure, hence higher flood risk				
Reduced absorption of pollutants and increased water and air pollution				
Increased erosion				
Compaction				

¹⁴¹ Losses over 1-2 tons/ha/year are to be considered irreversible. Source: Soil ATLAS of Europe, European Soil Bureau Network, European Commission, 2005, p. 111

Table Land S2 - 1: Data to be reported on significant impacts				
Impact	Impact cause (activities and project phase)	Magnitude	Frequency and duration	Population which may be affected
Loss of soil fertility due to change in soil structure				
Reduced water infiltration and retention				
Higher erosion susceptibility				
Loss of soil biodiversity				
Increased emission of GHG from the soil due to changes in nutrient cycle				
Landslides				
Landslides		<p>Marginal change in the magnitude of an event in terms of:</p> <ul style="list-style-type: none"> - loss of human lives and well-being - Damage to property and infrastructure - indirect negative effects on economic activities due to interruption of transport routes - Loss of fertile soil - contamination of soil due to damage to infrastructure - contamination of surface waters 	Marginal change in the likelihood of an event	
Contamination				
Risk to human health for people living on and in the surroundings of a contaminated site				
Contamination of surface water, groundwater and/or drinking water				
Loss of soil biodiversity				
Loss of soil fertility				
Restriction on land use and hindering future redevelopments				
Land use depreciation				
Sealing				
Disruption of gas, water and energy fluxes				
Increased flood risks				
Reduced groundwater recharge				
Increased water pollution				

Table Land S2 - 1: Data to be reported on significant impacts				
Impact	Impact cause (activities and project phase)	Magnitude	Frequency and duration	Population which may be affected
Loss in soil and terrestrial biodiversity				
Loss of biodiversity				
Reduced food web functioning and consequent crop yield loss				
Reduced soil formation				
Reduced nutrient cycling and nitrogen fixation				
Reduced carbon sequestration				
Reduced resilience of the soil to endure pressures				
Reduced recycling of organic waste/litter				
Increased plant pests and diseases				
Reduced water infiltration rate and water holding capacity				
Reduced bioremediation capacity				
Hampered soil structure				
Reduced genetic resources present in the soil				
Loss of biodiversity other than soil biodiversity				

Table Land S2 - 2: Data for reporting on impacts on land and soil		
Project objectives	Identify any specific project objectives relevant to the potential for impacts on land and soil	
Project socio-economic and environmental context	Provide information on the current situation in terms of any constraints on the project's activities and its outputs that are relevant to its impacts on land and soil	
Environmental criteria used in identifying the project options	Provide information on the current baseline land and soil protection aspects and any measures required at the national level to protect land and soil.	
Key factors underlying demand for the project relevant to land and soil impacts	Identify the design aspects that result in impacts to land and soil and indicate what steps were taken to minimise impacts, or what constraints exist on the ability to reduce impacts	
Key factors underlying demand for the project relevant to emissions of air pollutants	Identify the design aspects that result in impacts to air and indicate what steps were taken to minimise impacts, or what constraints exist on the ability to reduce	

Table Land S2 - 2: Data for reporting on impacts on land and soil		
	impacts (see also Section 4 on impacts for assessing impacts on air quality)	
Methodology (the methodology applied for quantification of externalities and the related assumptions and unitary values)	If the project assessment has included quantification of impacts, describe the methodology used for these purposes and provide any national or other guidance followed when undertaking the assessment. Key assumptions and per unit values should be detailed.	
Cumulative effects (potential for increase in impacts from the project when combined with other recent infrastructure developments)	Indicate whether there have been other infrastructure developments in the local area that could also lead to impacts on land and soil.	

Table Land S3 - 1: Example tools for the monetisation of land impacts				
Ref	Tool	Area covered	Description/services covered	Countries covered
1	ARIES - Artificial Intelligence for Ecosystem Services	Ecosystem services, Maps/GIS databases	<p>ARIES is an artificial intelligent modeler rather than a single model or collection of models. ARIES chooses ecological process models where appropriate, and turns to simpler models where process models do not exist or are inadequate. Based on a simple user query, ARIES builds all the agents involved in the nature/society interaction, connects them into a flow network, and creates the best possible models for each agent and connection. The result is a detailed, adaptive, and dynamic assessment of how nature provide benefits to people.</p> <p>Currently support queries:</p> <ul style="list-style-type: none"> - Carbon storage - Outdoor recreation - Pollination - Sediment retention - Riverine flood regulation - Water availability (based on hydrological calculations) - Crop yield production - Forest timber production - Valuation of other forest services - MicroHydro renewable energy - Mariculture suitability - Biodiversity value - Grassland and livestock 	Europe
2	Co\$ting Nature	Natural capital, ecosystem services, terrestrial, aquatic and coastal (not marine) habitats	<p>Co\$ting Nature is a web based policy support tool for natural capital accounting and analysing the ecosystem services provided by natural environments (i.e. nature's benefits), identifying the beneficiaries of these services and assessing the impacts of human interventions. Services covered by model:</p> <ul style="list-style-type: none"> - Timber (softwood, hardwood) - Fuelwood (softwood, hardwood) - Grazing/fodder - Non-wood forest products - Water provisioning (quantity, quality) 	Global

Table Land S3 - 1: Example tools for the monetisation of land impacts

			<ul style="list-style-type: none"> - Fish catch - Carbon - Natural hazard mitigation (flood, drought, landslide, coastal inundation) - Culture-based tourism - Nature-based tourism - Environmental and aesthetic quality services - Wildlife services (pollination, pest control) - Wildlife dis-services (crop raiding, pests) - Biodiversity - Pressure and threat <p>All required data for global analysis, plus the ability to upload your own datasets.</p>	
3	EcoServ-GIS	Maps/GIS databases	<p>EcoServ-GIS is a Geographic Information System (GIS) toolkit for mapping ecosystem services at a county or regional scale. It uses input GIS/map data to generate fine-scale maps that illustrate human need or demand for ecosystem services as well as the capacity of the natural environment to provide them. Services covered include:</p> <ul style="list-style-type: none"> - Air purification - Carbon storage - Local climate - Noise - Pollination - Water purification - Accessible nature - Education - Green travel 	England, Scotland and Wales
4	Ecosystem Services Transfer Toolkit	Inventory, ecosystem services	<p>The Ecosystem Services Transfer Toolkit is a literature review of the effect of land management actions on the provision of ecosystem services. The Toolkit is in the form of an Excel spreadsheet with an accompanying User Guide and Quick Start Guide. The spreadsheet can be searched and queried to find evidence of the effects of specific land management actions on ecosystem services provided by upland, freshwater, urban,</p>	UK

Table Land S3 - 1: Example tools for the monetisation of land impacts

			<p>lowland agriculture, coastal and marine habitats. It also assesses how transferable the effect of a land management action on ecosystem services may be, if done in a different place. Services covered:</p> <ul style="list-style-type: none"> - Climate regulation - Crops, livestock and fish - Crops, livestock, fish - Detoxification & purification in air, soils and water - Disease & pest regulation - Disease and pest regulation - Environmental settings - Hazard regulation - Noise regulation - Pollination - Soil quality regulation - Trees, standing vegetation and peat - Trees, standing vegetation, peat - Water quality regulation - Water supply - Wild species diversity 	
5	EVL - Environmental Value Look-up Tool	Habitats, ecosystem service, environmental impact	<p>The Environmental Value Look-Up (EVL) Tool has been developed by EFTEC for the UK's Department for Environment, Food and Rural Affairs to provide indicative values for environmental impacts for use by analysts in Government departments, non departmental public bodies, and other organisations. The tool contains a number of indicative values (low, central and high) for National Ecosystem Assessment broad habitats and component habitats. The tool can also be used to estimate an aggregate value. Environmental impacts/goods covered:</p> <ul style="list-style-type: none"> - Aesthetic value - Biodiversity - Cultural heritage - Human health - Recreation & tourism - Water purification and waste treatment 	Data predominantly in UK context

Table Land S3 - 1: Example tools for the monetisation of land impacts				
6	EVRI - Environmental Valuation Reference Inventory	Inventory	The EVRI is a searchable online database of empirical studies on the economic value of environmental benefits and human health effects. These summaries provide detailed information about the study location, the specific environmental assets being valued, the methodological approaches and the estimated monetary values along with proper contextualization. The EVRI database now contains over 4,000 summaries of valuation studies and information from new studies is being added on an ongoing basis. It has been developed as a tool to help policy analysts use the benefits transfer approach. Using the EVRI to do a benefits transfer is an alternative to doing new valuation research. Searches can be carried on various environmental assets such as air, animals, human health, land, man-made environment/infrastructure, micro-organisms, plants and water. A range of economic measures are also available; compensating surplus, compensating variation, consumer surplus, cost of injury/replacement, equivalent surplus, equivalent variation, price, willingness to accept, or willingness to pay.	Global, Europe
7	Farmscoper	Agriculture	Farmscoper is a decision support tool that can be used to assess diffuse agricultural pollutant loads on a farm and quantify the impacts of farm mitigation methods on these pollutants. The farm systems within the tool can be customised to reflect management and environmental conditions representative of farming across England and Wales. The tool contains over 100 mitigation methods, including many of those in the latest Defra Mitigation Method User Guide.	England and Wales
8	Health Economic Assessment Tools (HEAT) for walking and cycling	Green infrastructure, ecosystem services	The Health Economic Assessment Tools (HEAT) for walking and cycling are tools from the World Health Organisation Regional Office for Europe. They assess health benefits and are not specific to a certain type of green infrastructure feature. The benefit of these recreation activities is measured through reduced mortality.	Europe
9	InVEST - Integrated Valuation of	Ecosystem services	InVEST is a suite of open-source software models used to map and value the goods and services from nature that sustain and fulfil human life. It explores how changes in ecosystems are	Global, Europe

Table Land S3 - 1: Example tools for the monetisation of land impacts

	Environmental Services and Tradeoffs		<p>likely to lead to changes in benefits that flow to people. InVEST models are spatially explicit, using maps as information sources and producing maps as outputs. InVEST returns results in either biophysical terms, whether absolute quantities or relative magnitudes (e.g., tonnes of sediment retained or % of change in sediment retention) or economic terms (e.g., the avoided treatment cost of the water affected by that changed in sediment load. Supporting ecosystem services:</p> <ul style="list-style-type: none"> - Habitat quality - Habitat risk assessment - Pollinator abundance - crop pollination <p>Final ecosystem services:</p> <ul style="list-style-type: none"> - Forest carbon edge effect - Carbon storage and sequestration - Coastal blue carbon - Annual water yield - Nutrient delivery ratio - Sediment delivery ratio - Unobstructed views - scenic quality provision - Visitation – Recreation and tourism - Wave energy production - Offshore wind energy production - Marine finfish aquacultural production - Fisheries - Crop production - Seasonal water yield <p>Urban ecosystem services:</p> <ul style="list-style-type: none"> - Urban cooling model - Urban flood risk mitigation model 	
10	i-Tree Design	Green infrastructure, ecosystem services	<p>i-Tree is a software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools. i-Tree Design provides a platform for assessments of individual or multiple trees at the parcel level. The tool links to Google Maps and allows the user to see how tree selection, tree size, and placement around a home, affects energy use and other benefits</p>	US and Canada

