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How to consider biodiversity in an EIA process? Example of Ljusne harbour project in Sweden

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Hur beakta biologisk mångfald i en MKB-process? Exempel från projektet Ljusne hamn i Sverige

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ABSTRACT

Biodiversity loss continues worldwide and one of the ways to reduce it could be Environmental Impact Assessment (EIA). However, present biodiversity consideration in EIAs has lacks. Thus this thesis aims at investigating this problem worldwide and with a focus on Sweden. The main inconsistencies found are Sweden's problem with article 14 of Convention on Biological Diversity; the general confusion with biodiversity definition used by EU, national legislation and EIAs, as there is no single one; and the variety of frameworks used in treating biodiversity in EIA processes. It is argued here for a new framework to be applied in EIAs, which is presented as biodiversity concept matrix with 4 levels (landscape, ecosystem, species and genetic diversity) and 3 attributes of biodiversity (composition, structure and processes). The purpose of this matrix is to be a common tool, which would help to properly present and evaluate biodiversity during the EIA process and which could be used by all EIA participants. Ljusne harbour project in the municipality of Söderhamn, Sweden was chosen to test this framework in practise. Besides this, interviews have been conducted among people working with EIAs within different organisations in Sweden in order to reflect their opinion on biodiversity consideration in EIA processes. The knowledge collected from the Ljusne harbour project and interviewees suggest that biodiversity matrix could be the missing instrument for a proper biodiversity consideration in EIA processes.

Key words: EIA, biodiversity matrix, biodiversity levels, Ljusne harbour, biodiversity consideration.

SAMMANFATTNING

Förlusten av biologisk mångfald fortsätter i hela världen och ett sätt för att minska denna förlust kan vara genom miljökonsekvensbeskrivning (MKB). Likväl, behandling av biologisk mångfald i MKB visar ofta på stora brister. Den här avhandlingen syftar till att undersöka det här problemet i världen och med fokus på Sverige. En av de viktigaste bristerna för Sverige är att inte uppfylla artikel 14 i konventionen om biologisk mångfald. Ett stort problem är också att det inte finns en gemensam definition av biologisk mångfald som används av EU, i nationell lagstiftning respektive i MKB-processer. Jag argumenterar här för ett nytt ramverk för biologisk mångfald att tillämpas i MKB-processer. Ramverket består av en matris av konceptet biologisk mångfald med fyra nivåer (landskap, ekosystem, arter och genetisk mångfald) och 3 attribut (komposition, struktur och processer). Ett mål med denna matris är att vara ett gemensamt verktyg som skulle hjälpa till att presentera och utvärdera den biologiska mångfalden under MKB-processen och som kan användas av alla MKB-deltagare. Projektet utbyggnaden av Ljusne hamn i Söderhamns kommun valdes för att testa denna matris i praktiken. Intervjuer har också genomförts med tjänstemän som arbetar med MKB inom olika organisationer i Sverige för att avspegla deras åsikt om behandling av biologisk mångfald i MKB processer och undersöka om matrisens tillämpbarhet i sådana processer. Den kunskap som samlades in från Ljusne hamn projektet och resultatet från intervjuerna tyder på att matrisen för konceptet biologisk mångfald kan vara det saknade instrument för att biologisk mångfald på ett tillfredsställande sätt ska kunna beaktas i MKB-processer.

Nyckelord: MKB, matris av biologisk mångfald, biologisk mångfald nivåer, Ljusne hamn, behandling av biologisk mångfald.

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To continue, I appreciate the examples of EIA cases, given by Åsa Heiter from Swedish University of Agricultural Sciences.

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ABBREVIATIONS

BOD – Biological Oxygen Demand

CAB – County Administrative Board

CBD – Convention on Biological Diversity

EC – European Commission

EIA - Environmental Impact Assessment

EPA – Swedish Environmental Protection Agency

EU – European Union

IUCN – The International Union for Conservation of Nature

LOWP - Ljusne Offshore Wind Port

MKB - Miljökonsekvensbeskrivning (in Swedish)

SCI - Sites of Community Interest

SEA – Strategic Environmental Assessment

SLU - Swedish University of Agricultural sciences

SPA - Special Protected Areas

UN – United Nations

WPD – WPD think energy (company)

1. INTRODUCTION

Biological diversity (biodiversity) is one of the most important resources on Earth. Together with water, sun and soil it provides humanity with food, shelter, medicine and many other ecosystem services (Slootweg et al., 2006). However, biodiversity is recently facing a big challenge with mankind rapidly threatening its existence. Even with the many different conventions and agreements the world has signed and ratified so far, the loss of biodiversity continues, indicating that the target[1] to reduce it till 2010, set by the United Nations, was not met.

According to the UN's 3rd Global Biodiversity Outlook the main five pressures on biodiversity are habitat change, overexploitation, pollution, invasive alien species and climate change (SCBD, 2010). Considering them properly in the development process would be an important step towards reducing biodiversity loss. This thesis work will try to enlighten how biodiversity could be respected with a continuous development. How can natural environment and human developments flourish together with the least environmental cost? This is one of the tasks of Environmental Impact Assessment (EIA). However, even though all EIA processes are supposed to pay attention to biodiversity, the truth is, they lack quality in this field as the level of consideration differs very much between projects, countries and habitats (Peck, 1998, Gontier et al., 2006, Sandström, 2008). The following work is seeking to explore how biodiversity is defined and treated in EIA processes and to find a solution for a proper biodiversity consideration in EIAs looking at a much broader perspective of biodiversity concept. As an exemplifying EIA project for testing a new biodiversity framework is the Ljusne Orrskär South harbour (further abbreviated as Ljusne harbour) development project in Sweden.

EIA itself is a broad concept often associated with sustainability (Bruhn-Tysk and Eklund, 2002), environment, urban sprawl, biodiversity, etc. It could be defined as a process assessing possible environmental impacts caused by a certain project, including both positive and negative effects on socioeconomics, culture, and human health (Kolhoff et al., 2010). Another definition states that it is "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made" (IAIA and IEA, 1999).

[1] "to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth" SCBD 2010. Global Biodiversity Outlook 3. Montréal: Secretariat of the Convention on Biological Diversity.

According to the Swedish Environmental Code (SFS, 1998:808), the purpose of an EIA is "to establish and describe the direct and indirect impact of a planned activity or measure on biological diversity, human population, public health, animals, plants, land, water, air, climate factors, material resources, the landscape, built-up areas, ancient and other culture remains and their intermutual relations to each other"[2]. Another purpose is to "enable an overall assessment to be made of this impact on human health and the environment"(*Ibid.*).

Sweden has been dealing with EIA projects since 1981, when it was included in Environmental Protection Act (Tyskeng, 2006). Swedish requirements for an EIA rise from three official documents: the Convention on Biological Diversity (CBD), EU directives on impact assessments (85/337/EEC, 2001/42/EC) and Swedish law (Swedish Environmental Code). All three of them reflect biodiversity issue in EIA processes. However, biodiversity is not fully considered in EIAs and Sweden is struggling with its compliance with article 14 in CBD (de Jong et al., 2004, EPA, 2007, Sandström, 2008).

The definition of biodiversity used in this work is the one described in CBD with an addition of the landscape level. This convention states that "biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems" (UNEP, 1992).

The main problem with biodiversity in EIAs is that most of them rely on a much narrower concept of biodiversity, which often includes only a fraction of biodiversity, frequently it being a species level (IUCN and ICMM, 2003, Brownlie et al., 2006). Even with the increasing amount of those with ecosystem level considered, landscape as a scale is not yet common in biodiversity considerations in EIAs. As the highest level of biodiversity, landscape scale is very important to pay attention to within a planning process. Indeed, it includes all other biodiversity levels and shows the full picture of both nature and people persisting together. Thus, looking at the landscape level may help to identify the actual role of an ecosystem among other ones. To exemplify, ecosystem level assessment may focus on a single valuable ecosystem, which, being evaluated within a landscape level, might be completely isolated by the residential development

[2] Translated by Ulf G. Sandström from Swedish Environmental Code, Chapter 6 § 12:6 - "en beskrivning av den betydande miljöpåverkan som kan antas uppkomma med avseende på biologisk mångfald, befolkning, människors hälsa, djurliv, växtliv, mark, vatten, luft, klimatfaktorer, materiella tillgångar, landskap, bebyggelse, forn- och kulturlämningar och annat kulturarv samt det inbördes förhållandet mellan dessa miljöaspekter". SFS 1998:808. Svensk författningssamling. Miljöbalk (1998:808). *In:* MILJÖDEPARTEMENTET (ed.). Stockholm, Sweden: Sveriges Riksdag.

and thus be already lost from a conservative point of view (Peck, 1998). Genetic biodiversity level is lacking attention in EIAs as well. This level may be worth considering not only in threatened species' cases but also in the more common species, which could be much affected by the project if they had a low genetic diversity and thus would not be able to resist or adapt to the changes of their habitats (Peck, 1998). Thus, the following work will try to argue for the importance and improvement of biodiversity treatment in EIA studies.

1.1. Aim and objectives

The aim of the work is to argue for a proper framework for assessing biodiversity in EIAs on the basis of a matrix on biodiversity.

The objectives are:

- Why is there a concern in biodiversity treatment in EIA processes?
- How could biodiversity issues be better implemented in EIAs?
- What is scientific societies and developers' point of view towards presenting biodiversity in EIA processes?
- To assess impacts on biodiversity in Ljusne harbour project using a biodiversity concept matrix.

2. METHODS

2.1. Information search

The content of this work is based on many different resources: internet (mainly Google search engine), articles, books, EIA cases from the Department of Urban and Rural Development at Swedish University of Agricultural sciences (SLU), interviews, emails, personal communication, Ljusne harbour visit, laws and other official legislation, Söderhamn Municipality.

2.2. Search of EIA cases

EIA cases to be discussed in this work were chosen according to relevant key words, i.e. environmental impact assessment, biodiversity, harbour, port, marine; their relation to the marine environment; focusing on the framework which was used to assess biodiversity in EIAs; the place of the project with preference on European EIAs; and preferring later EIA cases.

The relevant EIA studies were not easy to find, as there is a limited access to the environmental statements with a great amount of executive and technical summaries, which do not reflect the full consideration of biodiversity that was actually done within an EIA process and thus could not be relied on. I had an access to some actual EIA cases from the Department of Urban and Rural Development at SLU. In addition, I was limited by the focus on Europe, marine environment and English language.

2.3. Study limits

Before the EIA process begins, the projects have to pass the screening stage to determine if the effect on biodiversity is significant. Then it could be continued with the biodiversity matrix scheme under the scoping stage. If not stated otherwise, discussions and recommendations within this study mainly aims at the EIA scoping stage.

The biodiversity matrix scheme, which is presented in this work, does not discuss the long/short and cumulative impacts. However, I would like to highlight that those are to be taken into account when doing an EIA of a project, and so these will be taken into account when assessing impacts on Ljusne harbour project.

2.4. Methodology for the interviews

Five interviewees were selected. Choosing criteria were that they must be familiar and have experience with EIA projects and be representatives of different organisations involved in

various stages of EIA process. Three of them were recommended by Erik G Löfgren, the project manager for the Ljusne harbour project. The number of 5 was chosen due to the limited time frame of this master thesis. Some of organisations, such as Ministry of the Environment, were excluded, because of the possible limited information sharing.

Qualitative interviews were chosen to reflect full persons' opinions and experiences. Also, interviewees were not familiarized with interview's content in advance, so the reflections were also instant and so giving the most information of what people working with EIA projects think about biodiversity and its implementation within EIAs. There were 4 groups of questions presented in appendices 1 and 2.

All interviews were recorded and the most relevant information according to the aim and objectives of this study were later transcribed in a table within a word document. All interviewees were interviewed in person.

3. THEORY

3.1. The structure of an EIA process

In order to fully understand what kind of process it is, I will briefly present the stages of an EIA (Fig. 3.1.). It does vary from country to country, but the general structure is mainly the same (Pettit, 2011):

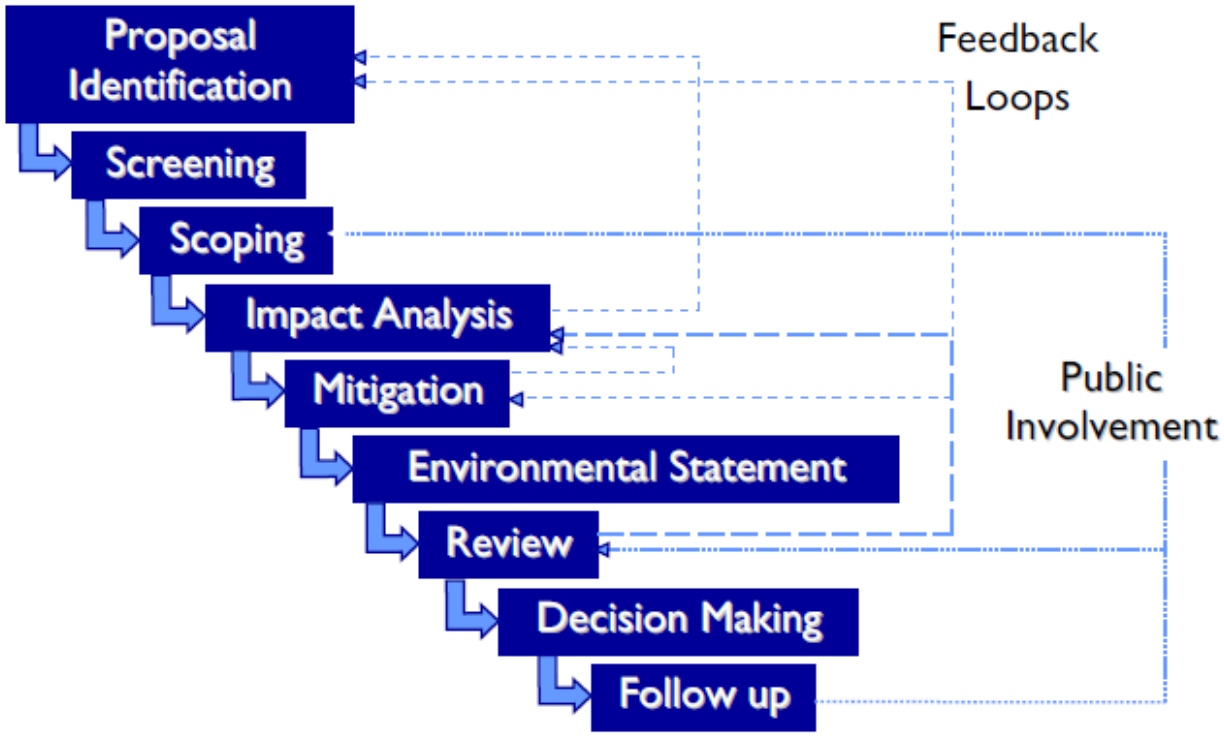

Figure 3.1. Stages of an EIA process. The figure reveals that the process is not always linear and could be looped from step to the other (Pettit, 2011).

1. **Proposal Identification.** Project description is to be made of the location, design and benefits from the development. Alternatives are also to be discussed to find the best one both from environmental and other perspectives, e.g. reasonability or costs, also including the no action alternative[3]. Environmental issues are more than welcomed to be considered at this starting point.

2. **Screening.** The screening stage concludes whether it is necessary to perform an EIA. This stage determines if the project is likely to result in significant environmental

[3] The no action alternative means that environmental impacts are foreseen when no project is conducted.

impacts. The criteria for performing an EIA are indicated in EU directives 85/337/EEC (see appendix 3) and 2001/42/EC (see appendix 4).

3. **Scoping.** In this stage main issues in the EIA processes are to be indicated to keep focus on the areas most likely to be affected. To exemplify, some of the key issues could be noise, air and water quality, ecology, cultural heritage, visual pollution, social disturbance, etc.

4. **Impact Analysis.** To start an impact analysis one needs to investigate baseline conditions in the project area. This can be done by collecting both old and new data. This step is about analysing the nature of the impact, its scale, how it is distributed in time and space, the length of it, its occurrence rate and whether it is reversible or not. These characteristics help to determine whether an impact is significant.

5. **Mitigation.** This section is important to avoid, decrease or remedy the significant environmental impacts discussed by the impact analysis.

6. **Environmental Statement.** It is a legal document containing the results of an EIA study.

