3. Guidelines on biodiversity inclusive Environmental Impact Assessment (EIA)

3.1 Stages in the process

For the purpose of these guidelines, the following definitions is used for environmental impact assessment (Decision VI/7A):

Environmental impact assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. Although legislation and practice vary around the world, the fundamental components of an environmental impact assessment would necessarily involve the following stages:

a. Screening to determine which projects or developments require a full or partial impact assessment study;

b. Scoping to identify which potential impacts are relevant to assess (based on expert knowledge and public involvement), to identify alternative solutions that avoid, mitigate or compensate adverse impacts on biodiversity (including not proceeding with the development, finding alternative designs or sites which avoid the impacts, incorporating safeguards in the design of the project, or providing compensation for adverse impacts), , and finally to derive terms of reference for the impact assessment;

c. Impact analysis and development of alternatives, to predict and identify the likely environmental impacts of a proposed project or development, including the detailed elaboration of alternatives. taking into account inter-related consequences of the project proposal, and the socio-economic impacts;

d. Reporting: the environmental impact statement (EIS) or environmental impact assessment report, including an environmental management plan (EMP), and a non-technical summary for the general audience.

e. Review of the Environmental Impact Statement (EIS), based on the terms of reference (scoping) and public consultation;

f. Decision-making on whether to approve the project or not; and

g. Monitoring, compliance, enforcement and environmental auditing. Monitor whether the predicted impacts and proposed mitigation measures occur as defined in the EMP. Verify the compliance of proponent to the environmental management plan, to ensure that unpredicted impacts or failed mitigation measures are identified and addressed in a timely fashion.

3.2. Biodiversity issues at different stages of environmental impact assessment

(a) Screening

Screening is used to determine which proposals should be subject to impact assessment, to exclude those unlikely to have harmful environmental impacts and to indicate the level of environmental appraisal required. If screening criteria do not include biodiversity measures, there is a risk that proposals with potentially significant impacts on biodiversity will be screened out. The outcome of the screening process is a screening decision.

Since a legal requirement for environmental impact assessment on environmental grounds does not guarantee that biological diversity will be taken into account, consideration should be given to incorporating biodiversity criteria into existing or new screening criteria.

Pertinent questions from a biodiversity perspective. Considering the objectives of the Convention on Biological Diversity, i.e., in particular, conservation, sustainable use and equitable sharing of benefits derived from biological diversity, fundamental questions need to be answered in an environment impact assessment study:

a. Does the intended activity affect the physical environment in such a manner or cause such biological losses that it influences the chance of extinction of cultivars, varieties, populations of species, or the chance of loss of habitats or ecosystems?

b. Does the intended activity surpass the maximal sustainable yield, the carrying capacity of a habitat/ecosystem or the maximum and minimum / allowable disturbance level of a resource, population, or ecosystem?

c. Does the intended activity result in changes to the access to and rights over biological resources?

To facilitate the development of criteria, the questions above have been reformulated for the three levels of diversity, reproduced in appendix 1 below.

Table 5.1 Questions pertinent to screening on biological diversity impacts

Level of diversity	*Biological diversity perspective*	
	Conservation of biological diversity (Non-use values)	*Sustainable use of biodiversity (Use values)*
Genetic diversity (1)	(I) Does the intended activity cause a local loss of varieties/cultivars/breeds of cultivated plants and/or domesticated animals and their relatives, genes or genomes of social, scientific and economic importance?	
Species diversity (2)	(II) Does the intended activity cause a direct or indirect loss of a population of a species?	(III) Does the intended activity affect the sustainable use of a population of a species?
Ecosystem diversity (2)	(IV) Does the intended activity lead to serious damage or total loss of (an) ecosystem(s) or land-use type(s), thus leading to a loss of ecosystem diversity (i.e. the loss of indirect use values and non-use values)?	(V) Does the intended activity affect the sustainable exploitation of (an) ecosystem(s) or land-use type(s) by humans in such manner that the exploitation becomes destructive or non-sustainable (i.e. the loss of direct use values)?

(1) The potential loss of natural genetic diversity (genetic erosion) is extremely difficult to determine, and does not provide any practical clues for formal screening. The issue probably only comes up when dealing with highly threatened, legally protected species which are limited in numbers and/or have highly separated populations (rhinoceros, tigers, whales, etc.), or when complete ecosystems become separated and the risk of genetic erosion applies to many species (the reason to construct so-called eco-ducts across major line infrastructure). These issues are dealt with at species or ecosystem level.