Table Land S3 - 1: Example tools for the monetisation of land impacts

			<p>related to greenhouse gas mitigation, air quality improvements, and stormwater interception. With the additional step of drawing a building footprint – and virtually "planting" or placing a tree – tree effects on building energy use can be evaluated.</p> <p>Tree benefits are estimated for (a) the current year, (b) a user-specified forecast year sometime in the future, (c) the projected total benefits across that future timespan, and (d) the total benefits provided to date (based on estimated tree age). Multiple trees and buildings can be added to compare benefits or to provide a full accounting of a property's trees.</p>	
11	i-Tree Eco	Green infrastructure, ecosystem services	<p>i-Tree is a software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools. i-Tree Eco provides a broad picture of the entire urban forest. It is designed to use field data from complete inventories or randomly located plots throughout a community along with local hourly air pollution and meteorological data to quantify urban forest structure, environmental effects, and values to communities. Functional Analyses:</p> <ul style="list-style-type: none"> - Pollution removal and human health impacts - Carbon sequestration and storage - Hydrology effects (avoided run-off, interception, transpiration) - Building energy effects - Tree bio-emissions - Avian habitat suitability (plot-based projects; limited to 9 bird species) <p>Ultraviolet radiation (UV) tree effects</p>	Adapted for Canada, Australia, the United Kingdom, Mexico, Europe, Colombia & South Korea
12	ORVaL - Outdoor Recreation Valuation Tool (demo)	Recreation, tourism	<p>Orval reports values and visit estimates for existing and new greenspaces that are derived from a sophisticated model of recreational demand in England.</p>	England

Table Land S3 - 1: Example tools for the monetisation of land impacts

Tools available at:

- 1) <http://aries.integratedmodelling.org/>
- 2) <http://www.policysupport.org/costingnature>
- 3) https://drive.google.com/drive/folders/0B_v9QO2jyC4eNIVUbzY1UUstZU0
- 4) <http://publications.naturalengland.org.uk/publication/5890643062685696>
- 5) <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=19514#Description>
- 6) <https://www.evri.ca/en/home>
- 7) <http://www.adas.uk/Service/farmscoper>
- 8) <https://www.heatwalkingcycling.org/#homepage>
- 9) <http://www.naturalcapitalproject.org/invest/>
- 10) <http://design.itreetools.org/>
- 11) <http://www.itreetools.org/eco/index.php>
- 12) <http://leep.exeter.ac.uk/orval/>

Table Land S3 - 2: Monetisation of land impacts

Value	Units	Year of value	Change being measured	Reference	Website
Filtering of nutrients and contaminants					
0–278	id\$ ha ⁻¹ year ⁻¹	2017	Estimated avoided cost provided by the soil ecosystem services filtering of nutrients and contaminants	Jónsson, J. Ö. G., Davíðsdóttir, B., & Nikolaidis, N. P. (2017). Valuation of soil ecosystem services. In <i>Advances in Agronomy</i> (Vol. 142, pp. 353-384). Academic Press.	https://www.sciencedirect.com/science/article/pii/S0065211316301171
Erosion					
14–67	\$/person/project	2006	Stated choice: Estimates mean willingness to pay for a specific erosion control project depending on the characteristics of that project	Colombo, S., J. Calatrava-Requena, and N. Hanley. 2006. Analysing the social benefits of soil conservation measures using stated preference methods. <i>Ecol.Econ.</i> 58:850–861. doi:10.1016/j.ecolecon.2005.09.010	https://www.sciencedirect.com/science/article/abs/pii/S0921800905004222

Table Land S3 - 2: Monetisation of land impacts					
Value	Units	Year of value	Change being measured	Reference	Website
42.75	EUR/ha/yr	2006	Avoided cost – erosion prevention	Ruijgrok, E. C. M., & De Groot, R. S. (2006). Kentallen Waardering Natuur, Water, Bodem en Landschap: hulpmiddel bij MKBA's.	https://www.omgevingseconomie.nl%2Fwp-content%2Fuploads%2F2012%2F03%2FKentalenboek-waardering-natuur-water-bodem.pdf&usg=AOvVaw0PVMbk-M0uTWyobExU0wVH
122	USD/ha/yr	2004	Benefit transfer – erosion prevention (forests)	Brenner Guillermo, J. (2007). Valuation of ecosystem services in the Catalan coastal zone. Universitat Politècnica de Catalunya.	https://upcommons.upc.edu/handle/2117/93710
37	USD/ha/yr	2004	Benefit transfer – erosion prevention (forests)	Brenner Guillermo, J. (2007). Valuation of ecosystem services in the Catalan coastal zone. Universitat Politècnica de Catalunya.	https://upcommons.upc.edu/handle/2117/93710
110-180 million	£/yr	2009	Estimated total cost of soil erosion per annum in England and Wales	Graves, A. R., Morris, J., Deeks, L. K., Rickson, R. J., Kibblewhite, M. G., Harris, J. A., ... & Truckle, I. (2015). The total costs of soil degradation in England and Wales. <i>Ecological Economics</i> , 119, 399-413.	https://www.sciencedirect.com/science/article/abs/pii/S0921800915003171
Soil contamination					
55	EU per capita / year	2003	Annual total per-capita cost of soil contamination	Görlach, B., R. Landgrebe-Trinkunaite, E. Interwies, M. Bouzit, D. Darmendrail and J.-D. Rinaudo (2004): Assessing the Economic Impacts of Soil Degradation. Volume III: Empirical Estimation of the Impacts. Study commissioned by the European Commission, DG Environment, Study Contract ENV.B.1/ETU/2003/0024. Berlin: Ecologic	https://www.ecologic.eu/sites/files/download/projekte/1950-1999/1962/1962_soil_economics_3_extrapolation.pdf
20-30 million	£/year	2009	Estimated total cost of soil diffuse contamination per annum in England and Wales	Graves, A. R., Morris, J., Deeks, L. K., Rickson, R. J., Kibblewhite, M. G., Harris, J. A., ... & Truckle, I. (2015).	https://www.sciencedirect.com/science/article/abs/pii/S0921800915003171

Table Land S3 - 2: Monetisation of land impacts					
Value	Units	Year of value	Change being measured	Reference	Website
				The total costs of soil degradation in England and Wales. <i>Ecological Economics</i> , 119, 399-413.	
Salinisation					
4,500	EU/ha	2003	Potential cost of restoring soils affected by salinisation	Görlach, B., R. Landgrebe-Trinkunaite, E. Interwies, M. Bouzit, D. Darmendrail and J.-D. Rinaudo (2004): <i>Assessing the Economic Impacts of Soil Degradation. Volume III: Empirical Estimation of the Impacts. Study commissioned by the European Commission, DG Environment, Study Contract ENV.B.1/ETU/2003/0024.</i> Berlin: Ecologic	https://www.ecologic.eu/sites/files/download/projekte/1950-1999/1962/1962_soil_economics_3_extrapolation.pdf
Soil formation					
12	USD/ha/yr	2004	Benefit transfer – soil formation (forests)	Brenner Guillermo, J. (2007). <i>Valuation of ecosystem services in the Catalan coastal zone.</i> Universitat Politècnica de Catalunya.	https://upcommons.upc.edu/handle/2117/93710
7	USD/ha/yr	2004	Benefit transfer – soil formation (grasslands)	Brenner Guillermo, J. (2007). <i>Valuation of ecosystem services in the Catalan coastal zone.</i> Universitat Politècnica de Catalunya.	https://upcommons.upc.edu/handle/2117/93710
Loss of soil organic content					
144	€ ha ⁻¹	2015	The average depreciation of soil natural capital, for a 1% relative reduction in soil organic carbon concentration	Brady, M. V., Hedlund, K., Cong, R. G., Hemerik, L., Hotes, S., Machado, S., ... & Thomsen, I. K. (2015). <i>Valuing supporting soil ecosystem services in agriculture: a natural capital approach.</i> <i>Agronomy Journal</i> , 107(5), 1809-1821.	https://access.onlinelibrary.wiley.com/doi/abs/10.2134/agronj14.0597

Table Land S3 - 2: Monetisation of land impacts					
Value	Units	Year of value	Change being measured	Reference	Website
360-700 million	£/year	2009	Estimated total cost of loss of soil organic content per annum in England and Wales	Graves, A. R., Morris, J., Deeks, L. K., Rickson, R. J., Kibblewhite, M. G., Harris, J. A., ... & Truckle, I. (2015). The total costs of soil degradation in England and Wales. <i>Ecological Economics</i> , 119, 399-413.	https://www.sciencedirect.com/science/article/abs/pii/S0921800915003171
Soil compaction					
350-540 million	£/year	2009	Estimated total cost of soil compaction per annum in England and Wales	Graves, A. R., Morris, J., Deeks, L. K., Rickson, R. J., Kibblewhite, M. G., Harris, J. A., ... & Truckle, I. (2015). The total costs of soil degradation in England and Wales. <i>Ecological Economics</i> , 119, 399-413.	https://www.sciencedirect.com/science/article/abs/pii/S0921800915003171
Protection against natural hazard					
213	EU/ha/year	2015	Economic value of protection against natural hazards by grassland in the Leiblachtal study area	Paletto, A., Geitner, C., Grilli, G., Hastik, R., Pastorella, F., & Garcia, L. R. (2015). Mapping the value of ecosystem services: A case study from the Austrian Alps. <i>Annals of Forest Research</i> , 58(1), 157-175.	http://www.afrjournal.org/index.php/afr/article/view/335
581	EU/ha/year	2015	Economic value of indirect protection against natural hazards by forest in the Leiblachtal study area	Paletto, A., Geitner, C., Grilli, G., Hastik, R., Pastorella, F., & Garcia, L. R. (2015). Mapping the value of ecosystem services: A case study from the Austrian Alps. <i>Annals of Forest Research</i> , 58(1), 157-175.	http://www.afrjournal.org/index.php/afr/article/view/335
707	EU/ha/year	2015	Economic value of direct protection against natural hazards by forest in the Leiblachtal study area	Paletto, A., Geitner, C., Grilli, G., Hastik, R., Pastorella, F., & Garcia, L. R. (2015). Mapping the value of ecosystem services: A case study from the Austrian Alps. <i>Annals of Forest Research</i> , 58(1), 157-175.	http://www.afrjournal.org/index.php/afr/article/view/335