7. **Review.** It is to be made in order to assess the quality of an environmental statement.

8. **Decision Making.** At this stage the decision is made whether to allow the project to be implemented.

9. **Follow Up.** This last stage of an EIA is very important as it makes sure that mitigation measures are being put into practice. Also, it is where impacts should be monitored. Both of these issues could be included and followed up together by the management plan.

Generally, it would seem that biodiversity should be included in the majority of the EIA stages: 1-6, 9, as these are the steps discussing environmental matters. However, it is usually present only in part of them, depending on the project, developer, legal requirements, etc.

3.2. Problems in integrating biodiversity in EIAs

3.2.1. Biodiversity in EU legislation

Even though biodiversity seems as a matter-of-course concept to be included within the legislation, it is rarely done so. To start with the first EU Directive 85/337/EEC (see appendix 3)

on assessing effects on environment by projects (Council, 1985), it targets "to ensure maintenance of the diversity of species". The third article of the directive clarifies that this maintenance should be assured by considering "fauna and flora" and "interaction between" them. From this text one could assume that by diversity here is meant only species diversity. Meanwhile, all the rest of biodiversity, which is discussed within CBD, is supposed to be included in an EIA based on the sensitiveness of the location of the project, with a specific attention to the lists of EU Habitats (92/43/EEC) and Birds (79/409/EEC) directives.

EU documents do not seem to have a common list of definitions, as none of the directives define what they mean with biodiversity or biological diversity. It is assumed that countries, which ratified CBD, use CBD's definition of biodiversity. However, even then it is not mandatory to apply and neither do countries bother to define biodiversity separately within the national legislation. Thus, it will depend on countries', different institutions' and parties' interest which definition to use and how to consider biodiversity. Another misleading thing is that when the word "biodiversity" is used in some context, it is not clear at all what exactly is meant by it as there is no requirement to define it afterwards.

To continue, the later EU directive 2001/42/EC (see appendix 4) on assessing impacts on the environment of plans and projects (EP, 2001) does mention biodiversity as such, but the concept itself is not defined and yet it seems that fauna and flora are being treated as separate parts from biodiversity, as well as in 85/337/EEC. The directive states that an environmental report should be set according to the information provided by Annex I, where part (f) indicates the environmental issues as "biodiversity, population, human health, fauna, flora..." on which the significant effects should be considered (EP, 2001). As well as the directive of 1985, it highlights the importance to conduct EIA if required according to Habitats Directive 92/43/EEC or Birds Directive 79/409/EEC.

3.2.2. EU directives and biodiversity in the Swedish Environmental Code

The EU EIA directives in Sweden are implemented in the Swedish Environmental Code, mainly chapter 6. Also, EIA requirements are included in other legislation, for example Construction of Railways Act, the Planning and Building Act, the Minerals Act and others. It is the local governments that are responsible for planning in their district (Sheate et al., 2005).

The Swedish Environmental Code has been into force since 1999 (ME, 2000) and biodiversity concept was not always in it. Until 2001 it was treated as „fauna and flora" as the code was

based on EIA directive 85/337/EC (Council, 1985). However, even though biodiversity as such is discussed there, its definition is not introduced within the code. In general, Sweden relies on definition from CBD as the country has ratified this convention (Blom, 2011).

In 2001 biodiversity was included in the EU directive 2001/42/EEC. Based on the new version, chapter 6 of the Swedish Environmental Code was expanded with paragraphs 11-18 to include the issues of biodiversity (Hedlund, 2011). However, as well as in the directive (2001/42/EEC), "fauna and flora" seem to be considered as a separate part of biodiversity in the Swedish Environmental Code, as all three concepts (biodiversity, fauna and flora) are present within these documents.

3.2.3. Swedish problem with CBD Article 14

As Sweden has ratified CBD, it has to comply with its requirements. However, according to Swedish Environmental Protection Agency (EPA) Sweden has some problems in complying with some of the convention's articles and article 14 is among them (Slootweg et al., 2006, EPA, 2007) (see appendix 5 for the Article 14 content). Even though it is implemented within the Swedish Environmental Code (Chapter 6), it does not give the wanted results. Firstly, it seems to be insufficient to rely on the level of harm to biodiversity as one of criteria for conducting EIA. Also, around 85% of Swedish EIAs are not based on CBD recommendations. To add, only a small fraction of projects include monitoring and follow-up once started. Main difficulties found by EPA were inferior collaboration, indifferent public society and unenterprising government agencies (EPA, 2007).

3.2.4. Biodiversity consideration in Swedish EIAs

Sweden has tried to analyze the problem of biodiversity handling in EIAs. The study has been made to examine how much EIA contents relate to biodiversity (de Jong et al., 2004). From 225 of EIA cases, the vast majority (199) do describe natural environment. The interest here is to see what is included in the nature description. Surprisingly, only 7% of the cases contain the concept of biodiversity. Nevertheless, the majority (66%) of those 199 EIAs describe species or species groups, the vast majority (82%) – habitats, and over half of them (53%) – landscape.

EIA cases with species investigations conducted mainly focus on endangered species with common species being mentioned as well. In those EIA cases describing the habitats, the dominating types are aquatic environments and forest habitats. As for the landscape examination,

it is usually very brief, mainly presenting the dominant habitat such as agricultural land (de Jong et al., 2004).

Such a high attention to habitats is because this kind of information is most easily collected (simple and fast methodology), while species' studies are actually more complicated requiring more time and data collection if focusing on a certain species, also having in mind different time frames (e.g. seasonality). Thus, investigations of a certain species are quite rare (de Jong et al., 2004).

The relevant conclusion from this analysis is that the majority of the overviewed EIAs investigate the natural environment quite poorly, not talking about biodiversity consideration as such, as they are based on broad inventories done by e.g. municipalities (de Jong et al., 2004).

Swedish EIA centre organized a couple of workshops to discuss the main problems in relation to biodiversity in EIAs. The first workshop (Sandström and Rodéhn, 2007a) highlighted the following issues in Swedish EIAs:

- The value of ecosystem services is underestimated;
- Ecological approach is lost with a technical handling of nature protection;
- Inclusion of biodiversity is not mandatory;
- Consultants discuss matters they do not have competence on;
- A problem that biodiversity concept could be understood differently among different EIA participants.

The second workshop (Sandström and Rodéhn, 2007b) was discussing the importance of a landscape level in EIAs and biodiversity matrix table as a mean to cope with Sweden's problem with article 14 in CBD. According to this workshop and Ulrika Nilsson (2011b), it is important to act collectively towards the same purpose. Basically, the biodiversity matrix could be a solution for all EIA participants to "talk the same language". Thus, the next chapter will explain and discuss this idea and its application in EIA processes in more detail.

3.3. Could biodiversity matrix solve the biodiversity consideration problem in EIAs?

3.3.1. Matrix idea and its importance

The biodiversity matrix idea is basically born from Noss (1990), who presents the whole new conception of biodiversity, and Peck (1998), who suggests to apply this conception in biodiversity management. This new biodiversity framework consists of three biodiversity attributes (Fig. 3.2). Usually, it is the ecosystem components' part of biodiversity that most

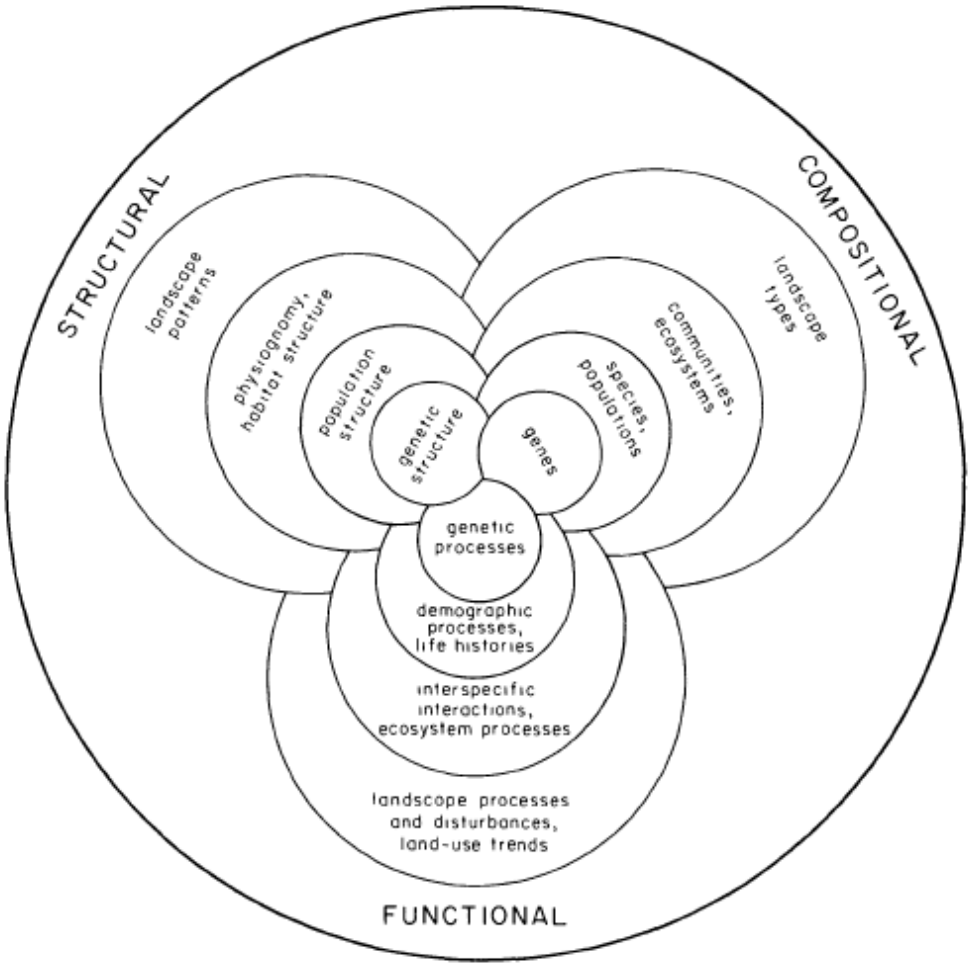

Figure 3.2. Biodiversity framework expressed as interrelated compositional, structural and functional spheres each divided in four levels of biodiversity organization (Noss, 1990).

people see and understand. So, naturally it is the part mostly being focused on in EIA studies, as well (Peck, 1998). However, the patterns and processes reflect the interactions between these

components and with abiotic[4] environment, without which biodiversity could not exist. Thus, they should be included in planning in order to preserve the environment and biodiversity as we know it.

The components' (composition) part presents the visible and accountable part of biodiversity. For example, if we looked only at biodiversity's species composition, we would make a list of species in the area and calculate the size of each species' population there in a particular time period (Noss, 1990, Slootweg et al., 2006).

To continue, under the structural attribute (pattern) we see how biodiversity components in the environment are being structured within temporal and spatial continuum. This part reveals the deeper understanding of biodiversity as it looks in more detail within components. It cares about distribution of age (within ecosystem, population, etc.), of landscape features, connectivity linkages and variability within and between populations, habitats, ecosystems, distribution of biomass, etc.

Lastly, the third of the framework – function (processes) – cares about key processes in the environment. These are physical processes such as rates of nutrient cycling, energy flow, patterns of various disturbances (natural and artificial); biological processes like growth rate of individuals, populations, fertility, and others (Noss, 1990, Slootweg et al., 2006).

As it is seen from the figure above (Fig. 3.2) biodiversity framework also includes four levels of organization: genetic, species/populations, communities/ecosystems and landscape. Interconnecting and depending from one another they make a basis for each other. Thus, three biological attributes and four organization levels form the whole. So far, this scheme seems to be the best in representing biodiversity as a whole. With the continuous biodiversity decline and other problems, this framework should be promoted to be used in all biodiversity related issues. EIA is one of the areas where it could be applied and bring benefit. For an easier use in planning this scheme was adjusted by Peck (1998) as a table. Here I will call it biodiversity matrix expressed as a table below (Table 3.1).

[4] Non-living

Table 3.1. Biodiversity concept matrix based on Peck (1998) and Sandström (2008).

Level of organisation	Composition	Structure	Processes
Landscape diversity	Types of ecosystems and communities; abiotic factors	Maps of ecosystems. How ecosystems, communities are distributed in the landscape (size, shape, barriers, etc.)	Processes within and between ecosystems: flows and exchanges, disturbances
Ecosystem diversity	Variety of communities and habitats within an ecosystem; their features, (presence of old communities)	Maps of habitats/communities. Their distribution, structure, connectivity	Processes within and between habitats: flows and exchanges, disturbances
Species diversity	Variety of populations, their size; species richness	Maps of populations. The amount of them, their distribution, interrelations	Flows and exchanges, disturbances between populations, their life cycle
Genetic diversity	Set of alleles; special alleles	Genetic diversity within and among populations/species	Genetic drift, gene flow, other fluctuations of genetic material

This table does not mention and so does not focus on biodiversity, which has a protection or rarity status. However, it does not mean that these are not included. If biodiversity concept used in an assessment is based on this matrix, those rare and protected parts of biodiversity would be seen and taken into account anyway. Besides, regulations for EIA projects include the requirements for biodiversity, as well. If the present table is applied, the whole biodiversity is defined, described and assessed under the same rules and both rare and common representatives of biodiversity are being considered.

3.3.2. Why biodiversity matrix could be relevant for EIA studies

Present and previous EIA cases mainly focus in evaluating ecosystem components, like species diversity (Gontier et al., 2006), which is normally reflected as species list. However, having in mind the extent of biodiversity framework expressed by Noss (1990), these studies consider only a small fraction of biodiversity. To exemplify, species move, migrate, climate changes and human interferes. Thus, even if a certain species is not included in the list, it very well might be that without human interference in an area, it would be present: in a year, few years time, or later. Besides, there are species whose population structure is based on metapopulation theory,

which means, that species inventory may miss to represent the actually present and vital populations (Pellet et al., 2007). Also, the content of species inventory list, even the number of species presented, may differ depending on a background and knowledge of the scientist who made it. In addition, it usually presents a variety of species within a great area containing various types of habitats and so rarely being made for a specific area, for example, the area of interest or a small fraction of an area. As species inventories for a very specific area are rare, it means that we generalize a great variety of species and habitats thus losing some specifics that could be valuable for the biodiversity consideration in the area. For example, if the species is said to be present in some particular habitats (often having exact areas identified if species is rare) the habitat not matching the described ones is assumed not to contain the particular species though it might very well contain it (Pellet et al., 2007), meaning that an impact on that species is not considered during the EIA within that particular habitat. In addition, species inventory lists do not reflect different species interactions, so the relations and effects of one species to another are easily missed in the EIAs as well.

Another often missed level in EIAs is the landscape (de Jong et al., 2004, Gontier et al., 2006). This level is important to consider not only in big development projects, such as the ones handled by SEAs, but also in the majority of simple projects as they cause smaller or bigger habitat fragmentation or degradation, which should be considered on a higher biodiversity level as well.

The lowest level – genetic – is also often neglected in EIAs, though it is not less important than the others. Impacts on other biodiversity levels may affect genetic diversity. For example, if reduced significantly, it may push a species towards extinction (local or higher scale). Genetic level is mostly of concern for rare species, but it should be noted that not only those are important. There are species which play vital roles in ecosystems and their reduction or loss may cause e.g. ecosystem collapse.

To further elaborate on the present extent of the biodiversity concept within EIA, it could be compared with a food chain, while the real concept would be as complex as a food network. The same comparison could be applied to the biodiversity matrix, as the species level is the one most often considered, forgetting the relationships and complexity of different scales, as one is always determined by the other. For example, landscape fragmentation determines ecosystem functioning (processes), as it affects diversity of populations and species composition.

Different biodiversity levels within the matrix are very much interconnected with each other. Another linkage though, also exists between biological and spatial hierarchy, as a higher biological hierarchy tends to occupy larger spaces (Peck, 1998). Similar connection may be seen in EIA projects when corresponding biological scale is considered according to the project's scale. This trend could explain why many of the EIA projects take into consideration mainly the species scale (J&W, 2001, SWECO, 2007). Indeed, these projects are often staying within the vicinity of a single ecosystem. Then it would mean that there is no reason in using resources for the other biodiversity levels to be assessed. However, this thinking is too limited because we know now that biological entities are very complex, not constant and depending on many linkages (Peck, 1998). Also, it is important to realize that sometimes biodiversity level could be treated at a smaller scale than it could appear in the beginning. For example, ecosystem may be also represented by a small puddle.