(2) Species diversity: The level at which "population" is to be defined fully depends on the screening criteria used by a country. For example, in the process of obtaining a special status, the conservation status of species can be assessed within the boundaries of a country (for legal protection), or can be assessed globally (IUCN Red Lists). Similarly, the scale at which ecosystems are defined depends on the definition of criteria in a country, and should ideally be defined by using a participative ecosystem approach.

Types of existing screening mechanisms include:

- Positive lists identifying projects requiring environmental impact assessment. A few countries use (or have used) negative lists, identifying those projects not subject to environmental impact assessment. These lists should be reassessed to evaluate their inclusion of biodiversity aspects;
- Expert judgement (with or without a limited study, sometimes referred to as "initial environmental examination" or "preliminary environmental assessment"). Biodiversity expertise should be included in expert teams; and
- A combination of a positive list and expert judgement; for a number of activities an environmental impact assessment is more appropriate, for others an expert judgement may be desirable to determine the need for an environmental impact assessment.

The result of a screening decision can be that:

- An environmental impact assessment is required;
- A limited environmental study is sufficient because only limited environmental impacts are expected; the screening decision is based on a set of criteria with quantitative norms or threshold values;
- There is still uncertainty whether an environmental impact assessment is required and an initial environmental examination has to be conducted to determine whether a project requires environmental impact assessment or not, and
- The project does not require an environmental impact assessment.

Biodiversity inclusive screening criteria may relate to:

- categories of activities, including thresholds referring to magnitude of the activity and/or size of the intervention area, duration and frequency, or to
- a magnitude of biophysical change that is caused by the activity, or to
- maps indicating areas important for biodiversity, often with legal status.

A suggested approach to the development of biodiversity-inclusive screening criteria, combining the above types of criteria, can be as follows (see annex 1 for the actual screening criteria). The suggested approach is based on the combination of geographically defined areas with valued biodiversity (including valued ecosystem services), and a description of activities creating so-called drivers of change of biodiversity.

If possible, integrate this activity with the development of a National Biodiversity Strategy and Action Plan. This process can generate valuable information such as conservation priorities and targets which can guide further development of environmental impact assessment screening criteria.

Step 1: According to the principles of the ecosystem approach (transparent, participative), a biodiversity screening map is designed, indicating important ecosystem services (replacing the concept of sensitive areas – see annex 2). The map is based on expert judgement and has to be formally approved.

Suggested categories of geographically defined areas and their relation to impact assessment are:

- Protected areas: depending on legal arrangements in a country these can be defined as "no go areas", i.e. no human intervention allowed at all, or as areas where impact assessment at an appropriate level of detail is always required.
- Areas with key ecosystem services where impact assessment at an appropriate level of detail is always required. Examples can be extractive reserves, indigenous people's territories, wetlands, fish breeding grounds, highly erodable soils protected by vegetation (e.g. steep slopes), relatively undisturbed or characteristic habitat, etc.
- Areas with other relevant ecosystem services (such as flood storage areas, groundwater recharge areas, areas with valued landscape quality, etc.): depending on the screening system in place, the need for impact assessment and/or the level of assessment is to be determined.
- All other areas: no impact assessment required from a biodiversity perspective (need for EIA from other perspectives may still be valid).

Step 2: Define activities for which impact assessment may be required from a biodiversity perspective. The activities are characterised by the following direct drivers of change:

- Extractive activities or change of land-use: EIA always required, regardless the area where the activity is located - define thresholds for level of assessment in terms of surface (or underground) area affected.
- Fragmentation, usually related to infrastructure: EIA always needed, regardless where the activity is located – define thresholds for level of assessment in terms of the length of the proposed infrastructural works.
- Emissions and/or effluents (including chemical or thermal pollution and noise) - relate level of assessment to the ecosystem services map.
- Change in ecosystem composition, ecosystem structure, or key ecosystem processes responsible for the maintenance of ecosystems and ecosystem services (see aspect of biodiversity in chapter 2 and annex 3 for an indicate listing) - relate level of assessment to ecosystem services map.

Note that these criteria only relate to biodiversity and serve as an add-on in situations where biodiversity has not been fully covered by the existing screening criteria.

Determining norms or threshold values is partly a technical and partly a political process of which the outcome may vary for countries and for ecosystems. The technical process should at least provide a description of:

(a) Categories of activities that create direct drivers of change (extraction, change of land-use, fragmentation, emissions and/or effluents, or change in ecosystem composition, structure or key functions), taking into account characteristics such as: type or nature of activity, magnitude, extent/location, timing, duration, reversibility/irreversibility, likelihood, and significance; possibility of interaction with other activities or impacts;

(b) Where and when: the area of influence of the mentioned direct drivers of change can be modelled or predicted; the moment and duration of influence can be similarly defined;

(c) A map of valued ecosystem services (including maintenance of biodiversity itself) on the basis of which decision makers can define levels of protection or conservation measures for each defined area. This map is the experts' input in the definition of categories on the biodiversity screening map referred to above under step 1.