Table Land S3 - 2: Monetisation of land impacts					
Value	Units	Year of value	Change being measured	Reference	Website
Climate regulation					
38	£/ton CO ₂ -eq. yr ⁻¹	2003	Estimated value of a ton of CO ₂ -eq. yr ⁻¹ sequestered in Scottish soils over a period of 20 years	Glenk, K., & Colombo, S. (2011). Designing policies to mitigate the agricultural contribution to climate change: an assessment of soil based carbon sequestration and its ancillary effects. <i>Climatic Change</i> , 105(1-2), 43-66.	https://link.springer.com/article/10.1007/s10584-010-9885-7
-2200 to -5610	id\$ ha ⁻¹ year ⁻¹	2017	Carbon mineralization as a proxy for climate regulation services	Jónsson, J. Ö. G., Davíðsdóttir, B., & Nikolaidis, N. P. (2017). Valuation of soil ecosystem services. In <i>Advances in Agronomy</i> (Vol. 142, pp. 353-384). Academic Press.	https://www.sciencedirect.com/science/article/pii/S0065211316301171
Biomass production from soils					
740–7560	id\$ ha ⁻¹ year ⁻¹	2017	Value of biomass from crop and livestock as a proxy for the biomass production service from soils	Jónsson, J. Ö. G., Davíðsdóttir, B., & Nikolaidis, N. P. (2017). Valuation of soil ecosystem services. In <i>Advances in Agronomy</i> (Vol. 142, pp. 353-384). Academic Press.	https://www.sciencedirect.com/science/article/pii/S0065211316301171

Annex 5 Resources to Biodiversity

Table Biodiversity S1 - 1: Documentation of available information on biodiversity impacts		
Legislative driver	Biodiversity impacts	Available detail
EIA Directive	<i>Please indicate which ecosystem functions and biodiversity assets may be affected, what the cumulative impacts on biodiversity are expected to be, what alternatives would protect or enhance biodiversity and enable ecosystems to absorb shocks and disturbances¹⁴²</i>	<i>Please indicate what detailed assessment reports are available; the extent to which the assessment was based on monitoring data versus modelling and the key uncertainties and assumptions</i>
Habitats Directive	<i>If the project is subject to an Appropriate Assessment, please indicate the conservation objectives of the sites, the habitats and species considered, the effects of the project on natural habitats and species, ecological structure and functions, and what alternatives and/or compensatory measures have been considered¹⁴³</i>	<i>Please indicate what detailed assessment reports are available from the Appropriate Assessment, what data sources have been used for these (e.g. surveys), what information on other plans and projects has been identified for the assessment</i>
Water Framework Directive	<i>Please indicate the waterbody (or waterbodies) concerned, the water dependent habitats they support, their conservation objectives, the status of the waterbodies and the likely effects of the project</i>	<i>Please indicate what assessments are available and the data sources used (monitoring data; modelling)</i>
Marine Strategy Framework Directive	<i>Please indicate the waterbody (or waterbodies) concerned, the indicators of good environmental status affected by the project and the likely effects of the project</i>	<i>Please indicate what assessments are available and the data sources used (monitoring data; modelling)</i>
SEA Directive	<i>Please indicate the likely significant effects of the project or plan on biodiversity, and the alternatives considered</i>	<i>Please indicate what data sources were used within the SEA</i>

¹⁴² Based on European Commission (2013): Guidance on integrating climate change and biodiversity into environmental impact assessment, accessed at: <https://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf> on 21st August 2020.

¹⁴³ Drawn from the overview of an Appropriate Assessment provided in European Commission (nd): Appropriate Assessment, accessed at: https://ec.europa.eu/inea/sites/inea/files/download/events/2014/may_ENER_info_day/cef_2352014_hab_dir_art_6_aa_env_extra.pdf on 21st August 2020.

Table Biodiversity S1 - 2: Applying the mitigation hierarchy	
Mitigation measure	Questions to consider
Avoid	Could negative impacts on biodiversity be avoided by implementing the project elsewhere? By implementing a different project? By using a different approach or method?
Minimise	Could the project be designed to include measures to minimise the impact on biodiversity? Examples include carrying out the work at a particular time of year, using a particular method, or implementing the project bit by bit What measures could be implemented to avoid indirect impacts or cumulative impacts? Could lessons be learnt from similar projects nearby?
Rehabilitate/restore	How could the project be designed to enable rehabilitation or restoration of biodiversity? What measures need to be taken before the project starts to enable restoration afterwards? What measures need to be taken once the project is implemented?
Offset	What could be done to compensate for negative impacts on biodiversity? Could habitat quality in other areas be improved? Does a specific habitat type need to be replaced? Where could this occur?

Table Biodiversity S1 - 3: WFD related information as required by the JASPERS checklist (Step 1)	
Base information required for screening	
<ul style="list-style-type: none"> • Project details, including the alternatives considered • Where water bodies are linked to water dependent habitats, identification of the water bodies (surface and groundwater) that would be affected by the project, and details of their size, scale, location and main characteristics • Identification of potentially relevant water-dependent protected areas and ecosystems, including details of the current future status of the protected areas (see also Section 4) • Details of the current ecological and chemical status of each potentially affected waterbody, including of elements failing to meet status objectives 	
Information also needed for next step	
<ul style="list-style-type: none"> • Identification of the planned future status of the protected areas • Details of any existing Article 4(4) or 4(5) exemptions and associated deadlines • Details of the measures identified in the RBMP as being in place or required to meet future objectives. • Identification of planned, proposed or already under construction projects, activities etc. that could affect water body status where the waterbody supports a water dependent habitat 	

Table Biodiversity S1 - 4: MSFD related information consistent with the JASPERS checklist	
Base information required for MSFD screening	
<ul style="list-style-type: none"> • Project details, including the alternatives considered • Where waterbodies are linked to protected areas, details of physical modifications / alterations (quality, litter, energy) to the regional waterbodies or relevant shoreline areas • Identification of the areas in the regional waterbodies that would be affected by the project, and details of their size, scale, location and main characteristics • Identification of potentially relevant water-dependent protected areas and ecosystems, including details of the current and planned future status of the protected areas (see also Section 4) • Details of the current status of each marine waterbody across the relevant descriptors 	
Information also needed for the next step	
<ul style="list-style-type: none"> • Identification of the planned future status of the affected marine water bodies, at the descriptor level • Details of any exceptions to achievement of GES and the type of exception together with an indication of the spatial coverage of those exceptions and the specific descriptors that fall under • Details of the measures identified as being in place or required to meet good environmental status • Identification of other projects, activities etc. that could affect water body status where this affects a protected site 	

Table Biodiversity S1 - 5: Marine Strategy Framework Directive compliance assessment cause-and-effect mechanisms

Descriptors (see also Annex I of the MSFD)	Is there a possible causal mechanism for a direct effect on achievement of good environmental status? (refer to Table 2, Annex III of the MSFD)	Is there a possible causal mechanism for an indirect effect on achievement of good environmental status? (refer to Table 2, Annex III of the MSFD)
Biodiversity – Descriptor 1	Yes/No/Uncertain <i>If yes, what sub-region?</i>	Yes/No/Uncertain <i>If yes, what sub-region?</i>
Non-indigenous species – Descriptor 2	Yes/No/Uncertain <i>If yes, what sub-region?</i>	As above
Commercially exploited fish and shellfish – Descriptor 3	<i>As above</i>	<i>As above</i>
Food webs - Descriptor 4	<i>As above</i>	<i>As above</i>

Table Biodiversity S1 - 6: Checklist for identifying potentially significant negative impacts on the biodiversity

Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
1) Are there any designated sites that could be affected by the project?		
2) Will construction or decommissioning of the project involve actions which will cause temporary impacts on a designated site?		
3) Will construction or decommissioning of the project involve actions which will cause impacts on protected sites or locally important sites?		
4) Could the project itself, during its operational phase, have an impact on a designated site or locally important site?		
5) Will the Project lead to risks from contamination of designated sites?		
6) Will the Project involve the use, storage, transport, handling or production of substances/mixtures (including biocides and pesticides) which could be harmful to flora and fauna?		
7) Are there any other areas on or around the location that are important or sensitive for reasons of their ecology that could be affected by the project?		
8) Are there any habitats that are important (e.g. for nesting) or sensitive, which are not designated but which could be affected by the project?		
9) Are there any other factors which should be considered such as consequential development which could lead to impacts on the surrounding biodiversity?		

Table Biodiversity S1 - 6: Checklist for identifying potentially significant negative impacts on the biodiversity		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
10) Are there any designated areas or locally important habitats within or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, that could be affected by the Project?		

Table Biodiversity S1 - 7: Checklist for identifying project characteristics reducing impacts on biodiversity		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
1) Will the project result in physical changes in the locality that: - assist with the control or removal of alien species? - assist with the conservation of native species or genetic diversity? - assist with the conservation of biodiversity rich and/or protected areas?		
2) Will the project result in new processes/systems whereby the use of substances or materials that are hazardous or toxic to the environment (flora, fauna) is decreased or avoided?		
3) Will the project result in reductions in the production of solid wastes? Or improved quality of wastes that are applied to the land (e.g. sewage sludge)?		
4) Will the project decrease the risk of protected sites or areas rich in biodiversity becoming contaminated by pollutants?		
5) Have other actions been taken as part of project design to limit impacts on biodiversity?		
6) Other aspects that demonstrate environmental good practice in project operation as well as delivery? E.g. increase awareness of residents and other businesses, take advantage of an opportunity within a growing environmental sector?		