Therefore, as biodiversity within EIAs is only partially represented, it calls for a model, which would not leave behind the actual relationships between all the biodiversity components. Here the biodiversity matrix could be helpful.

According to the results of the Swedish EIA centre workshops (Sandström and Rodéhn, 2007a, Sandström and Rodéhn, 2007b), one solution for Sweden to solve the problem of article 14 could be to apply this matrix (Table 3.1). It could both work in screening (as a check list) and scoping stages of an EIA process (Sandström, 2008).

3.3.3. Some concerns of biodiversity matrix application

Even though it seems that this biodiversity concept matrix is fully presenting biodiversity and would be a long waited and perfect solution, it does have its lacks and concerns. Some of them are discussed further down.

1. It would seem that one of the most problematic parts of the matrix to be applied is biodiversity evaluation within genetic level. As is said in the article by Slootweg and Kolhoff (2003), there are not yet any criteria to evaluate natural genetic diversity in a screening process and deeper studies were performed only in cases where protected species were involved or genetic diversity of a great number of species were threatened. However, in some cases it might be very well feasible. One of examples are discussed in the case of salamanders' genetic diversity in Peck's book (1998). As suggested by the author, genetic scale can be evaluated considering genetic and phenotypic patterns. First

you can evaluate diversity and variations within and between populations, which later can help to indicate and understand genetic processes of these populations. For instance, it is a known fact that if populations further from each other differ more than the closer ones it indicates low genetic information exchange between populations (Peck, 1998).

2. The matrix scheme does not include a temporal scale. Variation of biodiversity over time is very important in developing projects and planners must pay attention to it when considering biodiversity. However, Urban et al. (1987) discuss a way how temporal scale could be predicted. They found a correlation between temporal and spatial scale. As for smaller scale projects, shorter time framework may be enough to consider biodiversity. This makes temporal involvement a bit easier to investigate. Nevertheless, these temporal tendencies may not be applied for human dominated landscapes (Peck, 1998).

3. It may not be always clear what is meant and included in each of the matrix's parts and levels, and so it may be difficult to distinguish between them as well. This should be possible to understand better once getting into more detail within the matrix.

4. The use of the biodiversity matrix may make EIA more difficult to perform and accordingly, time and money consuming. From one point of view, this is a small price to pay for the benefit of biodiversity and thus ecosystem services. Also, it may be cost effective in some years' time both for the society and developer. To illustrate with a simple example, if an EIA process is fully executed, it may discover that the area of the project contains a rare species, which should be protected. Then developer has to change his plans or mitigate accordingly to the requirements of a species. This action might ensure the future existence of the species. Thus, the species would be present for the society's future benefit and the developer would avoid many accusations or lawsuits of harming the species. Another thing to argue for the matrix is the last stage of an EIA, the follow up, where fully considered impacts on biodiversity are mitigated and monitored. Accordingly, the more detailed knowledge is obtained during the EIA scoping, the more effective biodiversity protection will be and the lesser the probability of an unexpected biodiversity reaction towards a negative change. As a result, developer will be more insured against costly actions, necessary to fulfil EIA requirements.

5. To continue, it is clear that all the levels and attributes of biodiversity cannot be assessed in an EIA. Thus, it is important to pick parts of biodiversity which should be presented in

the actual case. However, it is still an organized way to do an EIA: projects will miss parts of biodiversity, but that is because those were looked at and decided to not be included in assessment due to unimportance for the case. This makes the developer, consultant and other EIA participants aware of what and maybe even why some parts where not presented.

3.3.4. Biodiversity matrix illustration

The matrix table by itself could appear very complicated and difficult to understand. The figure below aims at expressing the three biodiversity attributes and the four hierarchy levels as an illustration.

The figure below focuses on an aquatic environment, as the project for which this scheme will be applied later is on aquatic ecosystems as well. Once again I will explain the biodiversity

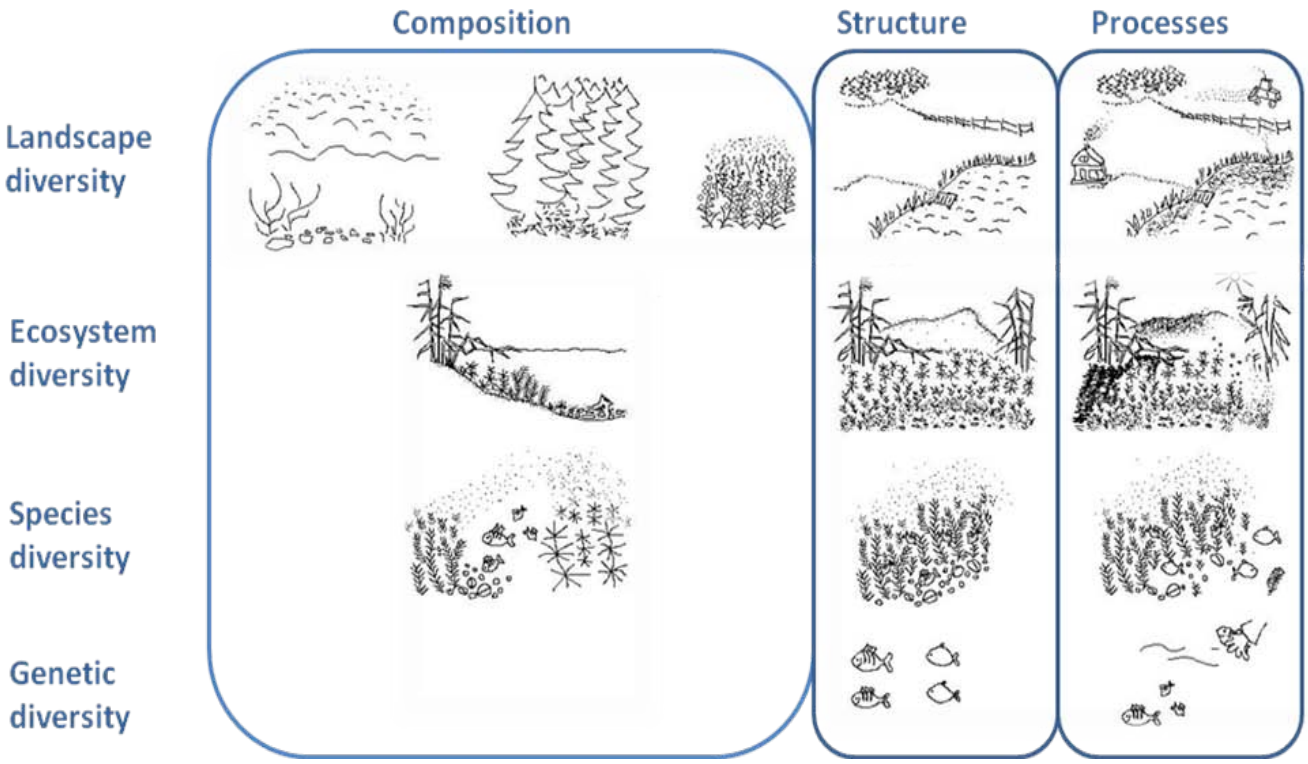

Figure 3.3. Illustrated biodiversity concept according to Peck (1998) and Sandström (2008). It consists of many small drawings presenting different levels of the biodiversity concept (Laima Bučionytė).

attributes, only in more detail and exemplified with small drawings within the figure.

To begin with the left corner of the highest biodiversity level, we can assess the composition of the landscape. It means specifying the communities within the landscape in focus (as exemplified by the drawings below it could be a lake, forest, meadow or heather land communities, etc.) and then arranging them according to their importance (species-rich, vulnerable, natural, endemic, rare, sensitive, etc. communities (Peck, 1998). Following to the right, another step is to describe the structure of the landscape, for which it is important to look at the whole picture of the communities within the landscape, indicating the topography, openness, species movement patterns, their distribution, shapes of the patches, vegetation types, sizes, etc. The drawing presents a possible map of the communities in the landscape showing their connectivity, barriers (like a fence, path or water line), which parts of the landscape they occupy. Finally, the processes to be indicated are disturbances such as storms, fires, floods, etc., including human activities and hydrological features like nutrient, water cycles, etc. Processes illustrated within the top right drawing are soil disturbance from the machinery, mowing, agricultural activity, emissions from human activities (from techniques and house-coal burning) and increased nutrient supply resulting in eutrophication within the lake.

The lower level of biodiversity hierarchy needs assessing the composition of an ecosystem. This step requires a closer look at the communities indicating and describing their characteristics such as age, species types e.g. rare, keystone, exotic and others (Peck, 1998). The figure presents a lake ecosystem, whose components would be riparian zone communities, water weed (e.g. elodea) communities, bottom communities (molluscs), etc. Going deeper into analysis we need to discuss the structure of an ecosystem, having a bigger focus on vegetation (its vertical layering, density and connectivity between the types) as vegetation determines other communities. In the drawing case we could describe how dense are plant communities within a lake, how they are distributed in width and height, how they penetrate into each other. Also, it is important to indicate habitat resources like water resources, breeding, foraging sites, etc. As exemplified by the picture, those could be rich vegetation islands or not vegetated bottom with favourable molluscs' plantations, or certain objects that could be favoured as hiding places (e.g. a stump seen in the illustration on the left or presence of big plants). To add, for structuring ecosystem it is also important to discuss the distribution of the communities. For the lake example this would require to describe how aquatic communities are distributed within a lake, e.g. vegetation belts along the shore. Processes should be assessed as in the landscape level by including ecosystem disturbances, nutrient and energy flows, etc. To illustrate, this drawing

presents different lighting and shadowing conditions affecting oxygen exchange in the water and other processes, such as algae migration, blooming and others.

On the species level a variety of species populations is to be indicated, exploring their features like size, rareness, etc. Populations presented in the drawing are elodea, muskgrass[5], perch and mussels. They could be described as common populations in the lake, but some of them could be indicated as rare at the national level. Structure of the species diversity is to be reflected as a space occupied by populations and spatial distribution of those populations. The drawing would require assessing the distribution of plant, fish and molluscs' populations, indicating the space they occupy, what connections are between them, for example, foraging, sheltering. Processes' section cares about the flows within and between populations, as well as their life cycle. So, to exemplify with the drawing these processes would include nutrient flows between populations e.g. from molluscs to fish, phosphorus and other nutrient cycles from dead fish into the water and sediments, getting into the living organisms again.

Finally, in the genetic level we care about the genetic composition of a population as it determines many characteristics of a population like its ability to adapt to changes, its natural capacity abilities, ability to disperse, etc. For that we would need to investigate DNA structure of individuals and indicate important alleles within the species. Then, for the composition it is important to assess how the genetic material is distributed within and among populations. The figure illustrates that genetic diversity within perch and bream populations could be determined by the phenotypes of individuals, as well. In the end, the last drawing shows one of the possible processes happening at the genetic level. An introduction of a new individual of the same species from another ecosystem would cause a gene flow within a population.

3.4. Ljusne harbour EIA: biodiversity

3.4.1. Ljusne harbour project description

Upgrading Orrskär harbour in Ljusne (Ljusne harbour) (Fig. 3.5.) is an explicit goal to fulfil the demands of a major national project called Ljusne Offshore Wind Port (LOWP). This project aims at harbour infrastructure development of several harbour basins. This particular harbour consists of two parts: Orrskär North, being used for timber handling; and Orrskär South, which is

[5] Chara sp.

Figure 3.5. Ljusne harbour and the project area. (map: maps.google.com; photo: Laima Bučionytė)

planned for wind farm support and which is being focused on in the discussion of biodiversity impact assessment.

WPD (WPD Think Energy) is the responsible company for the wind farm development and Söderhamn municipality for the upgrading of the Ljusne harbour. Figure 3.5 presents project

area and figure 3.4 shows a working document from more detailed development plans for the present harbour area and a possible outline for further development.

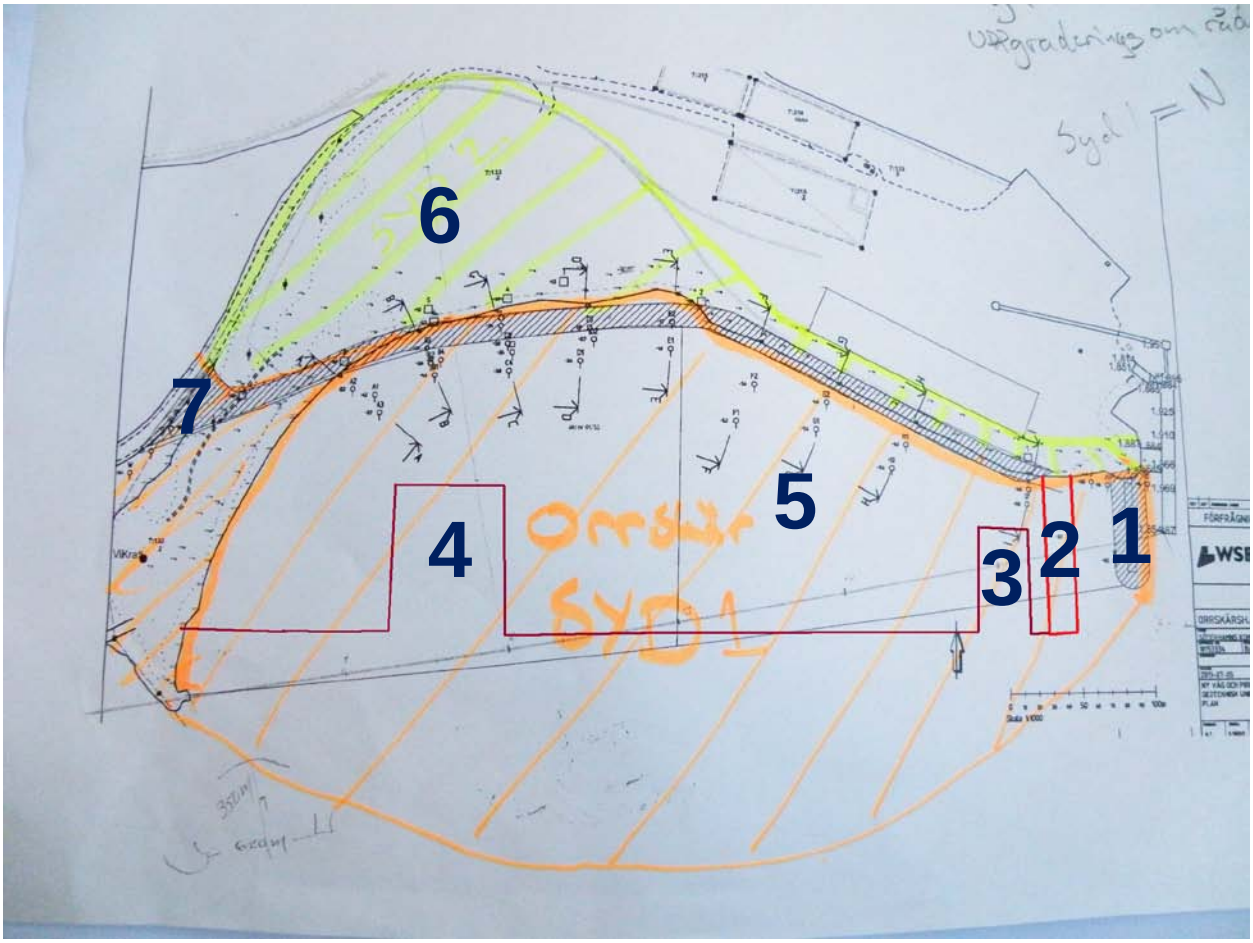

Figure 3.4. Project area. 1 - the old pier, 2 - the planned new pier, 3,4 – two docks to be built in 3 years, 5 – to be filled with concrete, 6 – creosote storage site, 7 – the harbour road. (Söderhamn Municipality)

The main purpose of this harbour development is to be the base for support activities, related to the offshore wind farm project Storgrundet, which has been positioned in an area close to Ljusne (see Fig. 3.6.). Besides the illustrated construction works Ljusne harbour project aims at upgrading the harbour storage area, which also includes the old storage site for creosote poles.