(b) Scoping

Scoping narrows the focus of the broad issues found to be significant during the screening stage. It is used to derive terms of reference (sometimes referred to as guidelines) for the environmental impact assessment study. Scoping also enables the competent authority (or environmental impact assessment professionals in countries where scoping is voluntary):

(a) To guide study teams on significant issues and alternatives to be assessed, clarify how they should be examined (methods of prediction and analysis, depth of analysis), and according to which guidelines and criteria;

(b) To provide an opportunity for stakeholders to have their interests taken into account in the environmental impact assessment;

(c) To ensure that the resulting environmental impact statement is useful to the decision maker and is understandable to the public.

During the scoping phase, promising alternatives can be identified for in-depth consideration during the environmental impact assessment study.

Consideration of mitigation measures. The purpose of mitigation in environmental impact assessment is to look for better ways to implement project activities so that negative impacts of the activities are avoided or reduced to acceptable levels and the environmental benefits are enhanced, and to make sure that the public or individuals do not bear costs which are greater than the benefits which accrue to them.

Remedial action can take several forms, i.e. avoidance (or prevention), mitigation (including restoration and rehabilitation of sites), and compensation (often associated with residual impacts after prevention and mitigation). Apply the 'positive planning approach', where avoidance has priority and compensation is used as a last resort measure. Avoid "excuse" type compensation, without first having seriously looked into possibilities for avoidance or mitigation measures. Look for opportunities to positively enhance biodiversity.

Acknowledge that compensation will not always be possible: there will still be cases where it is appropriate to say 'no' to development proposals on grounds of irreversible damage to biodiversity.

Practical evidence with respect to mitigation suggests that:

(a) Timely and ample attention to mitigation and compensation, addressing contents as well as the interaction with society, will largely reduce the risk of negative publicity, public opposition and delays;

(b) Mitigation requires joint effort of engineers and ecologists;

(c) Potential mitigation or compensation measures have to be included in an impact study in order to assess their feasibility; consequently they have to identified during the scoping stage;

(d) In project planning, it has to be kept in mind that it takes time for effects to become apparent and that the development of compensation measures is often slow.

The following sequence of questions provides an example of the kind of information that should be asked for in the terms of reference of an impact study if from the project screening is has become apparent that the proposed activity has probable consequences for biodiversity[1].

(a) Describe the type of project, and define each different sub-activity in terms of its nature, magnitude, location, timing, duration and frequency;

(b) Define possible alternatives, including "no net biodiversity loss" or "biodiversity restoration" alternatives;

(c) Describe expected biophysical changes (in soil, water, air, flora, fauna) resulting from proposed activities or induced by any socio-economic changes caused by the activity;

(d) Determine the spatial and temporal scale of influence of each biophysical change, identifying effects on connectivity between ecosystems, and potential cumulative effects;

(e) Describe ecosystems and land-use types potentially influenced by the biophysical changes identified (lying within the range of influence of biophysical changes);

(f) Determine for each of these ecosystem or land-use types if biophysical changes are likely have biodiversity impacts in terms of composition (what is there), structure (how is biodiversity organized in time and space), or function (how is biodiversity created and/or maintained);

(g) For the affected areas, collect available information on baseline conditions and any anticipated trends in biodiversity in the absence of the proposal;

(h) Identify in consultation with stakeholders the current and potential ecosystem services provided by the affected ecosystems or land-use types and determine the values these functions represent for society;

(i) Determine which of these services will be significantly affected by the proposed project, taking into account mitigation measures; highlight any irreversible impacts;

(j) Define possible measures to avoid, minimize or compensate for significant biodiversity damage or loss, making reference to any legal requirements;

(k) Provide information on the severity of residual impacts, i.e. apply weights to the expected impacts for the alternatives considered. Weigh expected impacts to a reference situation, which may be the existing situation, a historical situation, or an external reference situation;

(l) Identify necessary surveys to gather information required to support decision making; identify important gaps in knowledge;

(m) Provide details on required methodology and timescale.

The expected impacts of the proposed activity, including identified alternatives, should be compared with the selected reference situation and with the autonomous development (what will happen with biodiversity over time if the project is not implemented). There should be awareness that doing nothing may in some cases also have significant effects on biological diversity, sometimes even worse than the impacts of the proposed activity (e.g. projects counteracting degradation processes).