Table Biodiversity S2 - 1: Table to summarise impacts (drawing on European Commission, 2001 and 2018)	
Criteria	Response
1) Describe the elements of the project that are likely to result in significant effects on the designated site (or other site of biodiversity importance)	Description of project

Table Biodiversity S2 - 1: Table to summarise impacts (drawing on European Commission, 2001 and 2018)	
Criteria	Response
2) Set out the conservation objectives of the site ¹⁴⁴	List of objectives obtained from the relevant statutory body
3) Describe how the project will affect key species and habitats. Acknowledge uncertainties and gaps in information	Description with quantification where possible e.g. area affected, populations likely to be affected, way in which designated features are expected to be affected, other ecological assets and functions identified on the site, method used for assessment, uncertainties.
4) Describe how the integrity of the site (structure, function and conservation objectives) is likely to be affected by the project (e.g. through loss of habitat, disturbance, disruption, hydrological changes)	Description of impacts, also including implications for habitats and species outside of the boundaries of the site, taking into account the cumulative effects of different activities under the project (but also from other projects)

¹⁴⁴ As per the Commission's (2012) note on setting objectives, conservation objectives for particular sites set out the condition that species and habitat types should reach in order for the site to contribute to the overall goal of favourable conservation status of these species and habitat types at national, biogeographical or European level (see Article 2(2) of the Directive). Note, however, that local sites that are not part of the Natura 2000 network may also have conservation objectives.

Table Biodiversity S3 - 1: Example tools for the monetisation of biodiversity				
Ref	Tool	Area covered	Description/services covered	Countries covered
1	ARIES - Artificial Intelligence for Ecosystem Services	Ecosystem services, Maps/GIS databases	<p>ARIES is an artificial intelligent modeler rather than a single model or collection of models. ARIES chooses ecological process models where appropriate, and turns to simpler models where process models do not exist or are inadequate. Based on a simple user query, ARIES builds all the agents involved in the nature/society interaction, connects them into a flow network, and creates the best possible models for each agent and connection. The result is a detailed, adaptive, and dynamic assessment of how nature provide benefits to people.</p> <p>Currently support queries:</p> <ul style="list-style-type: none"> - Carbon storage - Outdoor recreation - Pollination - Sediment retention - Riverine flood regulation - Water availability (based on hydrological calculations) - Crop yield production - Forest timber production - Valuation of other forest services - MicroHydro renewable energy - Mariculture suitability - Biodiversity value - Grassland and livestock 	Europe
2	Co\$ting Nature	Natural capital, ecosystem services, terrestrial, aquatic and coastal (not marine) habitats	<p>Co\$ting Nature is a web based policy support tool for natural capital accounting and analysing the ecosystem services provided by natural environments (i.e. nature's benefits), identifying the beneficiaries of these services and assessing the impacts of human interventions. Services covered by model:</p> <ul style="list-style-type: none"> - Timber (softwood, hardwood) - Fuelwood (softwood, hardwood) - Grazing/fodder - Non-wood forest products - Water provisioning (quantity, quality) - Fish catch - Carbon - Natural hazard mitigation (flood, drought, landslide, coastal inundation) - Culture-based tourism - Nature-based tourism 	Global

Table Biodiversity S3 - 1: Example tools for the monetisation of biodiversity				
Ref	Tool	Area covered	Description/services covered	Countries covered
			<ul style="list-style-type: none"> - Environmental and aesthetic quality services - Wildlife services (pollination, pest control) - Wildlife dis-services (crop raiding, pests) - Biodiversity - Pressure and threat <p>All required data for global analysis, plus the ability to upload your own datasets.</p>	
3	Ecosystem Services Transfer Toolkit	Inventory, ecosystem services	<p>The Ecosystem Services Transfer Toolkit is a literature review of the effect of land management actions on the provision of ecosystem services. The Toolkit is in the form of an Excel spreadsheet with an accompanying User Guide and Quick Start Guide. The spreadsheet can be searched and queried to find evidence of the effects of specific land management actions on ecosystem services provided by upland, freshwater, urban, lowland agriculture, coastal and marine habitats. It also assesses how transferable the effect of a land management action on ecosystem services may be, if done in a different place. Services covered:</p> <ul style="list-style-type: none"> - Climate regulation - Crops, livestock and fish - Crops, livestock, fish - Detoxification & purification in air, soils and water - Disease & pest regulation - Disease and pest regulation - Environmental settings - Hazard regulation - Noise regulation - Pollination - Soil quality regulation - Trees, standing vegetation and peat - Trees, standing vegetation, peat - Water quality regulation - Water supply - Wild species diversity 	UK
4	EVL - Environmental Value Look-up Tool	Habitats, ecosystem service, environmental impact	<p>The Environmental Value Look-Up (EVL) Tool has been developed by EFTEC for the UK's Department for Environment, Food and Rural Affairs to provide indicative values for environmental impacts for use by analysts in Government departments, non departmental public bodies, and other organisations. The tool contains a number of indicative values (low, central and high) for National Ecosystem Assessment broad habitats and component habitats.</p>	Data predominantly in UK context

Table Biodiversity S3 - 1: Example tools for the monetisation of biodiversity				
Ref	Tool	Area covered	Description/services covered	Countries covered
			<p>The tool can also be used to estimate an aggregate value. Environmental impacts/goods covered:</p> <ul style="list-style-type: none"> - Aesthetic value - Biodiversity - Cultural heritage - Human health - Recreation & tourism - Water purification and waste treatment 	
5	EVRI Environmental Valuation Reference Inventory	Inventory	<p>The EVRI is a searchable online database of empirical studies on the economic value of environmental benefits and human health effects. These summaries provide detailed information about the study location, the specific environmental assets being valued, the methodological approaches and the estimated monetary values along with proper contextualization. The EVRI database now contains over 4,000 summaries of valuation studies and information from new studies is being added on an ongoing basis. It has been developed as a tool to help policy analysts use the benefits transfer approach. Using the EVRI to do a benefits transfer is an alternative to doing new valuation research. Searches can be carried on various environmental assets such as air, animals, human health, land, man-made environment/infrastructure, micro-organisms, plants and water. A range of economic measures are also available; compensating surplus, compensating variation, consumer surplus, cost of injury/replacement, equivalent surplus, equivalent variation, price, willingness to accept, or willingness to pay.</p>	Global, Europe
6	InVEST - Integrated Valuation of Environmental Services and Tradeoffs	Ecosystem services	<p>InVEST is a suite of open-source software models used to map and value the goods and services from nature that sustain and fulfil human life. It explores how changes in ecosystems are likely to lead to changes in benefits that flow to people. InVEST models are spatially explicit, using maps as information sources and producing maps as outputs. InVEST returns results in either biophysical terms, whether absolute quantities or relative magnitudes (e.g., tonnes of sediment retained or % of change in sediment retention) or economic terms (e.g., the avoided treatment cost of the water affected by that changed in sediment load).</p> <p>Supporting ecosystem services:</p> <ul style="list-style-type: none"> - Habitat quality - Habitat risk assessment - Pollinator abundance - crop pollination <p>Final ecosystem services:</p> <ul style="list-style-type: none"> - Forest carbon edge effect 	Global, Europe

Table Biodiversity S3 - 1: Example tools for the monetisation of biodiversity				
Ref	Tool	Area covered	Description/services covered	Countries covered
			<ul style="list-style-type: none"> - Carbon storage and sequestration - Coastal blue carbon - Annual water yield - Nutrient delivery ratio - Sediment delivery ratio - Unobstructed views - scenic quality provision - Visitation – Recreation and tourism - Wave energy production - Offshore wind energy production - Marine finfish aquacultural production - Fisheries - Crop production - Seasonal water yield Urban ecosystem services: <ul style="list-style-type: none"> - Urban cooling model - Urban flood risk mitigation model 	
7	TEEB	Ecosystem services, habitat types	The goal of the Ecosystem Services Valuation Database is to stop the structural undervaluation of nature in economic assessments (leading to continued biodiversity loss and landscape degradation) by providing better data on the ‘true value’, or welfare effect, of nature conservation, ecosystem restoration and sustainable land management. Within the context of the TEEB-project (2008-2010) the authors of the global overview of the “Estimates of monetary values of ecosystem services”, supported by many ESP-members (esp. the Biome Expert leads) and TEEB researchers developed a database on monetary values of ecosystem services which now contains over 4,000 value records distributed across all biomes, services and geographic regions from over 600 studies.	Global, Europe
<p>Tools available at:</p> <ol style="list-style-type: none"> 1) http://aries.integratedmodelling.org/ 2) http://www.policysupport.org/costingnature 3) http://publications.naturalengland.org.uk/publication/5890643062685696 4) http://scienceresearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=19514#Description 5) https://www.evri.ca/en/home 6) http://www.naturalcapitalproject.org/invest/ 7) http://es-partnership.org/services/data-knowledge-sharing/ecosystem-service-valuation-database/ 				

Table Biodiversity S3 - 2: Example values for the monetisation of biodiversity					
Value	Units	Year of value	Change being measured	Reference	Website
Parks and green spaces					
30.24	£ Per individual per year	2018	Total Economic Value (use and non-use) of Parks and Green Spaces	Watt, W., Lawton, R., & Fujiwara, D. (2018). Revaluing Parks and Green Spaces Measuring their Economic and Wellbeing Value to Individuals. Field in Trust, UK.	http://www.fieldsintrust.org/Upload/file/research/Revaluing-Parks-and-Green-Spaces-Report.pdf
Invasive species					
20 billion	EUR / year	2008	Monetary impact of invasive alien species in Europe (extrapolated costs for whole current European range)	Kettunen, M., Genovesi, P., Gollasch, S., Pagad, S., Starfinger, U., Ten Brink, P., & Shine, C. (2008). Technical support to EU strategy on invasive species (IAS)-Assessment of the impacts of IAS in Europe and the EU (final module report for the European Commission).	https://researchspace.auckland.ac.nz/handle/2292/33742
Mountain landscapes and ecosystems					
3,068	EUR per hectare per year	2016	Average value of the European mountain landscape /ecosystem	Žáková Kroupová, Z., Havlíková, M., Hálová, P., & Malý, M. (2016). Economic Valuation of Mountain Landscapes and Ecosystems: A Meta-Analysis of Case Studies. AGRIS on-line Papers in Economics and Informatics, 8(665-2016-45100), 103-112.	https://ageconsearch.umn.edu/record/245888/
Woodlands					
30.5	EUR per hectare per year	2007	Biodiversity protection, woodlands	Croitoru, L. How much are Mediterranean forests worth? Forest Policy and Economics 9(5): 536-545.	https://econpapers.repec.org/RePEc:eee:forpol:v:9:y:2007:i:5:p:536-545
1250	EUR per hectare	2018	Average economic value of forest areas	Nikodinoska, N., Paletto, A., Pastorella, F., Granvik, M., & Franzese, P. P. (2018). Assessing, valuing and mapping ecosystem services at city level: The case of Uppsala (Sweden). Ecological Modelling, 368, 411-424.	https://www.sciencedirect.com/science/article/abs/pii/S0304380017302478
Agriculture					
703	€ ha ⁻¹	2018	Average economic value of agricultural areas	Nikodinoska, N., Paletto, A., Pastorella, F., Granvik, M., & Franzese, P. P. (2018). Assessing, valuing and mapping ecosystem services at city level: The case of Uppsala (Sweden). Ecological Modelling, 368, 411-424.	https://www.sciencedirect.com/science/article/abs/pii/S0304380017302478
Floodplains					