The present magazine area in the harbour is 11 000 m^2 and the existing pier is 100 meter long (Fig. 3.5.). There is also an industrial railway line within the harbour that connects the harbour to the national railway system. At the moment, Ljusne harbour is shipping sawn timber and storing a limited number of creosote poles. It is an important timber shipment spot towards North Africa and other parts of the word (SSHAB, 2011).

Figure 3.6. Ljusne harbour and wind farm field within Municipality of Söderhamn. (maps.google.com)

EIA permits are already admitted for the offshore wind farm project, which makes EIA for this support harbour an important part of the wind energy development in the area. Construction works within the harbour will mainly involve dredging, filling and constructing the piers, which is still being debated whether they be based on concrete or steal[6].

3.4.2. Ljusne biodiversity description

The usual EIA baseline description of biodiversity would include species inventory list, fish and birds' migration routes, water parameters (BOD, water quality indices, etc.), rare species list, protected area, bottom benthos samples from the harbour area, etc. Most of this information could be found in "Ljusnan-Voxnans Vattenvårdsförbund" document (LVVF, 2009).

Natura 2000 sites

There are 8 Natura 2000 sites within the municipality of Söderhamn. The closest ones are Ålsjön and Stenöorn both within 10 km radius from the harbour (Fig. 3.7) (LG, 2011). Ålsjön is an important SCI and SPA for migrating and nesting birds and habitat types. Stenöorn is a SCI and SPA site as well. It aims at protecting resting sites for migrating birds, with a special focus on waders.

[6]This information about the project development was provided by Söderhamn Municipality and Erik G Löfgren. At the moment there is a lack of more information about the project.

Figure 3.7. Natura 2000 areas in Söderhamn Municipality. Map by Sölve Eriksson (Håberg et al.).

Impacts on Natura 2000 sites and other nature conservation areas by the harbour should be minimal both during construction and operational phases, as even the closest two areas are quite far (more than 5 km away) (Fig. 3.8.).

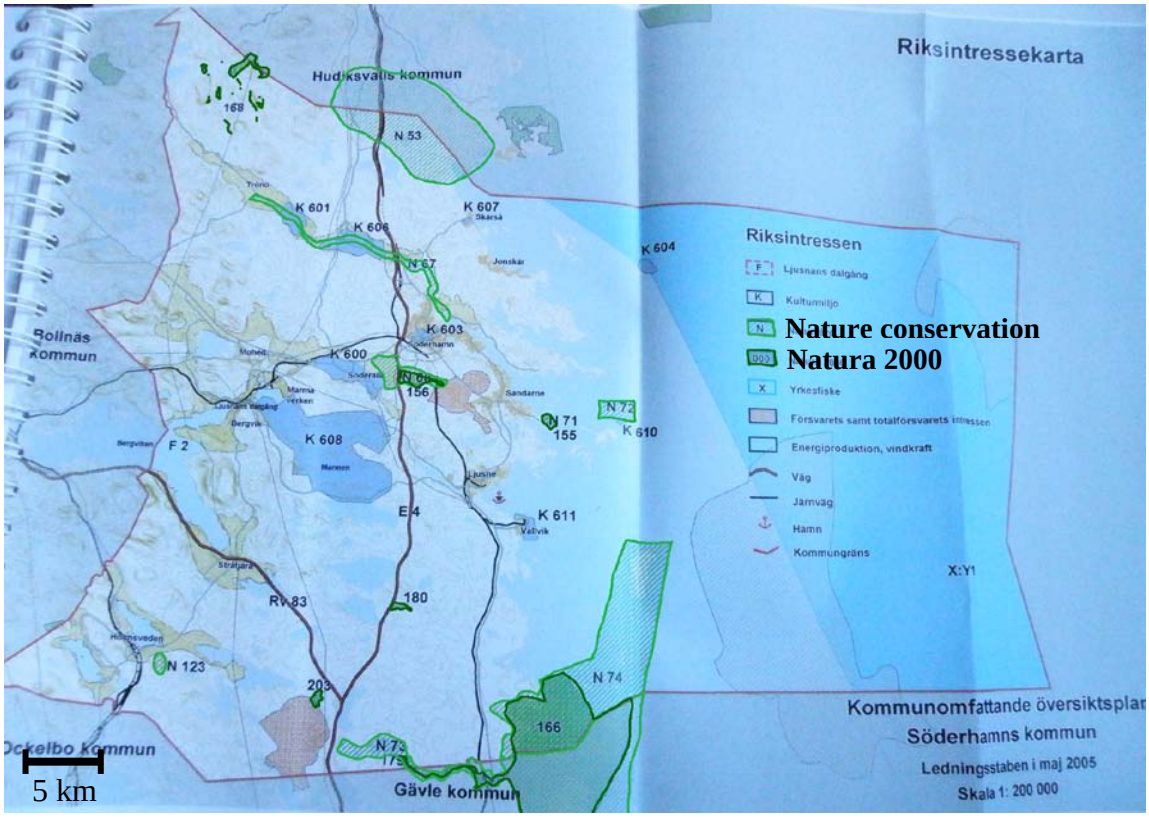

Figure 3.8. National interest map for Söderhamn municipality (Söderhamn municipality).

Migrating birds

The area of the project might be within a route of migrating birds[7].

Ice covers effect on birds' occurrence

Because of construction works the harbour area will be ice free during winter, which may tempt some bird species to stay in the harbour during this season. Ice cover will be disturbed by harbour activities during its operation, which can have favourable conditions for birds as well.

Future planning

The municipality of Söderhamn is planning to expand the area of national importance for outdoor life in the valley of River Ljusnan till the river mouth in Ljusne (Fig 3.9.). Thus the

[7] There is a lack of information.

development within the area should consider the interests of tourism and outdoor life (Nilsson, 2011a).

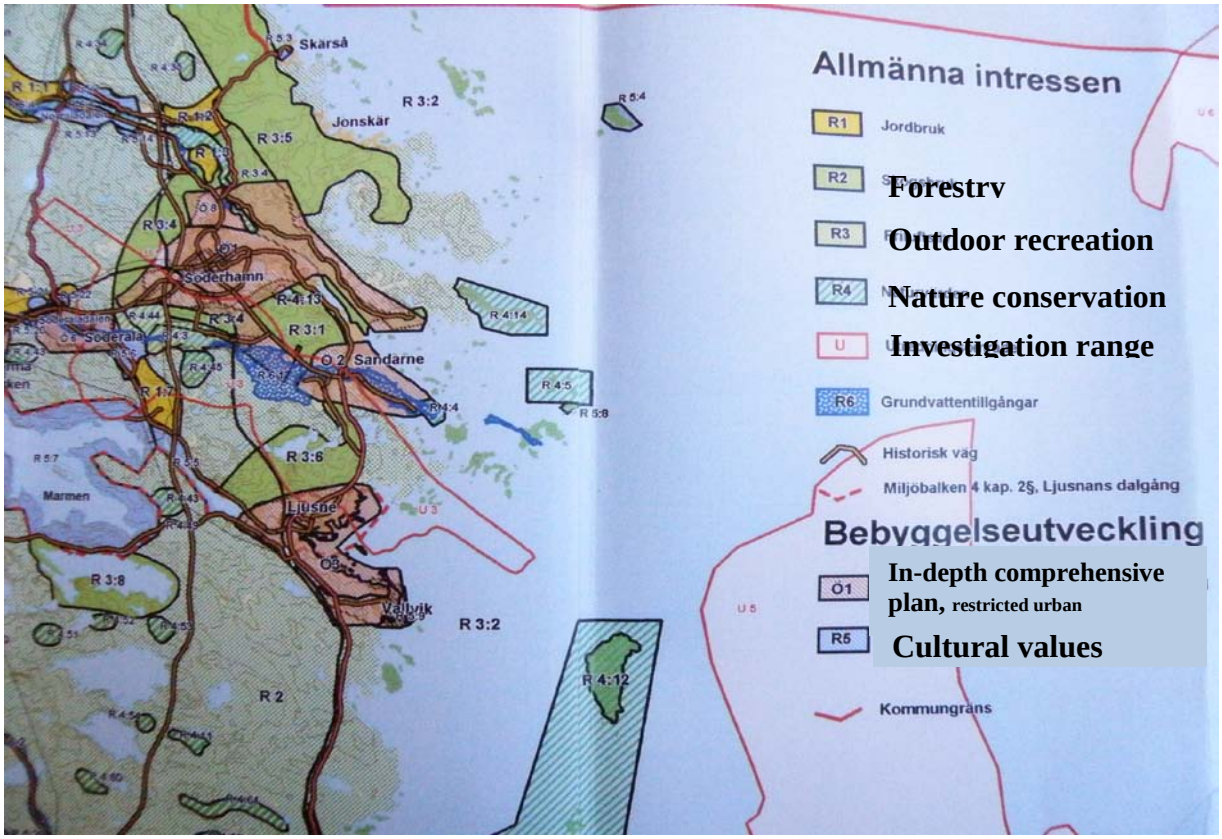

Figure 3.9. General interest for Söderhamn municipality (Söderhamn municipality).

Fish

Mostly concerned species to be affected include salmon, sea trout, eel and whitefish[8].

3.4.3. Possible impacts on biodiversity

Impacts on biodiversity (also on other issues of concern) often differ depending on which phase of the project we are looking at. Thus, the time frame of the project is usually divided into construction and operation phases so as to have a clearer and more thorough impact evaluation. Construction phase includes the part of the project when it is being built and constructed. Whereas, operation phase is when the project is implemented and it starts operating (working) according to its purpose, as foreseen by the developer.

During construction phase impacts on biodiversity by the Ljusne project could be:

[8] For more information see LVVF 2009. Ljusnan-Voxnans Vattenvårdsförbund. Söderhamn: Ljusnan-Voxnans Vattenvårdsförbund.

- Noise (construction works, some ship traffic): sea birds (route fragmentation, etc.), seals;
- Vibration (dredging, harbour construction): fish and other sea organisms;
- Pollution (creosote, oil and other chemicals' spills): fish and other sea organisms;
- Light pollution (lighting of construction site and harbour): seals and other sea organisms, birds;
- Biodiversity loss (sea bottom and shore side): the majority of the present biodiversity to be removed;
- Visual disturbance (landscape): birds.

During operational phase impacts on biodiversity could be:

- Noise (ship traffic, other harbour activities, windmills' construction): sea birds, seals;
- Vibration (harbour activities, windmill's construction): fish and other sea organisms, especially salmon;
- Pollution (creosote, oil and other chemicals' spills): fish and other sea organisms;
- Water turbulence: fish and other sea organisms;
- Invasive species introduction (together with ships);
- Light pollution (lighting of a harbour): seals and other sea organisms, birds;
- Visual disturbance: birds.
- Increased forestry and fishery in the area.

3.4.4. Impacts on biodiversity according to different scales in the area

The three figures below (Fig. 3.10 – Fig.3.12) represent the landscape diversity level of the biodiversity matrix. It is clear that landscape level can have different scales as well. The three pictures show the areas of the probable occurrence of impacts by the project. With each enlargement of the scale they seem to have a smaller extent in the covered area. However, we can predict the impacts by the project in larger and larger scale. For example, the largest scale is

important for the municipality of Söderhamn. But it might as well be important for the whole county of Gävleborg, as the project may affect forestry rates in the area. We can also look at the worldwide scale, where the project may have impact on the total greenhouse gases' amount from increased emissions at the harbour and forestry rates. Also, a consideration of project's input for wind farm development can reduce the amount of greenhouse gases in the longer run.

Figure 3.10. Ljusne harbour project area (www.maps.google.com).

1. Impacts on biodiversity[9] within the aquatic project area. The biggest part of the present biodiversity will be destroyed.

2. Impacts on biodiversity by creosote storage. As the storage site will be upgraded, this may cause greater leakage from the site and thus contaminate the local area and ecosystems.

[9] Biodiversity here includes all diversity levels, which could be included under the area indicated by a number. The same conception should be kept in mind when exploring other maps in this chapter.

3. Any biodiversity related issues within harbours' above sea constructions. Even small patches of natural habitats will be destroyed, so the area will have to be occupied by new species.

4. Biodiversity related issues in newly included harbour area. Impacts on the area can be both during construction works and operational phase. Local ecosystem will be affected by removing a part of it, as well.

5. Impacts on river estuaries. For instance, some species may start avoiding the harbour area or be affected by the pollution (creosote, oil spills) within it. This would mean that a part of an ecosystem network would be broken. Another example could be a change in fish (e.g. salmon) migration routes.

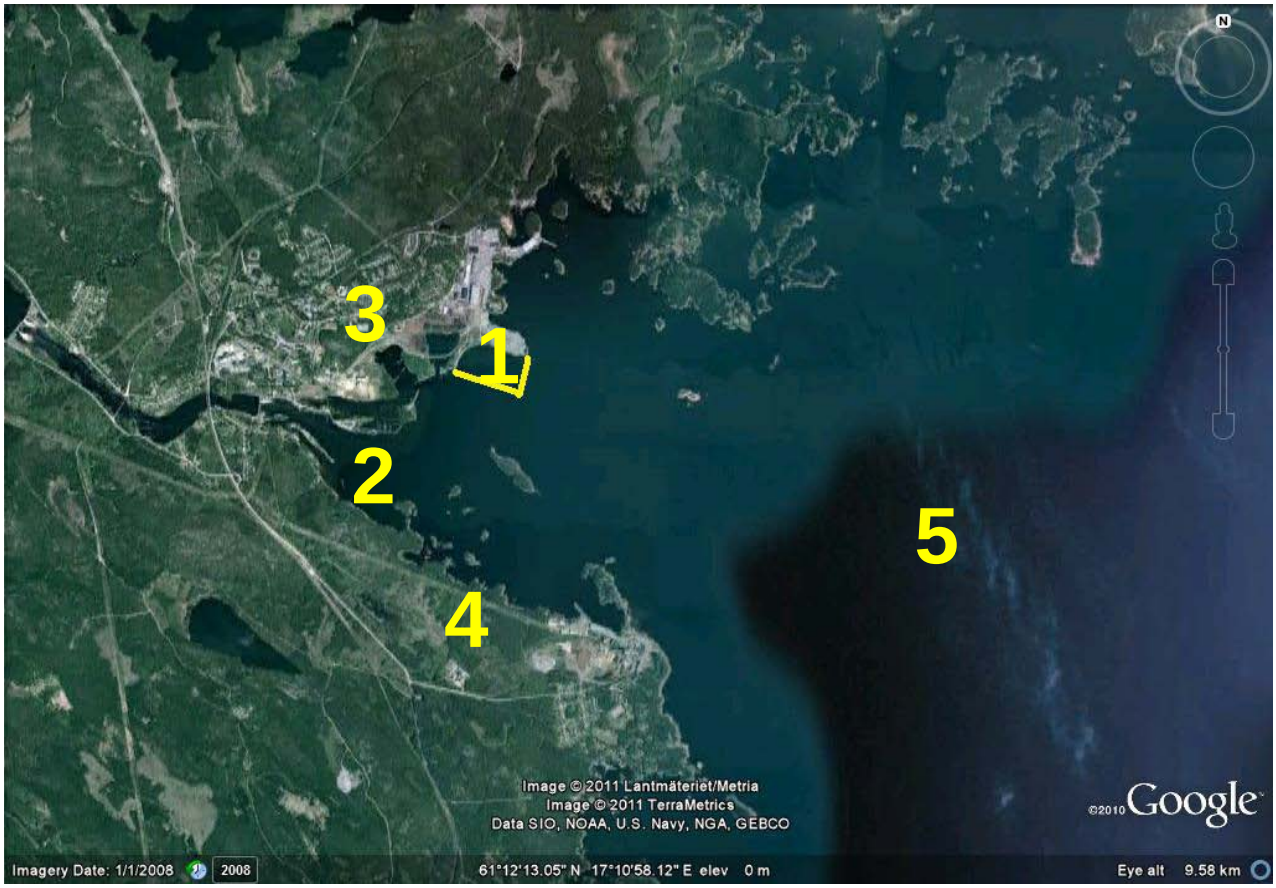

Figure 3.11. Ljusne harbour on a Ljusne region scale (www.maps.google.com).

1. Impacts on biodiversity within the planned harbour area. A big part of different habitats will be removed during the construction, meaning that present ecosystems within the harbour area will be destroyed.