[1] For a conceptual explanation behind this sequence of steps, see annex 4

An analysis of current impact assessment practise has provided a number of practical recommendations when addressing biodiversity related issues:

(a) Apart from the present focus on protected species and protected areas, further attention is needed for (i) sustainable use of ecosystem services, (ii) ecosystem level diversity, and (iii) non-protected biodiversity.

(b) The terms of reference should be unambiguous, specific and compatible with the ecosystem approach; too often the ToR are too general and impractical;

(c) In order to provide a sound basis for assessing the significance of impacts, baseline conditions must be defined and understood and quantified where possible;

(d) Field surveys, quantitative data, meaningful analyses, and a broad perspective are important elements when assessing biodiversity impacts. Potential indirect and cumulative impacts should be better assessed.

(e) Alternatives and/or mitigation measures must be identified and described in detail, including an analysis of their likely success and realistic potential to offset adverse project impacts.

(f) Guidance for scoping on biodiversity issues in EIA needs to be developed at country-level.

(g) Capacity development is needed to effectively represent biodiversity issues in the scoping stage; this will result in better guidelines for the EIA study.

(c) Impact analysis and development of alternatives

Environmental impact assessment should be an iterative process of assessing impacts, redesigning alternatives and comparison. The main tasks of impact analysis and assessment are:

(a) Refinement of the understanding of the nature of the potential impacts identified during screening and scoping and described in the terms of reference. This includes the identification of indirect and cumulative impacts, and of the likely causes of the impacts (impact analysis and assessment). Identification and description of relevant criteria for decision-making can be an essential element of this period;

(b) Review and redesign of alternatives; consideration of mitigation measures; planning of impact management; evaluation of impacts; and comparison of the alternatives; and

(c) Reporting of study results in an environmental impact statement (EIS) or EIA Report.

Assessing impacts usually involves a detailed analysis of their nature, magnitude, extent and effect, and a judgement of their significance, i.e., whether the impacts are acceptable to stakeholders, require mitigation, or are just unacceptable.

Biodiversity information available is usually limited and descriptive and cannot be used as a basis for numerical predictions. There is a need to develop or compile biodiversity criteria for impact evaluation and to have measurable standards or objectives against which the significance of individual impacts can be evaluated. The priorities and targets set in the national biodiversity action plan and strategy process can provide guidance for developing

these criteria. Tools will need to be developed to deal with uncertainty, including criteria on using risk assessment techniques, precautionary approach and adaptive management.

Practical lessons with respect to the study process provide guidance:

(a) Allow for enough survey time to take seasonal features into account.

(b) Focus on processes and services which are critical to human wellbeing and the integrity of ecosystems. Explain the main risks and opportunities for biodiversity.

(c) Take an ecosystem approach and consult with relevant stakeholders. Address any request from stakeholders for further information and/or investigation in a serious manner; this not necessarily imply that all requests need to be honoured.

(d) Consider the full range of factors affecting biodiversity. These include direct drivers of change associated with a proposal (eg land conversion, vegetation removal, emissions, disturbance, introduction of alien and genetically modified species, etc) and indirect drivers of change which are harder to quantify, including demographic, economic, socio-political, cultural and technological processes or interventions.

(e) Evaluate impacts of alternatives with reference to the baseline situation. Compare against thresholds and objectives for biodiversity. Use NBSAPs and other conservation reports for information and objectives.

(f) Take account of cumulative threats and impacts resulting either from repeated impacts of projects of the same or different nature over space and time, and/or from proposed plans, programmes or policies.

(g) Biodiversity is influenced by cultural, social, economic and biophysical factors. Cooperation between different specialists in the IA team is thus essential, as is the integration of findings which have bearing on biodiversity.

(h) Provide insight into cause - effect chains. (Also provide arguments why certain intervention – effect chains do NOT need to be studied.)

(i) If possible, quantify the changes in quality and amount of biodiversity. Explain the expected consequences of any biodiversity losses associated with the proposal, including the costs of replacing biodiversity services if they will be damaged by a proposal.

(j) Indicate the legal issues that create the boundary conditions for decision making. However, it is observed that impact studies are often directed by legal obligations. The aim of impact assessment is the provision of information for good decision making. By leapfrogging from expected impact to legal requirement, one runs the risk of losing relevant information on those biodiversity issues that cannot be caught under the legal umbrella, but which may represent valued elements from a biological or from a social perspective.

BOX: PARTICIPATION

Impact assessment is concerned with (i) information, (ii) participation and (iii) transparency of decision making. Public involvement consequently is a prerequisite for effective EIA and can take place at different levels: informing (one-way flow of information), consulting (two-way flow of information), or "real" participation (shared analysis and assessment). In all stages of EIA public participation is relevant. The legal requirements for and the level of participation differ among countries, but it is generally accepted that public consultation at the scoping and review stage are minimally required; participation during the assessment study is generally acknowledged to enhance the quality of the process.