Table Biodiversity S3 - 2: Example values for the monetisation of biodiversity					
Value	Units	Year of value	Change being measured	Reference	Website
374	EUR per hectare per year	1995	Value of floodplains (Danube)	Ing-MarieGren et al. (1995) Economic values of Danube floodplains. Journal of Environmental Management 45(4): 333-345.	https://www.sciencedirect.com/science/article/pii/S0301479785700801
Inland wetlands					
8599	GBP per year	2010	Total economic value of riparian buffer	Everard, M., & Jevons, S. (2010). Ecosystem services assessment of buffer zone installation on the upper Bristol Avon, Wiltshire. Environment Agency.	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291658/scho0210brxw-e-e.pdf
3,944	GBP per hectare per year	2001	Wetland providing little habitat no value of single service provision of birdwatching to Wetland of value for birdwatching	Woodward, R. T., & Wui, Y. S. (2001). The economic value of wetland services: a meta-analysis. Ecological economics, 37(2), 257-270.	http://www.unepscs.org/Economic_Valuation_Training_Materials/06%20Readings%20on%20Economic%20Valuation%20of%20Coastal%20Habitats/23-Economic-Value-Wetland-Services.pdf
304	GBP per ha per year	2011	Biodiversity non-use values	Bateman, I. J., Abson, D., Beaumont, N., Darnell, A., Fezzi, C., Hanley, N., ... & Mourato, S. (2011). Chapter 22: Economic values from ecosystems. The UK National Ecosystem Assessment: technical report. UNEP-WCMC, Cambridge, 1068-1151.	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiYps_2q17qAhXRPsaKHRgKBGsQFjABegQIBBAB&url=http%3A%2F%2Fwww.lse.ac.uk%2FGranthamInstitute%2Fwp-content%2Fuploads%2F2014%2F04%2Feconomic-values-ecosystems.pdf&usg=AOvVaw0LQvhzfEhBLwYsINLK50fB
Coastal wetlands					
1,866	GBP per ha per year	2011	Biodiversity non-use values	Bateman, I. J., Abson, D., Beaumont, N., Darnell, A., Fezzi, C., Hanley, N., ... & Mourato, S. (2011). Chapter 22: Economic values from ecosystems. The UK National Ecosystem Assessment: technical report. UNEP-WCMC, Cambridge, 1068-1151.	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiYps_2q17qAhXRPsaKHRgKBGsQFjABegQIBBAB&url=http%3A%2F%2Fwww.lse.ac.uk%2FGranthamInstitute%2Fwp-content%2Fuploads%2F2014%2F04%2Feconomic-values-ecosystems.pdf&usg=AOvVaw0LQvhzfEhBLwYsINLK50fB
Natural pest control					

Table Biodiversity S3 - 2: Example values for the monetisation of biodiversity					
Value	Units	Year of value	Change being measured	Reference	Website
88.86 – 2186.50	EUR per hectare	2017	Valuation of natural predators for biological pest control in pear production: losses to the net farm income	Daniels, S., Witters, N., Beliën, T., Vrancken, K., Vangronsveld, J., & Van Passel, S. (2017). Monetary valuation of natural predators for biological pest control in pear production. <i>Ecological economics</i> , 134, 160-173.	https://repository.uantwerpen.be/docman/irua/d3472c/140685_2019_01_27.pdf
Habitat defragmentation					
162.2	€ per individual (one-time payment)	2007	Mean willingness to pay (WTP) for two habitat defragmentation scenarios	Van der Heide, C. M., Van den Bergh, J. C., Van Ierland, E. C., & Nunes, P. A. (2008). Economic valuation of habitat defragmentation: A study of the Veluwe, the Netherlands. <i>Ecological Economics</i> , 67(2), 205-216.	https://www.academia.edu/download/39814750/Economic_valuation_of_habitat_defragmentation20151108-5238-1v1htr4.pdf
Biodiversity					
1,714 million	GBP / year	2011	Marine Biodiversity: non-use values	Bateman, I. J., Abson, D., Beaumont, N., Darnell, A., Fezzi, C., Hanley, N., ... & Mourato, S. (2011). Chapter 22: Economic values from ecosystems. The UK National Ecosystem Assessment: technical report. UNEP-WCMC, Cambridge, 1068-1151.	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiYps_2q17qAhXRPsAKHRgKBGsQFjABegQIBBAB&url=http%3A%2F%2Fwww.lse.ac.uk%2FGranthamInstitute%2Fwp-content%2Fuploads%2F2014%2F04%2Feconomic-values-ecosystems.pdf&usg=AOvVaw0LQvzhfEhBLwYsINLK50fB
845 million	GBP / year	2011	Terrestrial Biodiversity: non-use values	Bateman, I. J., Abson, D., Beaumont, N., Darnell, A., Fezzi, C., Hanley, N., ... & Mourato, S. (2011). Chapter 22: Economic values from ecosystems. The UK National Ecosystem Assessment: technical report. UNEP-WCMC, Cambridge, 1068-1151.	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiYps_2q17qAhXRPsAKHRgKBGsQFjABegQIBBAB&url=http%3A%2F%2Fwww.lse.ac.uk%2FGranthamInstitute%2Fwp-content%2Fuploads%2F2014%2F04%2Feconomic-values-ecosystems.pdf&usg=AOvVaw0LQvzhfEhBLwYsINLK50fB
2000	GBP / household / year	2011	Effects of proximity to greenspace/ freshwaters/ woodland/	Bateman, I. J., Abson, D., Beaumont, N., Darnell, A., Fezzi, C., Hanley, N., ... & Mourato, S. (2011). Chapter 22: Economic values from ecosystems. The UK National	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiYps_2q17qAhXRPsAKHRgKB

Table Biodiversity S3 - 2: Example values for the monetisation of biodiversity					
Value	Units	Year of value	Change being measured	Reference	Website
			farmland averages £2000 pa per household	Ecosystem Assessment: technical report. UNEP-WCMC, Cambridge, 1068-1151.	GsQFjABegQIBBAB&url=http%3A%2F%2Fwww.lse.ac.uk%2FGranthamInstitute%2Fwp-content%2Fuploads%2F2014%2F04%2Feconomic-values-ecosystems.pdf&usg=AOvVaw0LQvzhfEhBLwYsINLK50fB
356–1,001	NZD \$ /ha	2020	Valuing earthworm contribution to ecosystem services delivery: provision of food quantity	Schon, N. L., & Dominati, E. J. (2020). Valuing earthworm contribution to ecosystem services delivery. <i>Ecosystem Services</i> , 43, 101092.	https://www.sciencedirect.com/science/article/abs/pii/S2212041620300346

Table Biodiversity S3 - 3: Example ecosystem service and ecosystem asset valuations (per hectare per ecosystem type); Netherlands

Table 7.2.2. Value of ecosystem services per hectare per ecosystem type in 2015 (euros at current prices; using the broad scope estimates of tourism and recreation)

	Ecosystem services mln euro	Ecosystem assets mln euro	Extent (ha) ha	Ecosystem services euro/ha	Ecosystem assets euro/ha
Agriculture	4,970	159,566	1,872,164	2,655	85,231
Non-perennial plants	1,937	61,423	780,708	2,481	78,676
Perennial plants	225	7,202	79,277	2,838	90,841
Greenhouses	8	263	11,749	707	22,369
Meadows (grazing)	2,659	86,047	929,346	2,861	92,588
Hedgerows	98	3,278	35,683	2,758	91,868
Farmyards and barns	43	1,353	35,402	1,204	38,231
Dunes and beaches	2,283	72,660	46,903	48,674	1,549,159
Dunes with permanent vegetation	794	25,279	14,288	55,568	1,769,279
Active coastal dunes	1,288	41,044	22,052	58,425	1,861,257
Beach	201	6,337	10,564	18,995	599,921
Forest	2,085	68,761	309,825	6,730	221,935
Deciduous forest	723	24,098	109,421	6,610	220,230
Coniferous forest	574	18,780	81,898	7,011	229,305
Mixed forest	788	25,884	118,505	6,645	218,418
Heath land and inland dunes	274	8,825	44,368	6,183	198,912
Heath land	251	8,083	41,484	6,053	194,839
Inland dunes	23	743	2,884	8,044	257,503
Fresh water wetlands	146	4,707	38,873	3,768	121,096
(Semi) Natural grassland	217	7,090	51,884	4,183	136,656
Public green space	891	28,401	68,968	12,922	411,798
Other unpaved terrain	1,147	37,534	293,708	3,905	127,795
River flood basin and salt marshes	260	8,833	83,883	3,102	105,300
River flood basin	230	7,779	72,736	3,166	106,945
Salt marsh	30	1,054	11,147	2,682	94,569
Built-up terrain	74	2,609	540,173	137	4,830
Residential area	24	870	250,791	95	3,469
Industry: offices and businesses	5	172	66,173	69	2,607
Services: offices and businesses	13	455	89,082	147	5,109
Public administration: offices and businesses	0	10	1,084	273	9,224
Roads, parking lots, runways, other	29	984	113,217	259	8,694
Forestry: offices and businesses	0	5	173	799	26,213
Fishery: offices and businesses	0	0	113	51	1,712
Non-commercial services: offices and businesses	3	112	19,541	156	5,745
Water	631	19,914	801,826	787	24,835
Sea	61	1,915	380,586	161	5,031
Lakes and ponds	461	14,586	120,411	3,831	121,132
Rivers and streams	109	3,413	300,828	361	11,346
Other	1	32	658	1,548	49,007
Unknown	1	29	244	3,793	120,029
Null	0	3	415	229	7,285
TOTAL	12,981	418,933	4,153,232	3,125	100,869

Source: Horlings, E., Schenau, S., Hein, L., Lof, M., de Jongh, L., & Polder, M. (2020). Experimental monetary valuation of ecosystem services and assets in the Netherlands.