2. Impacts on river estuaries. The migrating patterns of migrating fish, such as salmons, may be affected.

3. Impacts on biodiversity within the Ljusne region. For example, noise and pollution from the harbour activities may influence the present ecosystems in the region, e.g. some species might be impelled to move, change foraging grounds, etc.

4. Impacts on shore bird patterns. For instance, how the harbour construction and operational phase would affect the birds' migrations patterns.

5. Impacts on offshore ecosystems. For example, the composition of the birds' species may change, which eventually will modify the present ecosystem network.

Figure 3.12. Ljusne harbour on Söderhamn municipality's scale (www.maps.google.com).

1. Impacts on biodiversity within the planned harbour area. A part of biodiversity will be removed changing the present ecosystem network.

2. Impacts on river estuary ecosystems. For example, fish and shore birds' migration patterns.

3. Impacts on open sea ecosystems. For instance, birds or sea mammal's migration patterns, because of harbour activities.

4. Indirect impacts on biodiversity in relation to a new wind farm construction. The harbour will provide opportunities for wind farm construction, which then affect the sea birds' migration patterns.

5. Impacts on biodiversity within the Ljusne region. The impacts on the biodiversity may decrease the total level of biodiversity within the region, like decreasing the presence of some birds' species, etc.

6. Impacts on biodiversity within Söderhamn municipality. Besides decreasing the total biodiversity, the project may entail indirect effects such as deforestation within the municipality, because of the convenient wood transportation by ships.

7. Impacts on biodiversity in freshwater and forest ecosystems within the region. If the birds' migration patterns are changed, this may decrease both the species richness and diversity of bird species in the freshwater ecosystems in the region. Also, the same as within the Söderhamn municipality, forestry may increase in the area, reducing biodiversity at the larger scale.

8. Impacts on offshore/shore ecosystems. Once again, birds' migration patterns might be affected in the surrounding ecosystems. Also, other sea organisms, such as fish or mammals.

Ecosystem diversity level could be scaled in a same way as well (see figures below Fig. 3.13 – Fig. 3.14). The maps this time focus on communities within an aquatic ecosystem. It depends on what scale of the ecosystem level we are looking at, as well. If we expand the scale, it gets easier to see the whole picture of how ecosystem functions, especially the processes part is clearer to assess.

Figure 3.13:

1. Literal zone communities. Impacts on literal communities should be assessed from dredging and other construction works. For example, the removal of the sediments from the bottom will completely remove the bottom biodiversity from the area.

2. Benthos communities. The same as on the literal zone, the majority of the benthos communities will be removed, while others will be disturbed by the construction works or later by the ship traffic.

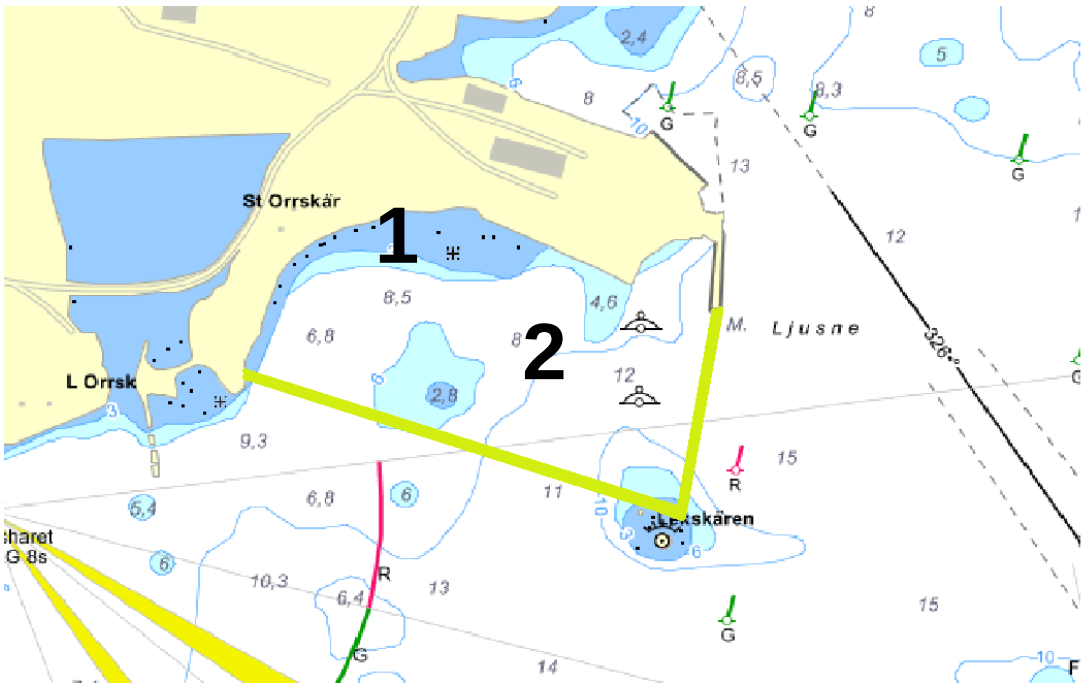

Figure 3.13. Aquatic ecosystem within the project area (www.eniro.se).

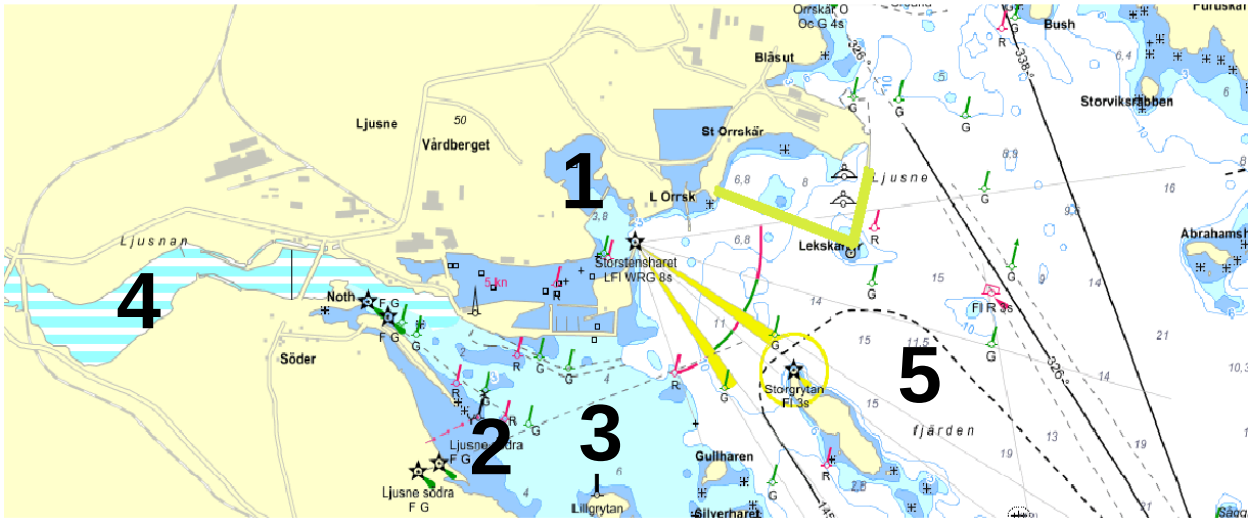

Figure 3.14. Aquatic ecosystems communities within and around the project area (www.eniro.se).

1. Bay's ecosystems' communities. Because of the construction works the bay could be influenced with the increased sedimentation, which may affect the communities within the bay. Also, they could be affected by changes of turbidity, pollution, etc.

2. Estuary's literal zone. A more wide insight within usual estuary's communities may help to understand the network between the literal communities, what processes are happening there and the variety of communities present around the harbour (are there any different ones, what communities established in earlier disturbed ecosystems, etc.). This will help to foresee the impacts on the literal communities around the harbour and predict how or if they will be affected by the disturbances from the project.

3. Estuary's bottom zone. This zone of communities may also be important to investigate in order to see the whole network and relations among the bottom communities. The same as above, those can be affected by the project, as well. Some examples would include the removal of before continuous bottom communities, and others would include pollution, turbidity, etc.

4. River's ecosystem. It could experience changes if the salmons coming from the sea would be affected by changes in streaming, turbidity, pollution (e.g. creosote), etc., which would impact the amount or quality of spawns, from which grown salmon juveniles are released in River Ljusnan.

5. Impact on the open water ecosystem (estuary's and sea). Many aquatic organisms, especially fish communities (e.g. salmons) may be influenced by the construction. For instance, increased turbidity may change usual fish movements.

For species diversity level, scaling mainly works within how big populations of species we are looking at (Fig. 3.15).

Figure 3.15:

1. Harbour area. Salmon population probably is close to zero in this area as they do not come here, though this should be paid attention to.

2. Estuary. Here is important to evaluate impacts on the local salmon population. Even though salmons may not persist within the project area, such things as pollutants, turbidity, and sedimentation may influence the local salmon population.

3. Open Sea. It is important to assess impacts on the total salmon population of the Baltic Sea by the project. The effects on the total population will depend on how big part of a local population will be affected, by what reason, e.g. presence of a cumulative pollutant.

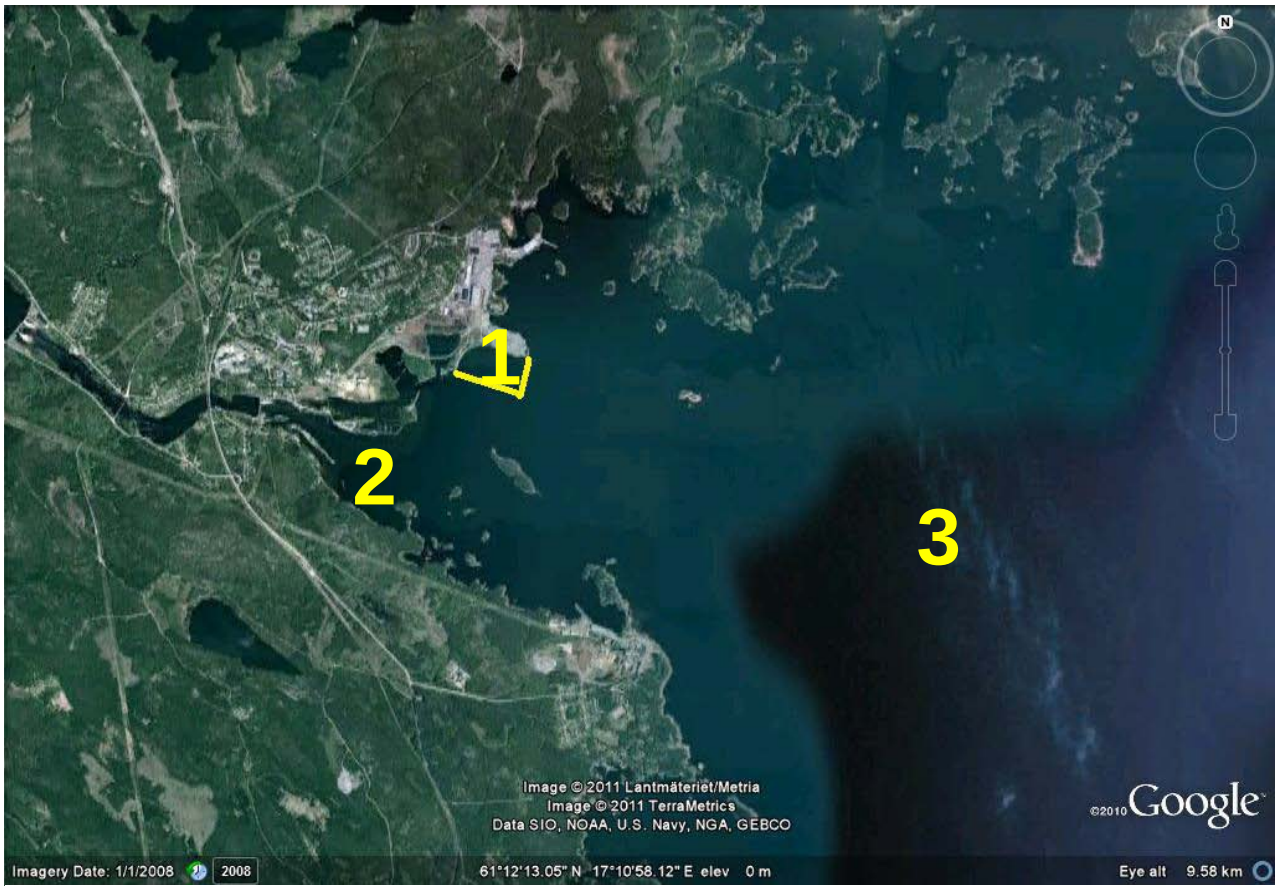

Figure 3.15. Scaling at species level (www.maps.google.com).

Even for the genetic level scaling is possible and might be important to consider. For example, genetic diversity of a species population might be looked at a small scale, like just within the project area; bigger, such as within the Ljusne estuary, and even greater scale like the Baltic Sea, or even bigger to include genetic diversity data of a worldwide populations. But this scaling will also depend on the project.

To sum up, from the maps and impacts above it is seen that the use of different scales for different biodiversity levels might be as much important as the levels themselves. It depends on the project goals, though. Also, it makes it easier to evaluate ecosystem networks and notice cumulative effects.

3.5. Interviews

3.5.1. Interviewees

Representatives were interviewed from:

- CAB (1)
- Söderhamn municipality (1)
- Company person from WPD (1)
- Environmental Protection Agency EPA (1)
- Swedish Transport Administration (1)

The set of questions the interview was based on and the handout given to interviewees can be found in the appendices 1 and 2.

As it can be noticed from the interview outline (see appendix 2), I had some starting questions to get interviewees towards the right direction. Those were not included in the results' table below.

The short content of the interview discussions was the following:

- The problem of biodiversity definition use in EIA studies;
- Discussing a few of biodiversity concepts, including fauna and flora concept in EIAs;
- Discussing the problem with biodiversity in EIAs;
- Discussing the biodiversity matrix idea and its use.

4. RESULTS

4.1. Interview results

As interview results show, there is no single, common definition used by all those organisations. All 5 interviewees do confirm this by defining biodiversity in different ways, with most of them including species diversity. When asked about fauna and flora, all interviewees (with one of them highlighting the condition it to include 5 animal kingdoms) admitted that it does reflect biodiversity. Also, they all agreed that the CBD biodiversity definition does cover the whole biodiversity concept.

According to the interviewees the main reason for too little focus on biodiversity in Swedish EIAs is the lack of information and knowledge about biodiversity issues, which makes it difficult to predict the impacts, as well. Also, there were ideas that authorities already have predetermined requirements in mind, which must be looked at in EIAs (WPD) or that most of EIAs are being conducted on the already exploited areas, making biodiversity issues irrelevant in those places (Söderhamn Municipality).

Another interesting thing is that only one interviewee stated red-listed fauna part of biodiversity being the most important, with others mainly arguing that it depends on the situation. The same tendency applies for the importance of including nature protection status in EIAs: it depends.

If we look at the table 4.1 and question no. 8, we will find many different ways how those organisations are treating biodiversity in EIAs, however, the interviewees themselves do not feel it is enough. Although, they do believe that better treatment of biodiversity would benefit the environment and society.

The given biodiversity matrix table seemed quite clear for the interviewees. Most of them agree it would help to consider biodiversity better and they would use the framework themselves. When asked about the importance of a single biodiversity level, opinions varied among all four levels with landscape and ecosystem levels being mentioned most. None of the interviewees noticed anything missing from the matrix scheme, not even the missing protection status, though it was highlighted in one of the interview questions before.

On the whole, the matrix idea was well supported by the representatives, especially as a good start in helping to communicate among different organisations involved in an EIA process (see the comments under question no. 16).

To sum up of the main conclusions from the interviews:

- Reflected differences in the biodiversity concept used by representatives of different organisations;
- Mentioned the lack of knowledge we have about biodiversity and missing the overall big picture in EIAs – only dealing with a narrow aspect;
- Understood the matrix idea and supported it.

Table 4.1. Interview results.