With respect to biodiversity, relevant stakeholders in the process are:

- Beneficiaries of the project - target groups making use of or putting a value to known ecosystem services which are purposefully enhanced by the project;
- Affected people – i.e. those people that experience, as a result of the project, intended or unintended changes in ecosystem services that they value;
- General stakeholders – i.e. formal or informal institutions and groups representing either affected people or biodiversity itself.

There is a number of potential constraints to effective public participation. These include:

- Poverty: involvement means time spent away from income-producing tasks;
- Rural settings: increased distances make communication more difficult and expensive;
- Illiteracy: or lack of command of non-local languages, can inhibit representative involvement if print media are used;
- Local values/culture: behavioural norms or cultural practice can inhibit involvement of some groups, who may not feel free to disagree publicly with dominant groups (e.g. women versus men);
- Languages: in some areas a number of different languages or dialects may be spoken, making communication difficult;
- Legal systems: may be in conflict with traditional systems, and cause confusion about rights and responsibilities for resources;
- Interest groups: may have conflicting or divergent views, and vested interests;
- Confidentiality: can be important for the proponent, who may be against early involvement and consideration of alternatives.

(d) Reporting: the environmental impact statement (EIS)

The environmental impact statement consist of a (i) technical report with annexes, (ii) an environmental management plan, providing detailed information on how measures to avoid, mitigate or compensate expected impacts are being implemented, managed and monitored, and (iii) a non-technical summary.

The environmental impact statement is designed to assist:

(i) The proponent to plan, design and implement the proposal in a way that eliminates or minimizes the negative effect on the biophysical and socio-economic

environments and maximizes the benefits to all parties in the most cost effective manner;

(ii) The Government or responsible authority to decide whether a proposal should be approved and the terms and conditions that should be applied; and

(iii) The public to understand the proposal and its impacts on the community and environment and provide an opportunity for comments on the proposed action for consideration by decision makers. Some adverse impacts may be wide ranging and have effects beyond the limits of particular habitats/ecosystems or national boundaries. Therefore, environmental management plans and strategies contained in the environmental impact statement should consider regional and transboundary impacts, taking into account the ecosystem approach. The inclusion of a non-technical summary of the EIA, understandable to the interested general audience, is strongly recommended.

(e) Review of the environmental impact statement

The purpose of review of the environmental impact statement is to ensure that the information for decision makers is sufficient, focused on the key issues, scientifically and technically accurate, and if the likely impacts are acceptable from an environmental viewpoint and the design complies with relevant standards and policies, or standards of good practice where official standards do not exist.

The review should also consider whether all of the relevant impacts of a proposed activity have been identified and adequately addressed in the environmental impact assessment. To this end, biodiversity specialists should be called upon for the review and information on official standards and/or standards for good practice to be compiled and disseminated.

Public involvement, including minority groups, is important in various stages of the process and particularly at this stage. The concerns and comments of all stakeholders are considered and included in the final report presented to decision makers. The process establishes local ownership of the proposal and promotes a better understanding of relevant issues and concerns.

Review should also guarantee that the information provided in the environmental impact statement is sufficient for a decision maker to determine whether the project is compliant with or contradictory to the objectives of the Convention on Biological Diversity.

(f) Decision-making

Decision-making takes place throughout the process of environmental impact assessment in a incremental way from the screening and scoping stages to decisions during data-collecting and analysis, and impact prediction to making choices between alternatives and mitigation measures and finally the decision between refusal or authorization of the project.

Biodiversity issues should play a part in decision-making throughout. This final decision is essentially a political choice about whether or not the proposal is to proceed, and under what conditions. If rejected, the project can be redesigned and resubmitted. It is desirable that the proponent and the decision-making body are two different entities.

The precautionary approach should be applied in decision-making in cases of scientific uncertainty about risk of significant harm to biodiversity. As scientific certainty improves, decisions can be modified accordingly.

Avoid putting conservation goals against development goals; balance conservation with sustainable use for economically viable, and socially and ecologically sustainable solutions.

(g) Monitoring, compliance, enforcement and environmental auditing

Monitoring and auditing are used to see what actually occurs after project implementation has started and whether the proponent is compliant with the environmental management plan (EMP). The EMP can be a separate document, but is considered part of the environmental impact statement; an EMP usually is required to obtain a permission to implement the project.