Annex 6 Resources to Cross-cutting impacts

Table CC - 1: Databases of chemical accidents

eMARS - The purpose of the Major Accident Reporting System is to facilitate exchange of lessons learned from accidents and near misses involving dangerous substances in order to improve chemical accident prevention and mitigation of potential consequences. eMARS contains reports of chemical accidents and near misses from EU, EEA, OECD, and UNECE countries (under the TEIA Convention). Source: <https://emars.jrc.ec.europa.eu/en/emars/content>

ARIA - The ARIA (Analysis, Research and Information on Accidents) database catalogues incidents or accidents that were, or could have been, deleterious to human health, public safety or the environment. ARIA has inventoried over 46,000 accidents and incidents. Some 1,200 new events are added to the database each year. Source: <https://www.aria.developpement-durable.gouv.fr/the-barpi/the-aria-database/?lang=en>

CDD - The Canadian Disaster Database (CDD) contains detailed disaster information on more than 1000 natural, technological and conflict events (excluding war) that have happened since 1900 at home or abroad and that have directly affected Canadians. Source: <https://www.publicsafety.gc.ca/cnt/rsrscs/cndn-dsstr-dtbs/index-en.aspx>

FACTS - FACTS is the acronym for "Failure and Accidents Technical information System". FACTS is an accident database which contains information on more than 25,700 (industrial) accidents (incidents) involving hazardous materials or dangerous goods that have happened all over the world during the past 90 years. Source: <http://www.factsonline.nl>

RISCAD – The Relational Information System for Chemical Accidents Database maintained by the National Institute of Advanced Industrial Science and Technology and the Japan Science and Technology Agency presents information on over 5,000 chemical accidents occurred between 1949 and 2016. Source: <https://riscad.aist-riss.jp>

Table CC S1 - 1: Documentation of available information on cross-cutting impacts		
Legislative driver	Cross-cutting impacts	Available detail
SEA Directive	<i>If the project is being carried out as a result of a national plan or programme, were cross-cutting impacts considered in the strategic environmental assessment? Is the project being carried out specifically to address noise and vibration issues?</i>	<i>Please indicate what cross-cutting impacts were considered and at what level the contribution of individual projects or groups of projects to overall levels was assessed. Please indicate if there is quantitative data available from the SEA which is relevant to understanding how the project may contribute to cumulative reductions or increases in cross-cutting impacts.</i>
EIA Directive	<i>Please indicate what sources of noise and vibration impacts, if any, were assessed as part of the EIA and whether any mitigation measures were adopted to minimise/reduce impacts. This should cover all relevant project phases and activities, including changes in emissions resulting from the choice of location, infrastructure type or transport mode.</i>	<i>Please indicate what detailed assessment reports are available and whether the assessment was based on modelling and whether there is quantitative data on impacts</i>
Industrial Emissions Directive	<i>Please indicate what potential sources of noise and vibration, if any, were assessed as part of the permitting process under the IED, and whether any mitigation measures were adopted in order to achieve BAT and to minimise relevant impacts.</i>	<i>Please indicate what detailed assessment reports are available from the permitting process and whether the assessment was based on modelling. Also indicate whether there is quantitative data on cross-cutting impacts.</i>
Noise Directive	<i>Does the project relate to a measure proposed under a national management action plan, e.g. under the Environmental Noise Directive, or a waste management plan? If yes, please provide details of the measures that will have to be put in place, and provide an indication of the impact that they will have on cross-cutting impacts. If the project could lead to reduction in impacts but no specific measures have been put in place or have been identified at this point in time by national authorities, please provide details.</i>	<i>Please indicate whether any detailed assessment reports are available with respect to the impacts of the project. Also indicate whether this includes quantitative data on changes in cross-cutting impacts.</i>
Seveso Directive	<i>Does the project fall under the Seveso Directive and if so is it, or would it be, a Tier 1 or Tier 2 site? Has the developer already prepared a risk assessment to identify residual risks?</i>	<i>Please indicate what assessment are available for the site, taking into account the fact that the scope of the assessment may vary by Member State and that the assessment may have been carried out as part of gaining a site permit.</i>

Table CC S1 - 2: Applying the mitigation hierarchy	
Mitigation measure	Questions to consider
Avoid	Could negative impacts and the achievement of local / regional objectives be avoided by implementing the project elsewhere? By implementing a different project? By using a different approach or method?
Minimise	Could the project be designed to include measures to minimise impacts? Examples include carrying out the work at a particular time of year, using a particular method, or implementing the project differently. What measures could be implemented to avoid indirect impacts or cumulative impacts? Could lessons be learnt from similar projects nearby?
Rehabilitate/restore	How could the project be designed to enable rehabilitation or restoration of better conditions? What measures need to be taken before the project starts? What measures need to be taken once the project is implemented?
Offset	What could be done to compensate for any negative impacts at the local or regional levels? Could impacts in other areas be reduced? Where could this occur?

Table CC S1 - 3: Screening question for identifying potentially significant cross-cutting impacts
Questions for identifying potentially significant noise or vibration impacts
<p>Thresholds for identifying significant impacts, where no national thresholds exist:</p> <ul style="list-style-type: none"> • Environmental noise: noise levels greater than 55 decibels (dB) for day-evening-night levels (L_{den}); noise levels greater than 50 decibels for night levels and (L_{night}); noise levels greater than the above as an equivalent continuous sound levels (L_{Aeq}) for transport schemes such as rail projects. • Vibration: The potential for an increase in human annoyance and sleep disturbance, as measured by the change in the percentage population of highly annoyed/disturbed, annoyed/disturbed and slightly annoyed/disturbed. <ol style="list-style-type: none"> 1) Will construction or decommissioning of the project involve actions which will could give rise to noise and vibration levels above the levels which cause annoyance or health effects? Please consider both daytime and night-time effects. 2) Will the project be located in an urbanised or residential area, and result in significant increases in day-time or night-time noise levels during its operation? 3) If the project involves changes in transport infrastructure or rolling stock, have noise and vibration issues been considered as part of project design or equipment design? 4) Are there any transport routes on or around the location which are susceptible to high levels of traffic or congestion or which cause environmental noise problems, and which could be affected by the project? 5) Are there any other factors which should be considered such as consequential development which could lead to the potential for cumulative impacts with other existing or planned activities in the locality (e.g. through increases in traffic or other industrial manufacturing activity as part of the creation of a manufacturing cluster)? 6) Are there any areas on or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, which could be affected by the project? 7) Are there any areas on or around the location which are already subject to excessive noise pollution or vibration related impacts, e.g. where existing EU objectives are not being achieved and which could be affected by the project?

Table CC S1 - 3: Screening question for identifying potentially significant cross-cutting impacts

Questions for identifying potentially significant odour impacts

As odour impacts are a cross-cutting issue, it may be most appropriate to look at guidance that is specific to the type of project being proposed/promoted (e.g. sewage treatment works, waste management and recycling centres, food processing facilities, etc.).

- 1) Will operation of the project give rise to offensive odorous emissions?
- 2) Is there the potential for the odours to be of a nature and at an intensity that could give rise to annoyance or to health impacts?
- 3) Will the site be located in an area that, taking into account wind directions etc., there is the potential for residential and other vulnerable populations as receptors to be affected?
- 4) Are there any other factors which should be considered such as consequential development which could lead to the potential for cumulative impacts with other existing or planned activities in the locality (e.g. through increases in activity as part of a cluster)?

Questions for identifying potentially significant light impacts

As light impacts are a cross-cutting issue, it may be most appropriate to look at guidance that is specific to the type of project being proposed/promoted (e.g. transport infrastructure, large industrial developments, etc.).

- 1) Will the resulting infrastructure give rise to the potential for light pollution?
- 2) Is there the potential for increased lighting levels to be of a nature and at an intensity that could give rise to annoyance or to health impacts?
- 3) Will the site be located in a residential area or near vulnerable populations?
- 4) Are there any other factors which should be considered such as consequential development which could lead to the potential for cumulative light impacts with other existing or planned activities in the locality (e.g. through increases in activity as part of a cluster)?

Questions for identifying potentially significant major hazard-related safety issues

Information on the types of accidents that may occur at facilities regulated by the Seveso Directive, and their associated impacts, is available from the eMARS database . This provides access to chemical accident reports from investigations, with the aim of raising awareness of the potential failures that could cause major accidents on sites using dangerous substances. The eMARS site includes statistics on accidents by industry type and lessons learned, which may help project promoters identify both the potential types of impacts relevant to their project and measures for minimising the risks of an event.

- 1) Would the project involve the use of hazardous substances in the qualifying quantities as listed in Part 1 of Annex I, or listed in Part 2 of Annex I of the Seveso Directive?
- 2) Is there the potential for the accidents involving hazardous substances to occur at the site, in particular a fire, explosion or toxic spill?
- 3) Is there the potential for this to lead to fatalities or injuries, other than single or minor injuries?
- 4) Is there the potential for this to lead to damage to infrastructure off-site, or to significant damage to onsite plant and equipment?
- 5) Is there the potential for this to lead to environmental damages and the need for environmental clean-up operations?
- 6) Will the project be located in an urbanised or residential area, or within a less than a kilometre of such developments?
- 7) Are there other facilities within the nearby vicinity that also fall under the Seveso Directive?

Table CC S1 - 4: Questions for assessing significance as part of screening in EIAs

Noise and vibration
<p>Will there be a large change in environmental noise or vibration? Will the effect be unusual in the area or particularly complex? Will the effect extend over a large area? Will many people be affected? Will many receptors of other types (fauna and flora, businesses, facilities) be affected?</p> <p>Is there a risk that noise standards will be breached? Is there a risk that protected sites, areas, features will be affected? Is there a high probability of the effect occurring? Will the effect continue for a long time? Will the effect be permanent rather than temporary? Will the impact be continuous rather than intermittent? Will it be difficult to avoid, or reduce or repair or compensate for the effect?</p>
Odour
<p>What will the nature or character of the odour be at different, relevant intensities? What will the frequency, intensity and duration of any odorous emissions be? Will the impact be continuous rather than intermittent? Will the effect be permanent rather than temporary? Will the impacts extend over a large area? Will many people be affected?</p>
Light
<p>What will the nature or character of light be at different, relevant intensities? What will the frequency, intensity and duration of light emissions be? Will the impact be continuous rather than intermittent? Will the effect be permanent rather than temporary? Will the impacts extend over a large area? Will many people be affected?</p>
<p>See also: https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf</p>

Table CC S1 - 5: Checklist for identifying project characteristics resulting in positive impacts

Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
Questions for identifying positive noise or vibration impacts		
<p>1) Will the project result in reductions in noise and/or vibration related impacts? These could result from: - specific measures to reduce noise and vibration - indirect reductions in night-time or day-time noise due to changes in activities - improvements in infrastructure, leading to reductions in vibration related effects</p>		
<p>2) Will the project result in the movement of noise generating activities out of a residential area or location surrounded by vulnerable populations, e.g. a hospital?</p>		
<p>3) Will the project include specific measures to reduce noise or vibration?</p>		