	CAB	***Söderhamn Municipality***	***EPA***	***WPD***	***Swedish Transport Administration***
1. Environment definition	The space where you live/ it is everything.	Nature components with abiotic factors (heritage and geological structures).	Distinction between two environments: Surrounding (human made) and nature environment-"naturmiljö" (not managed environment).	Everything. Very broad.	Everything. "Miljö" stands more for the nature.
2. Biodiversity definition	Different and shifting nature, species and environment; the shift/change in time and space.	The amount of species, species richness, change of animals from top predators to the smallest ones.	Different kind of biotopes; diversity of species. But it depends on the level. Scientific biodiversity - species, genetic level.	Species diversity.	Life – all living things. We and animals.
3. Would you include non bio-things in biodiversity concept; their role?	They create possibilities for bio-, e.g., soil, geology.	It should be in the section of environment.	It is the fundament of the biodiversity.	Would not include it. It could be a part of biodiversity but not by default. Artificial structures introduced only if they do not disturb the biodiversity.	Would not include them in biodiversity though they are important, e.g. nutrients.
4. Do you think "fauna & flora" reflect biodiversity?	Yes.	Yes.	Yes, in a rather good way.	Yes.	Yes, if it is defined by 5 animal kingdoms.
5. Why biodiversity is not being paid attention to in Swedish EIAs?	Because its complex. * Difficult to predict impacts on biodiversity and to follow up the cumulative effects; * Lack of information	Biodiversity issue is not that relevant in many cases as a lot of EIA projects are dealing with an already exploited area	It depends on the kind of EIA. * A lack of knowledge what biodiversity actually means; * Difficult to describe and	The authorities have predetermined things they want to look at. So it depends on what is wanted to achieve.	Lack of knowledge. * Because of the different view towards biodiversity. In Scandinavia nature is separated from human society. Society does not

	CAB	***Söderhamn Municipality***	***EPA***	***WPD***	***Swedish Transport Administration***
	about how chemicals act on different levels; * Lack of understanding different processes.	(not natural).	assess it on the right level; * Difficult to predict how the project will affect the area or the developer do not have knowledge how the project would affect the environment; * Lack of good consultants.		need biodiversity as it does not understand our dependence on it (ecosystem services).
6. Which part of biodiversity is the most important to be considered in EIAs?	Hard to look at the whole network so maybe we need indicators. In general, you need to look at a number of levels.	Red listed or unique part of fauna and flora.	All are important, but it depends on the situation. In some cases, rare and core species could be important. In some - other levels.	Would not put a value on it.	Cannot say, all are needed.
7. Do you think species and habitats protection status are important to include in EIA?	Yes, to a degree. It depends on what you look at, what scale (small site). There is too much focus on the borders. One needs to think outside the box.	Yes.	It depends.	Yes, but they are also put forward without a concern. E.g. when they want quantity and not quality.	Depends. We have to save the non rare ones as they may become rare. And the rare ones might have been always rare.
8. How do you treat/consider biodiversity in EIA projects?	It is limited: looking mainly at the measurable things (water quality, temperature, etc.).	EIAs are based on: * Looking at the inventory map; * Walking and checking in the field.	From EPA point they are mainly interested in a big view and protected vulnerable areas.	* Rely on baseline and look on other research; * Qualitative discussion in an EIA. * Classify long-, mid-term impacts; during, after construction impacts.	* Earlier: focus on red labelled and protected areas. * Now: expanded the focus more on ecosystem function and species. * In infrastructure cases: fragmentation, barrier effects, mortality, noise etc. * Use species as indicators.

	CAB	***Söderhamn Municipality***	***EPA***	***WPD***	***Swedish Transport Administration***
					* Also think about project's contribution by creating a habitat, improving connectivity, etc.
9. Is biodiversity fully considered in present EIAs/the ones you worked with?	No, there is a lack of information and you see only bits and pieces (not the whole picture).	In general it is handled quite well. But biodiversity is dynamic and EIAs would be better if they look at that.	* Better assessment is needed. * How much should u describe to take a right decision? * The description is not full but it should not be. It is the step, which gets you to the predictions of impacts that is not clear. Thus, those conclusions may not be reliable.	They do not have a special topic on biodiversity.	No. Because we lack knowledge.
10. If biodiversity is properly considered in an EIA process, would that benefit the society and environment?	Probably could.	Yes. Biodiversity is a value itself; it makes the nature more resistant.	Yes. We do not need to change more than we have to.	Yes. Generally it is beneficial if you have more species.	Yes. Because we want to survive in the long term.
11. Does CBD definition cover the whole biodiversity concept?	Yes.	Yes.	Yes.	Yes.	Yes.
12. Is the table clear?	Yes.	No response (my opinion - not very)	Yes.	Clear. Except "map of ecosystems" is something on the paper.	Yes.

	CAB	*Söderhamn Municipality*	*EPA*	*WPD*	*Swedish Transport Administration*
13. Matrix: Do you think it could help to consider biodiversity in EIAs (properly)?	Yes.	Yes.	Cannot answer.	Yes.	Yes.
14. Would you use it yourself?	Yes, makes it more understandable, narrows it down and defines things, so makes it easier to discuss everything on the same level. Help in communication	With some practise	You need to be an expert to use it (biologist, ecologist, etc.). As a planner he would be happy to see the structure and that they know what they are doing.	Would use the approach, because it is clear.	Yes. Some parts he uses right now.
15. Which level is the most important? Why?	Ecosystem and species levels.	Landscape and ecosystem levels.	Landscape. But also ecosystem and species. Maybe genetic is important in the long term.	* Processes are important to understand, because if you missed the other two parts, you can get an idea of how everything works. * All 4 are difficult to have in an EIA.	In early stages – the landscape level, but in general they all are equally important.
16. Comments about the matrix table	* The matrix is a good start. * Genetic level difficult to discuss.	Processes are connecting and interacting between the levels as well – makes it more difficult to distinguish.	* Landscape level is very important to include, especially for humans. * Also, the speed of the landscape change is very important. * It is clear when attributes are divided. * You should not describe all the levels in an EIA. * Risk of an overuse and	Would not have a description of the baseline according to the table, but could have it as an approach.	

	CAB	***Söderhamn Municipality***	***EPA***	***WPD***	***Swedish Transport Administration***
			relying too much.		
17. Anything missing from the table	No.	No.	No.	No.	No.
18. Absence of nature protection status (rarity, etc.)?	They already have a status, so it would be too much focus.	Should have an extra line so to have it written. Those borders are important.	It is a different thing and should not be included.	You do not need them, as you need the chapter on them in EIA anyway.	It is good without them.
19. Problems with EIAs in general			Lack of information between baseline and results in many EIAs: * The description might be good enough, but they do not use it well enough. You do not see how they came to those impacts. This makes not clear how much the EIA is reliable. * Good EIAs are lacking.	Lack of knowledge and information. * Having information on the small area and extrapolating that on the bigger area. * Problem: authorities have an already predetermined opinion what they want from EIAs.	
20. About the interviewee	Interviewee works with EIAs to see if it is enough information to get a permit or if something is missing.	Interviewee used fauna and flora instead of biodiversity concept.	* Interviewee works with transboundary EIAs, wind power, industrial projects. * Not all cases are being picked by them. * Does not totally agree with EPA reports about Sweden's problems with article 14th of CBD.	Most of the cases a person works with do not have any impacts on biodiversity.	

5. DISCUSSION

5.1. World & EU versus biodiversity

5.1.1. EIA struggles worldwide

Considering biodiversity in EIAs is not only the problem of Sweden. „Improved integration of biodiversity and natural ecosystems in EU development cooperation is critical to ensure the new EU 2020 Biodiversity target is reached“ (BirdLife et al., 2010). It means a general concern that something must change, something else should be done.

Even if EIA is implemented properly, the tendency says that it is done only in a fraction of the world. There are still doubting, unprepared, poor or having other problems countries, which have other priorities, and even if developed countries try to find the best solution for an effective EIA this solution may be unreachable or unwanted in other countries. A lot is dependent on political system as well (based on Kolhoff et al. (2010).

It is good that developed countries are more and more concerned with the developing world and conservation of their resources, including biodiversity. Thus we know about such organizations as SIDA, DANIDA etc.

5.1.2. EU and worldwide policy on biodiversity in EIAs

After exploring the requirements of EU on biodiversity and EIA, it seems that EU legislation is not very fluent and clear on the concept of biodiversity, raising such questions as what is included within the concept of biodiversity; and what is the definition of fauna and flora? Consequently, member states are obliged to assess the impacts mainly on fauna and flora. Also, they are quite free to apply whatever definition of biodiversity is convenient. The same goes for the countries, which ratified the CBD. I believe that this kind of freedom makes biodiversity conservation more complicated and difficult both within EU and worldwide.

Birdlife, CI and WWF (2010) overview EU policy and cause a feeling that EC is doing much more „talking“ than “doing”. They do suggest some immediate advice areas, which should be quickly considered in order to improve the situation. However, even though they try to highlight the doing, it still misses the actual word „practically“. I believe, that it has already been a lot of talking and recognition that the problem with biodiversity and development exists and that there

is no good solution how to do it. I have an impression that it is an actual “doing” that needs to be enforced. The ideas humanity has so far are quite promising, as there is so much research being done. It seems that if proper enforcements by politicians would be applied, we would not need to discuss about unreached targets and think once again what went wrong.

The problem of EIA interaction with biodiversity could be the overall comprehension of biodiversity, not only as a concept, but as an important part of the development. I believe that it is not only protected and sensitive areas, as stated in EU EIA directive (EP, 2001), which should be taken into consideration. I agree with an opinion that protection and rarity status is often overrated in EIAs (de Jong et al., 2004, Gontier et al., 2006). Indeed, nature areas protected by legislation reflect only a small fraction of total biodiversity. I think that every EIA should carefully treat impacts on biodiversity and mitigate them as much as possible. Usually, if these impacts are not significant, it should not be too expensive to mitigate them.

Humanity should be concerned, especially as it wants to preserve the mosaic of biodiversity worldwide. Even urban areas have their own environment and biodiversity. Thus it should not be considered “ok” to sacrifice biodiversity fractions within the urban environment.

5.1.3. How biodiversity is defined in other EIA projects?

There is no constant and worldwide biodiversity concept, which would be used in all EIAs. Biodiversity in an EIA study can be understood as biology, fauna and flora, natural environment, etc. To illustrate, EIA of off-shore exploration in Mozambique instead of biodiversity mentions only “fauna and flora“ (ERMSA and CALtd, 2006). The same understanding is found within SEA for port developments in Vung Tau area in Vietnam (BSP, 2006).

EIA for one airport project in Sweden (J&W, 2001) does discuss biodiversity, presenting it as a landscape and special species, but it does not include its definition. Besides biodiversity, this EIA contains two more separate paragraphs on vegetation and fauna, where vegetation part is focusing on the forest cover and fauna is treated as red-listed species.

Another EIA, this time for harbour development (SWECO, 2007), does not contain a biodiversity section, but has related sections in marine biology, landscape and natural environment. Some parts of biodiversity are reflected within the aquatic environment (aquatic plants and animals) and fish and fisheries. Protected areas and future interest are also highlighted in the document.

Even those different sections in the documents mentioned above have in mind different things. To compare, natural environment in the Hallandsås tunnel project (Banverket and J&W, 2000) is focusing on natural landscape and biotopes, as affecting them will affect species within them as well (with the highlight on valuable species). Whereas, natural environment in the EIA of a harbour project (SWECO, 2007) includes such subsections as insects and fungi (highlight on rare and protected species), fauna (occurring species of mammals and birds) and general description (with focus on geological features and vegetation types).

Sometimes EIAs are quite narrow in their biodiversity descriptions. For example, an EIA of an onshore grid connection in UK (RH, 2007) focuses on habitats, plants and animals with the highlight on protected or invasive species.

To sum up, from those examples it could be seen that each EIA has its own structure, concepts, focus and varieties in describing biodiversity, also splitting it into different branches. This makes a confusion of what biodiversity actually is and what is complete and incomplete presentation of this concept in EIA cases both in Sweden and worldwide.

5.2. Interviewees´ reflections on biodiversity issues in EIAs

I am well aware about a small number of interviews I conducted for this thesis[10], and that this limits the certainty of my interpretations and conclusions. However, as those interviews are qualitative, they represent the full opinions on the matter.

Although there were many different opinions and ideas about biodiversity issues within EIAs, some questions were answered the same. Surprisingly, all interviewees agreed that fauna and flora reflect biodiversity, but when given the official biodiversity definition by CBD, all of them said that it covers the whole biodiversity concept. It is interesting that they probably did not think about biodiversity in such a broad sense. Also, I noticed that biodiversity definitions used by interviewees were quite diverse. As all representatives have been working with EIAs, I think it could be assumed, that fauna and flora concept is very familiar to them and thus served as biodiversity. This could also be because of fauna and flora presented in the Swedish Environmental Code, which they all presumably dealt with before it was improved in 2001.

[10] The smaller amount was chosen rather than a bigger in consultation with my supervisor and examiner, due to a lack of time.

5.3. Biodiversity matrix idea

5.3.1. Is biodiversity matrix consistent with the requirements of EU directives, the Swedish Environmental Code and CBD?

As for the EU directives 85/337EEC and 2001/42/EC (see appendices 3 & 4), the matrix table includes even more than is required by those documents. However, it does not exclusively point out the focus on species and habitats protected by Habitats and Birds directives or having a rarity status according to IUCN. As highlighted in chapter 3.3.1, this focus is not necessary to have in the matrix table, as protection status will be considered according to EU and worldwide legislation anyway.

The use of the matrix assures that all levels of biodiversity and different protection status would be evaluated, meaning that important areas are less likely to be overlooked as all of the biodiversity in the area is presented.

As for the CBD, this matrix certainly covers the whole definition of biodiversity and more. Also, the structure of the matrix would help to analyse and assess impacts on biodiversity according to the requirements by article 14 (see appendix 5).

Meanwhile, as the Swedish Environmental Code conception of biodiversity refers to the CBD (Blom, 2011), the biodiversity matrix only improves the present perception within the Code.

5.3.2. Are there any clarifications needed?

As the biodiversity matrix presents the whole complexity of the biodiversity concept it might seem overwhelming at the first look. But with few comments and the matrix picture (Fig.3.3) for the majority of interviewees no further explanation was needed. In general, interviews showed that the biodiversity matrix table is clear, and the only thing needed is practise.

5.3.3. Would the biodiversity matrix be effective?

The good thing about the matrix is that it represents not only different levels, but 3 different attributes of biodiversity (components, patterns, processes). This, however, does not mean that developer has to analyze each of them. However, he should look through all of them and pick the relevant aspects of biodiversity for that specific project, depending on:

- the scale of the project,

- its specifics and goals, and
- the time frame.

Then impacts should be assessed for those aspects. Also, it would be good to have a baseline study and impact assessment presented according to the approach of the matrix (levels and attributes), as well. This would ensure a common way to present and understand impacts on biodiversity and be able to support and motivate how those conclusions were met and why certain parts of biodiversity matrix were excluded. In the end, it should be a common "victory" both for nature and people.

In theory, this idea should simplify and structure the biodiversity analysis in EIA and thus be an efficient tool for assessing biodiversity in many worldwide projects. An advantage is that it expands the biodiversity perspective towards a broad understanding of it as a network, and, thus evaluate it as such and not single spots of that network.

5.3.4. Schematic approach of the matrix idea

As has been mentioned, the biodiversity matrix has some lacks and temporal scale is among them. However, if schematic approach to be applied, it is possible to have a time aspect within the matrix.

To begin with, the dependence between the three biodiversity attributes can be expressed in a triangle (Fig 3.16.). Composition here is something given and it changes due to external influences (natural or human induced). In order to find the reason for the change in composition, we need to look at structure and processes. Structure and processes stand for a deeper and more complex part of biodiversity, where changes are mainly caused by internal processes. The connection between them can be schematically shown as figure 3.17. This scheme also makes an assessment easier as changes in composition of all four biodiversity levels could be determined within four aspects and not eight if the previous matrix table approach is used. That is, instead of looking at two parts: structure and processes times four levels, we can study the structure-processes scheme for each level.

Thus we can basically evaluate e.g. ecosystem changes according to this scheme. Following the line from stable towards collapse, we can assess a time scale, as we would assess when ecosystem changes from stable towards collapse. Here are examples of four main types of coexistence between those two attributes, with a landscape level as a baseline.