Management systems and programmes, including clear management targets (or Limits of Acceptable Change) and appropriate monitoring, should be set in place to ensure that mitigation is effectively implemented, unforeseen negative effects or trends are detected and addressed, and expected benefits (or positive developments) are achieved as the project proceeds. Provision should be made for emergency response measures and/or contingency plans where upset or accident conditions could threaten biodiversity.

Monitoring and evaluation focussed on counting of species and measuring of surface areas only does not provide sufficient information; understanding and monitoring the mechanisms behind these changes leads to better understanding of the effects of the intervention and the actual results of mitigation and/or compensation.

The results of monitoring provide information for periodic review and alteration of environmental management plans, and for optimizing environmental protection through good practice at all stages of the project. Biodiversity data generated by environmental impact assessment should be made accessible and useable by others and should be linked to biodiversity assessment processes being designed and carried out under the Convention on Biological Diversity.

Provision is made for regular auditing in order to verify the proponents compliance with the EMP, and to assess the need for adaptation of the EMP (usually including the proponents' license). An environmental audit is an independent examination and assessment of a project's (past) performance, is part of the evaluation of the environmental management plan and contributes to the enforcement of EIA approval decisions.

Implementation of activities described in the EMP and formally regulated in the proponent's environmental license in practise highly depends on actual enforcement of formal procedures. It is commonly found that lack of enforcement leads to reduced compliance and inadequate implementation of EMPs. Competent authorities are thus requested to seriously enforce pertinent impact assessment regulations, when formal regulations are in place.

ANNEX 1: SCREENING CRITERIA FOR BIODIVERSITY INCLUSIVE EIA

This is a suggested outline of a set of screening criteria, to be elaborated on country level. It only deals with biodiversity criteria and thus is an add-on to already existing screening criteria. The present criteria are a highly simplified version of the COP VI guidelines annex.

Category A: Environmental impact assessment mandatory for:

- Activities in protected areas (define type and level of protection);
- Extractive activities or activities leading to a change of land-use occupying or directly influencing a minimal area (land or water, above or underground; threshold to be defined);
- Creation of line infrastructure that lead to fragmentation of habitats over a minimal length (threshold to be defined);
- Activities resulting in emissions and/or effluents (including chemical or thermal pollution and noise) in areas providing key ecosystem services (areas to be defined)[2];
- Activities leading to changes in ecosystem composition, ecosystem structure or ecosystem functions[3] responsible for the maintenance of ecosystems and ecosystem services in areas providing key ecosystem services (areas to be defined).

Category B: The need for, or the level of environmental impact assessment, is to be determined for:

- Activities resulting in emissions and/or effluents (including chemical or thermal pollution and noise) in areas providing other relevant ecosystem services (areas to be defined);
- Activities leading to changes in ecosystem composition, ecosystem structure, or ecosystem functions responsible for the maintenance of ecosystems and ecosystem services in areas providing other relevant ecosystem services (areas to be defined);
- Extractive activities, activities leading to a change of land-use, and creation of line infrastructure below the Category A threshold, in areas providing key and other relevant ecosystem services (areas to be defined)

[2] For a non-exhaustive list of ecosystem services, see annex 2
[3] For examples of these aspect of biodiversity, see annex 3

ANNEX 2: INDICATIVE LIST OF ECOSYSTEM SERVICES

Provisioning services: harvestable goods

Natural production:

- timber
- firewood
- grasses (construction and artisanal use)
- fodder & manure
- harvestable peat
- secondary (minor) products
- harvestable bush meat
- fish and shellfish
- drinking water supply
- supply of water for irrigation and industry
- water supply for hydroelectricity
- supply of surface water for other landscapes
- supply of groundwater for other landscapes
- genetic material

Nature-based human production

- crop productivity
- tree plantations productivity
- managed forest productivity
- rangeland/livestock productivity
- aquaculture productivity (freshwater)
- mariculture productivity (brackish/saltwater)

Regulating services responsible for maintaining natural processes and dynamics

Land-based regulating services

- decomposition of organic material
- natural desalinization of soils
- development / prevention of acid sulphate soils
- biological control mechanisms
- pollination of crops
- seasonal cleansing of soils
- soil water storage capacity
- coastal protection against floods
- coastal stabilization (against accretion / erosion)
- soil protection
- suitability for human settlement
- suitability for leisure and tourism activities
- suitability for nature conservation
- suitability for infrastructure