Table CC S1 - 5: Checklist for identifying project characteristics resulting in positive impacts		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
4) Have production technologies been selected so as to minimise the potential for impacts at source?		
5) Have other actions been taken as part of project location and or design to limit impacts?		
Questions for identifying positive odour impacts		
Will the project result in reductions in odorous emissions through the installation of new plant? If so, would this affect the nature of the odour, the frequency or the duration, etc.?		
Will the project result in the movement of odour generating activities out of a location surrounded by large, sensitive and/or vulnerable populations?		
Will the project include specific measures to reduce odorous emissions?		
Have production technologies been selected so as to minimise the potential for impacts at source?		
Have other actions been taken as part of project location and or design to limit impacts, e.g. the use of local ventilation systems together with exhaust gas treatment methods?		
Questions for identifying positive light impacts		
Will the project result in reductions in light emissions through the installation of new equipment? If so, would this affect the level of light pollution?		
Will the project result in the movement of light generating activities out of a location surrounded by large, sensitive and/or vulnerable populations?		
Will the project include specific measures to reduce light emissions?		
Has lighting been selected so as to minimise the potential for impacts at source?		
Have other actions been taken as part of project location and or design to limit impacts?		
Questions for identifying positive odour impacts		
Will the project result in reductions in the use of hazardous substances, to the extent that a site currently falling under the Seveso Directive will no longer do so?		
Will the project result in the relocation of a site falling under the Directive to a less built up or environmentally sensitive location, such that the severity of the potential		

Table CC S1 - 5: Checklist for identifying project characteristics resulting in positive impacts		
Question to be considered – see also EIA Scoping Guidance	Yes / No / Brief description	Is this likely to result in a significant impact? Yes / No - Why
consequences from an accident would be reduced?		
Will the project include specific measures to improve safety at an existing site?		

Table CC S2 - 1: Data to be reported on significant noise impacts of concern				
Sources of noise or vibration (activities and project phase)	Type of impact: increase in day-time or night-time noise; increase in vibration	Levels of increase in dB in terms of L_{den}, L_{night} or L_{Aeq} for transport schemes; increase in population likely to be annoyed or suffer from sleep disturbance	Frequency and duration of increased levels of noise or vibrations	Population by number and type which may be affected

Table CC S2 - 2: Data to be reported on significant odour impacts of concern				
Sources of odour (activities)	Characteristics of the odour – measured in terms of European Odour Units (OUE.m-3) if available	Frequency, and duration of odorous emissions	Population by number and type which may be affected	Types of health effects

Table CC S2 - 3: Data to be reported on significant light impacts of concern				
Sources of light (activities)	Characteristics of the lighting – (e.g. maximum luminous intensity / environmental zone)	Frequency, and duration of light emissions - potential to be obtrusive at night, etc.	Population by number and type which may be affected	Potential effects on health and the environment

Table CC S2 - 4: Data for reporting on impacts from noise and vibration, odour, light and related to major hazards

Project objectives	Identify any specific project objectives relevant to the cross-cutting impacts	
Project socio-economic and environmental context	Provide information on the current situation in terms of any constraints on the project's activities and its outputs that are relevant to the different cross-cutting impacts	
Environmental criteria used in identifying the project options	Provide information on the current baseline air quality and any measures required at the national level to reduce impacts that are relevant to the project.	
Key factors underlying demand for the project relevant to the impacts	Identify the design aspects that result in changes in impacts and indicate what steps were taken to minimise impacts, or what constraints exist on the ability to reduce impacts	
Methodology (the methodology applied for quantification of externalities and the related assumptions and unitary values)	If the project assessment has included quantification of changes in impacts, describe the methodology used for these purposes and provide any national or other guidance followed when undertaking the assessment. Key assumptions should be detailed.	
Cumulative effects (potential for increase in impacts from the project when combined with other recent infrastructure developments to lead to cumulative impacts)	Indicate whether there have been other new developments in the local area that could also lead to impacts.	

Table CC S3 - 1: Example values for noise cost road transport (2016)

Table 37 - Marginal noise costs road transport - in €-cent (2016) per pkm, tkm or vkm (data for 2016)

Road	Time of the day	Traffic situation	Urban	Suburban	Rural
Passenger transport (€-cent per pkm)					
Passenger car	Day	Dense	0.5	0.03	0.004
		Thin	1.1	0.07	0.009
	Night	Dense	0.9	0.05	0.007
		Thin	2.1	0.13	0.015
Motorcycle	Day	Dense	7.4	0.4	0.06
		Thin	18.0	1.2	0.14
	Night	Dense	13.5	0.8	0.11
		Thin	32.7	2.1	0.24
Bus	Day	Dense	0.5	0.03	0.004
		Thin	1.3	0.08	0.010
	Night	Dense	1.0	0.05	0.008
		Thin	2.4	0.15	0.018
Coach	Day	Dense	0.3	0.02	0.002
		Thin	0.7	0.04	0.005
	Night	Dense	0.5	0.03	0.004
		Thin	1.2	0.08	0.009
Light commercial vehicles (€-cent per vkm)					
LCV	Day	Dense	1.7	0.1	0.01
		Thin	4.1	0.3	0.03
	Night	Dense	3.0	0.2	0.03
		Thin	7.4	0.5	0.06
Freight transport (€-cent per tkm)					
HGV average	Day	Dense	0.7	0.04	0.01
		Thin	1.6	0.11	0.01
	Night	Dense	1.2	0.07	0.01
		Thin	3.0	0.19	0.02
HGV 3.5-7.5 t	Day	Dense	1.5	0.08	0.01
		Thin	3.6	0.23	0.03
	Night	Dense	2.7	0.15	0.02
		Thin	6.5	0.42	0.05
HGV 7.5-16 t	Day	Dense	0.7	0.04	0.01
		Thin	1.8	0.11	0.01
	Night	Dense	1.3	0.07	0.01
		Thin	3.2	0.21	0.02
HGV 16-32 t	Day	Dense	0.6	0.03	0.00
		Thin	1.3	0.09	0.01
	Night	Dense	1.0	0.06	0.01
		Thin	2.4	0.16	0.02
HGV > 32 t	Day	Dense	0.6	0.03	0.00
		Thin	1.4	0.09	0.01
	Night	Dense	1.1	0.06	0.01
		Thin	2.6	0.17	0.02

Annex 7 IP Master Checklist

Due Diligence Checklist

This checklist has been designed to be a rapid assessment allowing the user to review information received from partners and highlight any information gaps. Multiple choice options have been provided where appropriate. The explanatory notes section is an opportunity to provide further or supporting information; it is not intended to require significant input and information can be as brief as providing page references to the appropriate information.

Step 0 checks: <i>"Determine whether proofing should be undertaken"</i>		Multiple choice answers	Explanatory notes	Instructions
Question 0.1	Has proofing been carried out because it was mandatory?	Yes / No / I don't know		If yes, go to sub-question 0.11; If no or don't know, go to sub-question 0.13
Sub-question 0.11	If yes, proofing was triggered by the requirement for an EIA, what other legislative compliance was required?			If other legislative compliance was required please provide brief notes in "Explanatory notes"; you may also wish to add page references. Go to sub-question 0.12
Sub-question 0.12	Is this information available for scrutiny, e.g. has the Appropriate Assessment report been provided?	Yes / No / I don't know		You may wish to provide page references in "Explanatory notes". Go to "Step 1 checks"
Sub-question 0.13	If no, proofing was carried out voluntarily, what information has been provided by the project promoter?			Please provide more information in "Explanatory notes" and go to sub-question 1.4
Sub-question 0.14	Is this information available for scrutiny?	Yes / No / I don't know		You may wish to provide page references in "Explanatory notes". Go to "Step 1 checks"

Step 1 checks: "Identify whether the project could give rise to significant impacts"		Multiple choice answers	Explanatory notes	Instructions
Question 1.1	For all projects, is there evidence that the mitigation hierarchy has been followed?	Yes / No / I don't know		Go to sub-question 1.11
Sub-question 1.11	Have project promoters documented the measures taken for avoiding impacts?	Yes / No / I don't know		Go to sub-question 1.12
Sub-question 1.12	Where relevant, what mitigation measures have been suggested?			If mitigation measures have been suggested please provide brief notes in "Explanatory notes"; you may wish to add page references. Go to sub-question 1.13
Sub-question 1.13	Has consideration been given to rehabilitation/restoration if needed?	Yes / No / I don't know		Go to sub-question 1.14
Sub-question 1.14	If the project needs to offset biodiversity impacts, are these measures recorded?	Yes / No / I don't know		Go to sub-question 1.15
Sub-question 1.15	Are costs available for the measures considered in the mitigation hierarchy?	Yes / No / I don't know		Go to "Step 2 checks"

Step 2 checks: "Apply the proofing checklists "		Multiple choice answers	Explanatory notes	Instructions
Question 2.1	Have the proofing checklists identifying significant negative impacts been completed?	Yes / No / I don't know		Go to question 2.2
Question 2.2	Have the proofing checklists identifying significant positive impacts been completed?	Yes / No / I don't know		Go to "Step 3 checks"

Step 3 checks: "Quantification of impacts "		Multiple choice answers	Explanatory notes	Instructions
Question 3.1	Have project impacts been identified?	Yes / No / I don't know		If yes, go to sub-question 3.11
Sub-question 3.11	Have impacts on air and climate change been identified?	Yes / No / I don't know		If yes, go to "Air and Climate Change" sheet. Go to sub-question 3.12
Sub-question 3.12	Have impacts on water been identified?	Yes / No / I don't know		If yes, go to "Water" sheet. Go to sub-question 3.13
Sub-question 3.13	Have impacts on land been identified?	Yes / No / I don't know		If yes, go to "Land" sheet. Go to sub-question 3.14
Sub-question 3.14	Have impacts on biodiversity been identified?	Yes / No / I don't know		If yes, go to "Biodiversity" sheet. Go to question 3.2
Question 3.2	Have project impacts been quantified?	Yes / No / I don't know		If yes, go to sub-question 3.21
Sub-question 3.21	Have impacts on air and climate change been quantified?	Yes / No / I don't know		If yes, go to "Air and Climate Change" sheet. Go to sub-question 3.22
Sub-question 3.22	Have impacts on water been quantified?	Yes / No / I don't know		If yes, go to "Water" sheet. Go to sub-question 3.23
Sub-question 3.23	Have impacts on land been quantified?	Yes / No / I don't know		If yes, go to "Land" sheet. Go to sub-question 3.24
Sub-question 3.24	Have impacts on biodiversity been quantified?	Yes / No / I don't know		If yes, go to "Biodiversity" sheet. Go to "Step 4 checks"

Step 4 checks: "Monetary valuation of the negative and/or environmental benefits"		Multiple choice answers	Explanatory notes	Instructions
Question 4.1	Have significant impacts been monetized?	Yes / No / I don't know		If yes, go to question 4.2. If no, go to question 4.5
Question 4.2	What are these monetary values?			Go to question 4.3
Question 4.3	How do they compare with project costs?	Significantly higher / Moderately higher / same-similar / Moderately lower / Significantly lower		Go to question 4.4
Question 4.4	What proportion of the total costs do these represent?			Go to question 4.5
Question 4.5	What would be the costs of any additional measures?	Yes / No / I don't know		Finished. You may wish to provide any additional notes below, if you feel they may be useful.