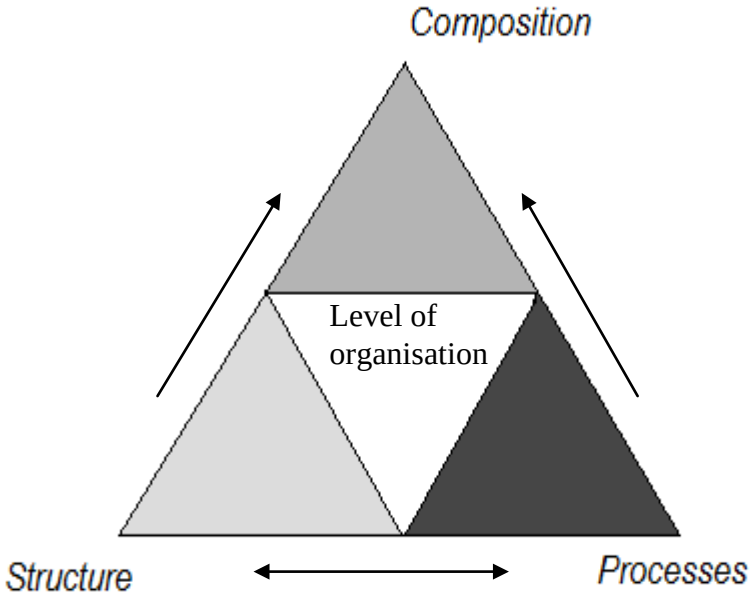

Figure 3.16. Triangle relation between three biodiversity attributes (based on Bengs (2011).

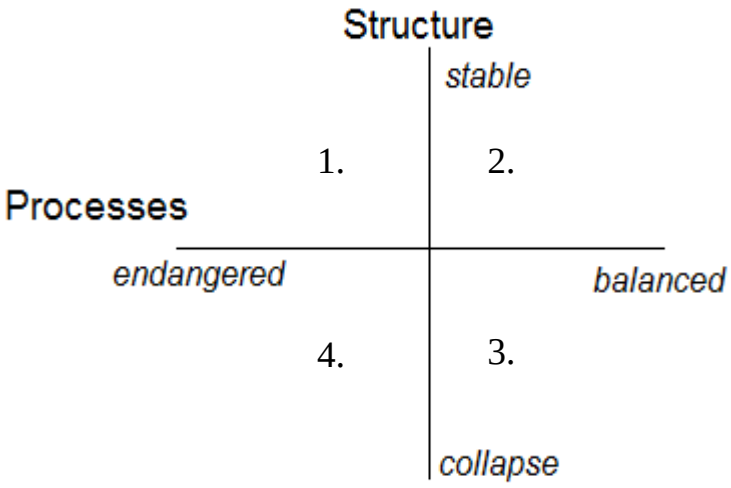

Figure 3.17. Connection between the structure and processes attributes (based on Bengs (2011).

1 – We can have a landscape with a stable structure of ecosystems and communities, where it is a harmony in their distribution, connectivity and barriers. But if we look deeper into the underlying processes within this landscape, we could notice that processes may be endangered. For example, they could be artificially managed by adding nutrients to the soil, and thus interrupting a natural circle of nutrients between ecosystems, e.g. a farming landscape.

2 – The same as above, the structure is stable, but the processes are in balance as well. The best example here would be a natural landscape consisting of such ecosystems as an old growth forest, small stream, etc. The processes in this case are not disturbed in any way and have been in balance for a long time.

3 – Even though the processes in this case are in balance, this may not be enough for a structure to be stable. For instance, the structure of communities could be changing and collapsing because of increasing temperature, as due to a climate change.

4 – The last forth of the scheme presents an unstable landscape both in the structure and the processes. This case could be exemplified by highly human interfered landscape, like an intensive agricultural landscape with a constant interference in nutrient cycling, disturbances from heavy machineries, water regulation by draining, putting or removing barriers (hedgerows, fences, etc.) among the existing communities and ecosystems.

5.3.5. Biodiversity matrix application in different EIA stages

This work was focusing on biodiversity matrix application in the scoping stage of an EIA process. However, it is possible to apply it for the other stages of this process as well. It seems rather complex to be used in the screening, though it is feasible to base screening according to the composition attribute of the table (Bengs, 2011). A proper and easy application for screening and other stages following after the scoping are to be better investigated to be used by practitioners.

6. CONCLUSIONS

Increasing biodiversity loss, degrading ecosystem services, weak legislation and its enforcement, unclear biodiversity definition, freedom in conducting EIAs, all of this and more is calling for a change in biodiversity consideration both worldwide and within EU. Just recently, there are steps being made by International Finance Corporation towards improving maintenance of ecosystem services within project planning and thus promoting World Resources Institute to prepare technical guidelines to help project participants to address ecosystem services within the environmental and social impact assessment process (Landsberg et al., 2011).

The discussion of biodiversity treatment in different EIA cases shows that each EIA is presenting different aspects and levels of biodiversity with only a few of them mentioning biodiversity as such. And so, there is no surprise that neither of them defines biodiversity, this way once again bringing the uncertainty of biodiversity conception.

According to my interviewees, it seems that present biodiversity consideration in EIA processes is not ideal, and each interviewee had to add something from his or her perspective on what is wrong and how it could be improved. For example, lack of knowledge, predetermined needs from the authorities, the need of a common approach, etc. (see chapter 4.1.). The confusion about biodiversity definition was noticed here, as well.

Because of the fact that Ljusne harbour project is still an ongoing process, biodiversity description of the project area and impacts assessment according to the biodiversity matrix was not made, meaning that one of the objectives of this thesis was not met.

Based on the discussions on EU and worldwide legislations on biodiversity and EIA, biodiversity concept matrix presented in this work could be a good tool for a proper biodiversity treatment. Also, this would be a good solution to have a common biodiversity framework to apply in EIAs, which would be understood by all EIA participants and would not miss important links between biodiversity consideration and project planning. In addition, it would solve confusion on biodiversity definition.

In the end, biodiversity matrix should be not difficult to apply and be very useful in EIA processes. Its use should benefit all the different stakeholders involved in an EIA process

including the biodiversity itself. Also, this idea was supported by my interviewees representing both scientists and developers.

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APPENDICES

Appendix 1

Interview for master thesis: **How to consider biodiversity in an EIA process? Example of Ljusne harbour project in Sweden.**

Interviewer: Laima Bučionytė

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Interview outline

- Perspective on the environment
- Biodiversity understanding
- Biodiversity in EIA
- Biodiversity concept matrix. Short presentation and discussion
- Anything else you want to add?

Abbreviations:

EIA – Environmental Impact Assessment (MKB)

CBD – Convention on Biological Diversity

Swedish vocabulary:

Environment – Miljö

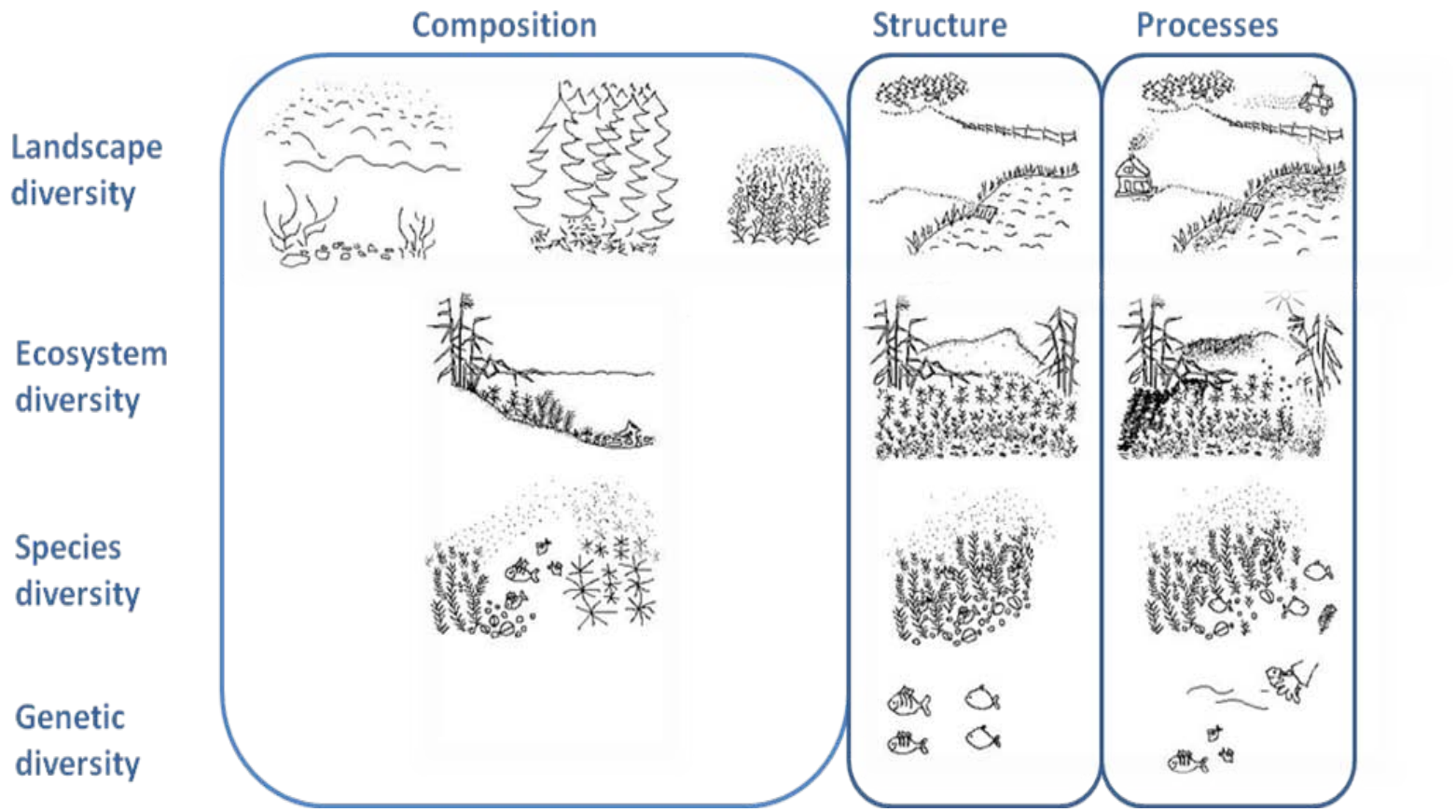
Biodiversity - Biologisk mångfald

Biodiversity – “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems“ - Convention on Biological Diversity (UNEP, 1992).

Biodiversity concept matrix based on Peck (1998) and (Sandström, 2008).

Level of organisation	Composition	Structure	Processes
Landscape diversity	Types of ecosystems and communities; abiotic factors	Map of ecosystems. How ecosystems, communities are distributed in the landscape (size, shape, barriers, etc.)	Processes within and between ecosystems: flows and exchanges, disturbances
Ecosystem diversity	Variety of communities and habitats within an ecosystem; their features, (presence of old communities)	Maps of habitats/communities. Their distribution, structure, connectivity	Processes within and between habitats: flows and exchanges, disturbances
Species diversity	Variety of populations, their size; species richness	Map of populations. The amount of them, their distribution, interrelations	Flows and exchanges, disturbances between populations, their life cycle
Genetic diversity	Set of alleles; special alleles	Genetic diversity within and among populations/species	Genetic drift, gene flow, other fluctuations of genetic material

Illustrated biodiversity concept according to (Peck, 1998) and (Sandström, 2008) (Laima Bučionytė).



Interview material by Laima Bučionytė (2011)

Appendix 2

Interview outline

Perspective on the environment

- Where do you go for a picnic with your family/relatives?
- What do you see around you? What do you like/don't like about it?
- What do you notice when you are outdoor in general?
- How would you define the environment?

Biodiversity understanding

- What do you think is biodiversity?
    - How would you define it? Would you include non bio- things in biodiversity concept; their role?
- Do you think "fauna & flora" reflect biodiversity?

Biodiversity in EIA

- Biodiversity is very little or not at all being paid attention to in Swedish EIAs (According to EPA). Why do you think is like that?
- Which part of biodiversity is the most important to be considered in EIAs? Maybe special places of interest? You are aware about species and habitats protection status. Do you think these are important to include in EIA?
- How do you treat/consider biodiversity in EIA projects?
- In your opinion, is biodiversity fully considered in present EIAs/the ones you worked with? What is good/missing?
- If biodiversity is properly considered in an EIA process, would that benefit the society and environment? How?

- Have a look at the biodiversity definition by CBD. What do you think of it? Does it cover the whole biodiversity concept?

Biodiversity matrix: “Through the table below I tried to make this concept applicable for EIAs, so as to fully assess biodiversity in the development projects. Also, I expanded it to include landscape level.” Few minutes for the interviewees to read and then explain if needed.

- Is it clear for you, or is there anything you would like to clarify? Or do you have any question about it?
- Do you think it could help to consider biodiversity in EIAs (properly)?
- Would you use it yourself?
- Which level is the most important? Why?
- Is there anything missing there?
- What do you think of the absence of nature protection status (rarity, etc.)?

Anything else you want to add?

Appendix 3

COUNCIL DIRECTIVE

of 27 June 1985

on the assessment of the effects of certain public and private projects on the environment

(85/337/EEC)

THE COUNCIL OF THE EUROPEAN

COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Articles 100 and 235 thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas the 1973 (4) and 1977 (5) action programmes of the European Communities on the environment, as well as the 1983 (6) action programme, the main outlines of which have been approved by the Council of the European Communities and the representatives of the Governments of the Member States, stress that the best environmental policy consists in preventing the creation of pollution or nuisances at source, rather than subsequently trying to counteract their effects; whereas they affirm the need to take effects on the environment into account at the earliest possible stage in all the technical planning and decision-making processes; whereas to that end, they provide for the implementation of procedures to evaluate such effects;

Whereas the disparities between the laws in force in the various Member States with regard to the assessment of the environmental effects of public and private projects may create unfavourable competitive conditions and thereby directly affect the functioning of the common market; whereas, therefore, it is necessary to approximate national laws in this field pursuant to Article 100 of the Treaty;

Whereas, in addition, it is necessary to achieve one of the Community's objectives in the sphere of the protection of the environment and the quality of life;

Whereas, since the Treaty has not provided the powers required for this end, recourse should be had to Article 235 of the Treaty;

Whereas general principles for the assessment of environmental effects should be introduced with a view to supplementing and coordinating development consent procedures governing public and private projects likely to have a major effect on the environment;

Whereas development consent for public and private projects which are likely to have significant effects on the environment should be granted only after prior assessment of the likely significant

environmental effects of these projects has been carried out; whereas this assessment must be conducted on the basis of the appropriate information supplied by the developer, which may be supplemented by the authorities and by the people who may be concerned by the project in question;

Whereas the principles of the assessment of environmental effects should be harmonized, in particular with reference to the projects which should be subject to assessment, the main obligations of the developers and the content of the assessment;

Whereas projects belonging to certain types have significant effects on the environment and these projects must as a rule be subject to systematic assessment;

Whereas projects of other types may not have significant effects on the environment in every case and whereas these projects should be assessed where the Member States consider that their characteristics so require;

Whereas, for projects which are subject to assessment, a certain minimal amount of information must be supplied, concerning the project and its effects;

Whereas the effects of a project on the environment must be assessed in order to take account of concerns to protect human health, to contribute by means of a better environment to the quality of life, to ensure maintenance of the diversity of species and to maintain the reproductive capacity of the ecosystem as a basic resource for life;

Whereas, however, this Directive should not be applied to projects the details of which are adopted by a specific act of national legislation, since the objectives of this Directive, including that of supplying information, are achieved through the legislative process;

Whereas, furthermore, it may be appropriate in exceptional cases to exempt a specific project from the assessment procedures laid down by this Directive, subject to appropriate information being supplied to the Commission,

HAS ADOPTED THIS DIRECTIVE:

Article 1

1. This Directive shall apply to the assessment of the environmental effects of those public and private projects which are likely to have significant effects on the environment.

2. For the purposes of this Directive:

'project' means:

- the execution of construction works or of other installations or schemes,

- other interventions in the natural surroundings and landscape including those involving the extraction of mineral resources;

'developer' means:

the applicant for authorization for a private project or the public authority which initiates a project;

'development consent' means:

the decision of the competent authority or authorities which entitles the developer to proceed with the project.

3. The competent authority or authorities shall be that or those which the Member States designate as responsible for performing the duties arising from this Directive.