Water related regulating services

- water filtering
- dilution of pollutants
- discharge of pollutants
- flushing / cleansing
- bio-chemical/physical purification of water
- storage of pollutants
- flow regulation for flood control
- river base flow regulation
- water storage capacity
- ground water recharge capacity
- regulation of water balance
- sedimentation / retention capacity
- protection against water erosion
- protection against wave action
- prevention of saline groundwater intrusion
- prevention of saline surface-water intrusion
- transmission of diseases
- suitability for navigation
- suitability for leisure and tourism activities
- suitability for nature conservation

AIR-RELATED REGULATING SERVICES

- filtering of air
- carry off by air to other areas
- photo-chemical air processing (smog)
- wind breaks
- transmission of diseases
- carbon sequestration

Biodiversity-related regulating services

- maintenance of genetic, species and ecosystem composition
- maintenance of ecosystem structure
- maintenance of key ecosystem processes for creating or maintaining biological diversity

Cultural services providing a source of artistic, aesthetic, spiritual, religious, recreational or scientific enrichment, or nonmaterial benefits.

Supporting services necessary for the production of all other ecosystem services

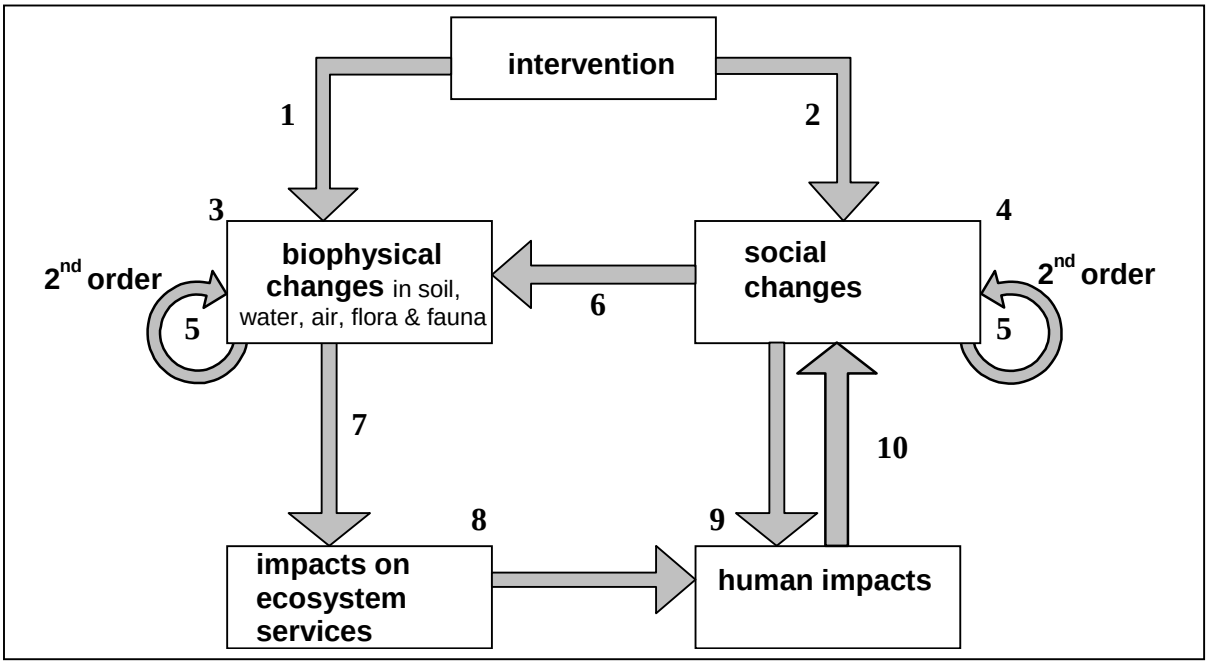
- soil formation,
- nutrients cycling
- primary production.
- evolutionary processes