Impacts to AIR

	Step 3 - further detail	
	Have impacts been identified for the following areas?	What are these impacts? (Only brief information is required here and may only need to be page references to indicate the location of the information)
Air quality in the project area	Yes / No / I don't know	
Air quality: pollutions from urban traffic	Yes / No / I don't know	
Air quality: pollution from industry	Yes / No / I don't know	
Air quality: pollution from other sources	Yes / No / I don't know	
Meteorological condition	Yes / No / I don't know	
Public health	Yes / No / I don't know	
Existing air quality and criticality for public health	Yes / No / I don't know	

Public health impacts linked to construction activities (noise, dust, light etc.)	Yes / No / I don't know	
Public health impacts related to emissions and pollutants	Yes / No / I don't know	
Climate change - mitigation	Yes / No / I don't know	
Greenhouse gas emissions (transport, energy, industry)	Yes / No / I don't know	
Greenhouse gas emissions (agriculture, livestock, forestry)	Yes / No / I don't know	
	Yes / No / I don't know	
	Yes / No / I don't know	
Climate change - adaptation	Yes / No / I don't know	
Climate change vulnerability	Yes / No / I don't know	
Climate resilience	Yes / No / I don't know	
Energy production and use	Yes / No / I don't know	
Energy related emissions: energy efficiency	Yes / No / I don't know	
Energy related emissions : renewable energy	Yes / No / I don't know	
Use of energy sources	Yes / No / I don't know	
Urban transportation	Yes / No / I don't know	
Air emission from urban traffic	Yes / No / I don't know	
Waste production and management	Yes / No / I don't know	
General: versatile waste management measures	Yes / No / I don't know	
Generation of hazardous waste products	Yes / No / I don't know	
Generation of nonhazardous waste products	Yes / No / I don't know	
Chemical risk management	Yes / No / I don't know	
Air based effluents: Methanization of agricultural waste	Yes / No / I don't know	
Air quality impacts associated with SVHC (human health and environmental impacts)	Yes / No / I don't know	
Impact from industries	Yes / No / I don't know	

Improved risk management/avoidance of banned substances	Yes / No / I don't know	
Ozone depletion	Yes / No / I don't know	

Impacts to WATER

	<i>Step 3 - further detail</i>	
	<i>Have impacts been identified for the following areas?</i>	<i>What are these impacts? (Only brief information is required here and may only need to be page references to indicate the location of the information)</i>
Characteristic of water bodies	Yes / No / I don't know	
Rivers: Hydromorphological supporting elements	Yes / No / I don't know	
Rivers: Physio-chemical supporting elements	Yes / No / I don't know	
Rivers: Chemical status	Yes / No / I don't know	
Lakes: Hydromorphological supporting elements	Yes / No / I don't know	
Lakes: Physio-chemical supporting elements	Yes / No / I don't know	
Lakes: Chemical status	Yes / No / I don't know	
Transitional waters: Hydromorphological supporting elements	Yes / No / I don't know	
Transitional waters: Physio-chemical supporting elements	Yes / No / I don't know	
Transitional waters: Chemical status	Yes / No / I don't know	
Coastal waters: Hydromorphological supporting elements	Yes / No / I don't know	
Coastal waters: Physio-chemical supporting elements	Yes / No / I don't know	
Coastal waters: Chemical status	Yes / No / I don't know	
Groundwater bodies: Available groundwater resource	Yes / No / I don't know	
Groundwater dependent surface water bodies	Yes / No / I don't know	
Groundwater dependent terrestrial ecosystems	Yes / No / I don't know	

Groundwater bodies: Saline or other intrusions	Yes / No / I don't know	
Sensible areas/specific situation	Yes / No / I don't know	
Pesticides near to sensitive areas	Yes / No / I don't know	
Storm water risks	Yes / No / I don't know	
Improved drainage for groundwater	Yes / No / I don't know	
Chemical impacts (non-specific)	Yes / No / I don't know	
Chemical pollutants	Yes / No / I don't know	
Release of pollutants linked to the construction, rehabilitation and/or use of infrastructures	Yes / No / I don't know	
Improved risk management/avoidance of banned substances	Yes / No / I don't know	
Waste impacts (non-specific)	Yes / No / I don't know	
Waste water production	Yes / No / I don't know	
Waste management	Yes / No / I don't know	
Ground water contamination linked to waste disposal	Yes / No / I don't know	
Surface water contamination linked to waste disposal	Yes / No / I don't know	
Generation of hazardous waste products	Yes / No / I don't know	
Generation of nonhazardous waste products	Yes / No / I don't know	
Livestock pollutants	Yes / No / I don't know	
Water pollutants linked to construction	Yes / No / I don't know	
Water and sewage treatment	Yes / No / I don't know	
Agricultural water discharge	Yes / No / I don't know	
Radioactive materials	Yes / No / I don't know	
Other impacts (non-specific)	Yes / No / I don't know	
Impacts on quantity and quality of water resource	Yes / No / I don't know	

Water (in)efficiency	Yes / No / I don't know	
Water shortage	Yes / No / I don't know	
Resource related impacts (i.e. modification of water courses)	Yes / No / I don't know	
Diseases	Yes / No / I don't know	
Energy production and (in)efficiency	Yes / No / I don't know	
Unsustainable fishing methods	Yes / No / I don't know	

Impacts to LAND

	Step 3 - further detail	
	Have impacts been identified for the following areas?	What are these impacts? <i>(Only brief information is required here and may only need to be page references to indicate the location of the information)</i>
Characteristic of soil	Yes / No / I don't know	
Geomorphology and geology (incl. surfaces)	Yes / No / I don't know	
Geographic sensitivity	Yes / No / I don't know	
Sensible areas/specific situation	Yes / No / I don't know	
Pesticide use in very sensitive/protected areas (i.e. important to biodiversity- incl. human health)	Yes / No / I don't know	
Humid areas, water banks etc.	Yes / No / I don't know	
Agriculture and forestry	Yes / No / I don't know	
Impacts on greenfield sites	Yes / No / I don't know	
Deforestation	Yes / No / I don't know	
Increased soil erosion	Yes / No / I don't know	
Soil pollution due to use of pesticides	Yes / No / I don't know	
Handling of pesticides and their packaging	Yes / No / I don't know	
Crop protection measures	Yes / No / I don't know	

Agricultural water discharge	Yes / No / I don't know	
Social impacts	Yes / No / I don't know	
Exposure to chemicals	Yes / No / I don't know	
Impacts on food security	Yes / No / I don't know	
Disturbance in local balances between environment and social organization	Yes / No / I don't know	
Occupational health and safety	Yes / No / I don't know	
Structural component impacts (failure of structures such as dams, faulty design)	Yes / No / I don't know	
Nuisance	Yes / No / I don't know	
Change in social habitat	Yes / No / I don't know	
Land use and settlement patterns	Yes / No / I don't know	
Landscape and visual impacts	Yes / No / I don't know	
Electromagnetic radiation	Yes / No / I don't know	
Diseases	Yes / No / I don't know	
Public health impacts linked to construction activities (noise, dust, light etc.)	Yes / No / I don't know	
Urban transportation	Yes / No / I don't know	
Soil pollution from urban transport	Yes / No / I don't know	
Impacts on sensitive areas due to changes in surface water runoff	Yes / No / I don't know	
Environmental impacts linked to construction works (pollutions, dust, hazardous waste management)	Yes / No / I don't know	
Waste management	Yes / No / I don't know	
Versatile waste management measures	Yes / No / I don't know	
Reuse, recycle, use as energy(biomass), or dispose (inc circular economy)	Yes / No / I don't know	

Detection of environmental pollutants	Yes / No / I don't know	
Energy choice of fuels	Yes / No / I don't know	
Energy production and (in)efficiency	Yes / No / I don't know	
Chemicals management	Yes / No / I don't know	
Use/production of substance of very high concern (SVHC)	Yes / No / I don't know	
Improved risk management/avoidance of banned substances	Yes / No / I don't know	
	Yes / No / I don't know	
Contamination/deterioration the quality of soil	Yes / No / I don't know	
Generation of hazardous waste products	Yes / No / I don't know	
Generation of nonhazardous waste products	Yes / No / I don't know	
Livestock pollutants	Yes / No / I don't know	
Policy on emergency procedures (human and environmental)	Yes / No / I don't know	

Impacts to BIODIVERSITY

	Step 3 - further detail	
	Have impacts been identified for the following areas?	What are these impacts? <i>(Only brief information is required here and may only need to be page references to indicate the location of the information)</i>
Characteristic of ecosystems (habitat and species)	Yes / No / I don't know	
Natural habitats	Yes / No / I don't know	
Endemic or restricted-range species	Yes / No / I don't know	
Migratory/congregatory species	Yes / No / I don't know	
Importance to local communities	Yes / No / I don't know	
Genetic diversity	Yes / No / I don't know	
Habitat related to water	Yes / No / I don't know	
Sensible areas/specific situation	Yes / No / I don't know	
High conservation value areas	Yes / No / I don't know	

Highly threatened/unique ecosystem	Yes / No / I don't know	
Vulnerable species	Yes / No / I don't know	
Key scientific value/key evolutionary processes	Yes / No / I don't know	
Agriculture and forestry	Yes / No / I don't know	
Semi-natural habitats	Yes / No / I don't know	
Degraded habitats	Yes / No / I don't know	
Pesticides	Yes / No / I don't know	
Fishing and water management	Yes / No / I don't know	
Collection and release of waste water	Yes / No / I don't know	
Fish fauna	Yes / No / I don't know	
Other impact on biodiversity	Yes / No / I don't know	
Exposure to harmful effects from noise originating from human activity	Yes / No / I don't know	

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