ANNEX 3: ASPECT OF BIODIVERSITY: COMPOSITION, STRUCTURE, AND ECOSYSTEM FUNCTION

Composition	**Influenced by:**
Minimal viable population of: (a) legally protected varieties/cultivars/breeds of cultivated plants and/or domesticated animals and their relatives, genes or genomes of social, scientific and economic importance; (b) legally protected species; (c) migratory birds, migratory fish, species protected by CITES; (d) non-legally protected, but threatened species; species which are important in local livelihoods and cultures.	- selective removal of one or a few species by fisheries, forestry, hunting, collecting of plants (including living botanical and zoological resources); - fragmentation of their habitats leading to reproductive isolation; - introducing living modified organisms that may transfer transgenes to varieties / cultivars / breeds of cultivated plants and/or domesticated animals and their relatives; - disturbance or pollution; - habitat alteration or reduction; - introduction of (non-endemic) predators, competitors or parasites of protected species.
Structure	**Influenced by:**
<u>Changes in spatial or temporal structure</u>, at the scale of relevant areas, such as: (a) legally protected areas; (b) areas providing important ecosystem services, such as (i) maintaining high diversity (hot spots), large numbers of endemic or threatened species, required by migratory species; (ii) services of social, economic, cultural or scientific importance; (iii) or supporting services associated with key evolutionary or other biological processes.	Effects of human activities that work on a similar (or larger) scale as the area under consideration. For example, by emissions into the area, diversion of surface water that flows through the area, extraction of groundwater in a shared aquifer, disturbance by noise or lights, pollution through air.etc.
<u>Foodweb structure and interactions</u>. Species or groups of species perform certain roles in the foodweb (functional groups); changes in species composition may not necessarily lead to changes in the foodweb as long as roles are taken over by other species.	All influences mentioned with *composition* may lead to changes in the foodweb, but only when an entire role (or functional group) is affected. Specialised ecological knowledge is required.
<u>Presence of keystone species</u>: these are often species that singularly represent a given functional type (or role) in the foodweb.	All influences mentioned with composition that work directly on keystone species. This is a relatively new, but rapidly developing field of ecological knowledge. Examples are: - sea otters and kelp forest - elephants and African savannah - starfish in intertidal zones - salmon in temperate rainforest - tiger shark in some marine ecosystems - beaver in some freshwater habitats - black-tailed prairie dogs and prairie

Key processes (some examples only)	**Influenced by**
Sedimentation patterns (sediment transport, sedimentation, and accretion) in intertidal systems (mangroves, mudflats, seagrass beds)	- reduced sediment supply by damming of rivers; interruption of littoral drift by seaward structures
Plant-animal dependency for pollination, seed dispersal, nutrient cycling in tropical rainforests	- selective removal of species by logging, collecting or hunting
Soil surface stability and soil processes in montane forests	- imprudent logging leads to increased erosion and loss of top soil
Nutrient cycling by invertebrates and fungi in deciduous forests	- soil and groundwater acidity by use of agrochemicals.
Plant available moisture in non-forested, steeply sloping mountains	- overgrazing and soil compaction lead to reduced available soil moisture
Fire and grazing by herbivorous mammals in savannahs	- cattle ranching practises
Available nutrients and sunlight penetration in freshwater lakes	- inflow of fertilizers and activities leading to increased turbidity of water (dredging, emissions)
Hydrological regime in floodplains, flooded forests and tidal wetlands	- changes in river hydrology or tidal rhythm by hydraulic infrastructure or water diversions
Permanently waterlogged conditions in peat swamps and acid-sulphate soils	- drainage leads to destruction of vegetation (and peat formation process), oxidisation of peat layers and subsequent soil subsidence; acid sulphate soils rapidly degrade when oxidised
Evaporation surplus in saline / alkaline lakes	- outfall of drainage water into these lakes changes the water balance
Tidal prism and salt/freshwater balance in estuaries	- infrastructure creating blockages to tidal influence; changes in river hydrology change the salt balance in estuaries.
Hydrological processes like vertical convection, currents and drifts, and the transverse circulation in coastal seas	- coastal infrastructure, dredging.

ANNEX 4: CONCEPTUAL FRAMEWORK FOR SCOPING



Physical and social (and economic) interventions (1 & 2 in the figure above) lead to biophysical (3) and social changes (4), each of these potentially leading to higher order changes (5). Some social changes may lead to biophysical changes (6). Within their range of influence and depending on the type of ecosystem under influence (7), biophysical changes may influence different aspects of biodiversity (8). If these impacts are significant this has an impact on the ecosystem services provided by biodiversity. Impacts on ecosystem services will lead to a change in the valuation of these services by various stakeholders in society (9). People may respond to these changes in the value of ecosystem services and act accordingly, thus leading to new social changes (10).

The elements that should appear in the terms of reference of an impact assessment when the proposed activity is expected to have consequences for biodiversity are derived from the conceptual framework above. They relate to this framework in the following manner:

a) Describe type of project – relates to the intervention 1 and 2 in the above figure;
b) Define alternatives – relates to the intervention 1 and 2;
c) Describe direct and induced biophysical changes – relates to steps 4, 5 and 6;
d) Spatial and temporal scale of influence – relates to step 7;
e) Describe area under influence – step 7;
f) Impacts on composition, structure or function of ecosystem – relates to step 8;
g) Autonomous development – step 8
h) Ecosystem services – step 9
i) Impact prediction – step 9

The following elements j and k are deal with the identification of mitigation measures and how to deal with residual impacts. These can be considered as an iteration of the above framework, trying to maximise beneficial impacts, and to minimise unwelcome impacts.