4. Projects serving national defence purposes are not covered by this Directive.

5. This Directive shall not apply to projects the details of which are adopted by a specific act of national legislation, since the objectives of this Directive, including that of supplying information, are achieved through the legislative process.

Article 2

1. Member States shall adopt all measures necessary to ensure that, before consent is given, projects likely to have significant effects on the environment by virtue inter alia, of their nature, size or location are made subject to an assessment with regard to their effects.

These projects are defined in Article 4.

2. The environmental impact assessment may be integrated into the existing procedures for consent to projects in the Member States, or, failing this, into other procedures or into procedures to be established to comply with the aims of this Directive.

3. Member States may, in exceptional cases, exempt a specific project in whole or in part from the provisions laid down in this Directive.

In this event, the Member States shall:

(a) consider whether another form of assessment would be appropriate and whether the information thus collected should be made available to the public;

(b) make available to the public concerned the information relating to the exemption and the reasons for granting it;

(c) inform the Commission, prior to granting consent, of the reasons justifying the exemption granted, and provide it with the information made available, where appropriate, to their own nationals.

The Commission shall immediately forward the documents received to the other Member States.

The Commission shall report annually to the Council on the application of this paragraph.

Article 3

The environmental impact assessment will identify, describe and assess in an appropriate manner, in the light of each individual case and in accordance with the Articles 4 to 11, the direct and indirect effects of a project on the following factors:

- human beings, fauna and flora,

- soil, water, air, climate and the landscape,

- the inter-action between the factors mentioned in the first and second indents,

- material assets and the cultural heritage.

Article 4

1. Subject to Article 2 (3), projects of the classes listed in Annex I shall be made subject to an assessment in accordance with Articles 5 to 10.

2. Projects of the classes listed in Annex II shall be made subject to an assessment, in accordance with Articles 5 to 10, where Member States consider that their characteristics so require. To this end Member States may inter alia specify certain types of projects as being subject to an assessment or may establish the criteria and/or thresholds necessary to determine which of the projects of the classes listed in Annex II are to be subject to an assessment in accordance with Articles 5 to 10.

Article 5

1. In the case of projects which, pursuant to Article 4, must be subjected to an environmental impact assessment in accordance with Articles 5 to 10, Member States shall adopt the necessary measures to ensure that the developer supplies in an appropriate form the information specified in Annex III inasmuch as:

(a) the Member States consider that the information is relevant to a given stage of the consent procedure and to the specific characteristics of a particular project or type of project and of the environmental features likely to be affected;

(b) the Member States consider that a developer may reasonably be required to compile this information having regard inter alia to current knowledge and methods of assessment.

2. The information to be provided by the developer in accordance with paragraph 1 shall include at least:

- a description of the project comprising information on the site, design and size of the project,

- a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects,

- the data required to identify and assess the main effects which the project is likely to have on the environment,

- a non-technical summary of the information mentioned in indents 1 to 3.

3. Where they consider it necessary, Member States shall ensure that any authorities with relevant information in their possession make this information available to the developer.

Article 6

1. Member States shall take the measures necessary to ensure that the authorities likely to be concerned by the project by reason of their specific environmental responsibilities are given an opportunity to express their opinion on the request for development consent. Member States shall designate the authorities to be consulted for this purpose in general terms or in each case when the request for consent is made. The information gathered pursuant to Article 5 shall be forwarded to these authorities. Detailed arrangements for consultation shall be laid down by the Member States.

2. Member States shall ensure that:

- any request for development consent and any information gathered pursuant to Article 5 are made available to the public,

- the public concerned is given the opportunity to express an opinion before the project is initiated.

3. The detailed arrangements for such information and consultation shall be determined by the Member States, which may in particular, depending on the particular characteristics of the projects or sites concerned:

- determine the public concerned,

- specify the places where the information can be consulted,

- specify the way in which the public may be informed, for example by bill-posting within a certain radius, publication in local newspapers, organization of exhibitions with plans, drawings, tables, graphs, models,

- determine the manner in which the public is to be consulted, for example, by written submissions, by public enquiry,

- fix appropriate time limits for the various stages of the procedure in order to ensure that a decision is taken within a reasonable period.

Article 7

Where a Member State is aware that a project is likely to have significant effects on the environment in another Member State or where a Member State likely to be significantly affected so requests, the Member State in whose territory the project is intended to be carried out shall forward the information gathered pursuant to Article 5 to the other Member State at the same time as it makes it available to its own nationals. Such information shall serve as a basis for any consultations necessary in the framework of the bilateral relations between two Member States on a reciprocal and equivalent basis.

Article 8

Information gathered pursuant to Articles 5, 6 and 7 must be taken into consideration in the development consent procedure.

Article 9

When a decision has been taken, the competent authority or authorities shall inform the public concerned of:

- the content of the decision and any conditions attached thereto,

- the reasons and considerations on which the decision is based where the Member States' legislation so provides. The detailed arrangements for such information shall be determined by the Member States.

If another Member State has been informed pursuant to Article 7, it will also be informed of the decision in question.

Article 10

The provisions of this Directive shall not affect the obligation on the competent authorities to respect the limitations imposed by national regulations and administrative provisions and accepted legal practices with regard to industrial and commercial secrecy and the safeguarding of the public interest.

Where Article 7 applies, the transmission of information to another Member State and the reception of information by another Member State shall be subject to the limitations in force in the Member State in which the project is proposed.

Article 11

1. The Member States and the Commission shall exchange information on the experience gained in applying this Directive.

2. In particular, Member States shall inform the Commission of any criteria and/or thresholds adopted for the selection of the projects in question, in accordance with Article 4 (2), or of the types of projects concerned which, pursuant to Article 4 (2), are subject to assessment in accordance with Articles 5 to 10.

3. Five years after notification of this Directive, the Commission shall send the European Parliament and the Council a report on its application and effectiveness. The report shall be based on the aforementioned exchange of information.

4. On the basis of this exchange of information, the Commission shall submit to the Council additional proposals, should this be necessary, with a view to this Directive's being applied in a sufficiently coordinated manner.

Article 12

1. Member States shall take the measures necessary to comply with this Directive within three years of its notification (1).

2. Member States shall communicate to the Commission the texts of the provisions of national law which they adopt in the field covered by this Directive.

Article 13

The provisions of this Directive shall not affect the right of Member States to lay down stricter rules regarding scope and procedure when assessing environmental effects.

Article 14

This Directive is addressed to the Member States.

Done at Luxembourg, 27 June 1985.

For the Council

The President

A. BIONDI

(1) OJ No C 169, 9. 7. 1980, p. 14.

(2) OJ No C 66, 15. 3. 1982, p. 89.

(3) OJ No C 185, 27. 7. 1981, p. 8.

(4) OJ No C 112, 20. 12. 1973, p. 1.

(5) OJ No C 139, 13. 6. 1977, p. 1.

(6) OJ No C 46, 17. 2. 1983, p. 1.

(1) This Directive was notified to the Member States on 3 July 1985.

ANNEX I

PROJECTS SUBJECT TO ARTICLE 4 (1)

1. Crude-oil refineries (excluding undertakings manufacturing only lubricants from crude oil) and installations for the gasification and liquefaction of 500 tonnes or more of coal or bituminous shale per day.

2. Thermal power stations and other combustion installations with a heat output of 300 megawatts or more and nuclear power stations and other nuclear reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kilowatt continuous thermal load).

3. Installations solely designed for the permanent storage or final disposal of radioactive waste.

4. Integrated works for the initial melting of cast-iron and steel.

5. Installations for the extraction of asbestos and for the processing and transformation of asbestos and products containing asbestos: for asbestos-cement products, with an annual production of more than 20 000 tonnes of finished products, for friction material, with an annual production of more than 50 tonnes of finished products, and for other uses of asbestos, utilization of more than 200 tonnes per year.

6. Integrated chemical installations.

7. Construction of motorways, express roads (1) and lines for long-distance railway traffic and of airports (2) with a basic runway length of 2 100 m or more.

8. Trading ports and also inland waterways and ports for inland-waterway traffic which permit the passage of vessels of over 1 350 tonnes.

9. Waste-disposal installations for the incineration, chemical treatment or land fill of toxic and dangerous wastes.

(1) For the purposes of the Directive, 'express road' means a road which complies with the definition in the European Agreement on main international traffic arteries of 15 November 1975.

(2) For the purposes of this Directive, 'airport' means airports which comply with the definition in the 1944 Chicago Convention setting up the International Civil Aviation Organization (Annex 14).

ANNEX II

PROJECTS SUBJECT TO ARTICLE 4 (2)

1. Agriculture

(a) Projects for the restructuring of rural land holdings.

(b) Projects for the use of uncultivated land or semi-natural areas for intensive agricultural purposes.

(c) Water-management projects for agriculture.

(d) Initial afforestation where this may lead to adverse ecological changes and land reclamation for the purposes of conversion to another type of land use.

(e) Poultry-rearing installations.

(f) Pig-rearing installations.

(g) Salmon breeding.

(h) Reclamation of land from the sea.

2. Extractive industry

(a) Extraction of peat.

(b) Deep drillings with the exception of drillings for investigating the stability of the soil and in particular:

- geothermal drilling,

- drilling for the storage of nuclear waste material,

- drilling for water supplies.

(c) Extraction of minerals other than metalliferous and energy-producing minerals, such as marble, sand, gravel, shale, salt, phosphates and potash.

(d) Extraction of coal and lignite by underground mining.

(e) Extraction of coal and lignite by open-cast mining.

(f) Extraction of petroleum.

(g) Extraction of natural gas.

(h) Extraction of ores.

(i) Extraction of bituminous shale.

(j) Extraction of minerals other than metalliferous and energy-producing minerals by open-cast mining.

(k) Surface industrial installations for the extraction of coal, petroleum, natural gas and ores, as well as bituminous shale.

(l) Coke ovens (dry coal distillation).

(m) Installations for the manufacture of cement.

3. Energy industry

(a) Industrial installations for the production of electricity, steam and hot water (unless included in Annex I).

(b) Industrial installations for carrying gas, steam and hot water; transmission of electrical energy by overhead cables.

(c) Surface storage of natural gas.

(d) Underground storage of combustible gases.

(e) Surface storage of fossil fuels.

(f) Industrial briquetting of coal and lignite.

(g) Installations for the production or enrichment of nuclear fuels.

(h) Installations for the reprocessing of irradiated nuclear fuels.

(i) Installations for the collection and processing of radioactive waste (unless included in Annex I).

(j) Installations for hydroelectric energy production. 4. Processing of metals

(a) Iron and steel works, including foundries, forges, drawing plants and rolling mills (unless included in Annex I).

(b) Installations for the production, including smelting, refining, drawing and rolling, of nonferrous metals, excluding precious metals.

(c) Pressing, drawing and stamping of large castings.

(d) Surface treatment and coating of metals.

(e) Boilermaking, manufacture of reservoirs, tanks and other sheet-metal containers.

(f) Manufacture and assembly of motor vehicles and manufacture of motor-vehicle engines.

(g) Shipyards.

(h) Installations for the construction and repair of aircraft.

(i) Manufacture of railway equipment.

(j) Swaging by explosives.

(k) Installations for the roasting and sintering of metallic ores.

5. Manufacture of glass

6. Chemical industry

(a) Treatment of intermediate products and production of chemicals (unless included in Annex I).

(b) Production of pesticides and pharmaceutical products, paint and varnishes, elastomers and peroxides.

(c) Storage facilities for petroleum, petrochemical and chemical products.

7. Food industry

(a) Manufacture of vegetable and animal oils and fats.

(b) Packing and canning of animal and vegetable products.

(c) Manufacture of dairy products.

(d) Brewing and malting.

(e) Confectionery and syrup manufacture.

(f) Installations for the slaughter of animals.

(g) Industrial starch manufacturing installations.

(h) Fish-meal and fish-oil factories.

(i) Sugar factories.

8. Textile, leather, wood and paper industries

(a) Wool scouring, degreasing and bleaching factories.

(b) Manufacture of fibre board, particle board and plywood.

(c) Manufacture of pulp, paper and board.

(d) Fibre-dyeing factories.

(e) Cellulose-processing and production installations.

(f) Tannery and leather-dressing factories.

9. Rubber industry

Manufacture and treatment of elastomer-based products.

10. Infrastructure projects

(a) Industrial-estate development projects.

(b) Urban-development projects.

(c) Ski-lifts and cable-cars.

(d) Construction of roads, harbours, including fishing harbours, and airfields (projects not listed in Annex I).

(e) Canalization and flood-relief works.

(f) Dams and other installations designed to hold water or store it on a long-term basis.

(g) Tramways, elevated and underground railways, suspended lines or similar lines of a particular type, used exclusively or mainly for passenger transport.

(h) Oil and gas pipeline installations.

(i) Installation of long-distance aqueducts.

(j) Yacht marinas. 11. Other projects

(a) Holiday villages, hotel complexes.

(b) Permanent racing and test tracks for cars and motor cycles.

(c) Installations for the disposal of industrial and domestic waste (unless included in Annex I).

(d) Waste water treatment plants.

(e) Sludge-deposition sites.

(f) Storage of scrap iron.

(g) Test benches for engines, turbines or reactors.

(h) Manufacture of artificial mineral fibres.

(i) Manufacture, packing, loading or placing in cartridges of gunpowder and explosives.

(j) Knackers' yards.

12. Modifications to development projects included in Annex I and projects in Annex I undertaken exclusively or mainly for the development and testing of new methods or products and not used for more than one year.

ANNEX III

INFORMATION REFERRED TO IN ARTICLE 5 (1)

1. Description of the project, including in particular:

- a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases,

- a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used,

- an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project.

2. Where appropriate, an outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects.

3. A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.

4. A description (1) of the likely significant effects of the proposed project on the environment resulting from:

- the existence of the project,

- the use of natural resources,

- the emission of pollutants, the creation of nuisances and the elimination of waste;

and the description by the developer of the forecasting methods used to assess the effects on the environment.

5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

6. A non-technical summary of the information provided under the above headings.

7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.

(1) This description should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project.

Appendix 4

Directive 2001/42/EC of the European Parliament and of the Council

of 27 June 2001

on the assessment of the effects of certain plans and programmes on the environment

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission(1),

Having regard to the opinion of the Economic and Social Committee(2),

Having regard to the opinion of the Committee of the Regions(3),

Acting in accordance with the procedure laid down in Article 251 of the Treaty(4), in the light of the joint text approved by the Conciliation Committee on 21 March 2001,

Whereas:

(1) Article 174 of the Treaty provides that Community policy on the environment is to contribute to, inter alia, the preservation, protection and improvement of the quality of the environment, the protection of human health and the prudent and rational utilisation of natural resources and that it is to be based on the precautionary principle. Article 6 of the Treaty provides that environmental protection requirements are to be integrated into the definition of Community policies and activities, in particular with a view to promoting sustainable development.

(2) The Fifth Environment Action Programme: Towards sustainability - A European Community programme of policy and action in relation to the environment and sustainable development(5), supplemented by Council Decision No 2179/98/EC(6) on its review, affirms the importance of assessing the likely environmental effects of plans and programmes.

(3) The Convention on Biological Diversity requires Parties to integrate as far as possible and as appropriate the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans and programmes.

(4) Environmental assessment is an important tool for integrating environmental considerations into the preparation and adoption of certain plans and programmes which are likely to have significant effects on the environment in the Member States, because it ensures that such effects of implementing plans and programmes are taken into account during their preparation and before their adoption.

(5) The adoption of environmental assessment procedures at the planning and programming level should benefit undertakings by providing a more consistent framework in which to operate by the inclusion of the relevant environmental information into decision making. The inclusion of a

wider set of factors in decision making should contribute to more sustainable and effective solutions.

(6) The different environmental assessment systems operating within Member States should contain a set of common procedural requirements necessary to contribute to a high level of protection of the environment.

(7) The United Nations/Economic Commission for Europe Convention on Environmental Impact Assessment in a Transboundary Context of 25 February 1991, which applies to both Member States and other States, encourages the parties to the Convention to apply its principles to plans and programmes as well; at the second meeting of the Parties to the Convention in Sofia on 26 and 27 February 2001, it was decided to prepare a legally binding protocol on strategic environmental assessment which would supplement the existing provisions on environmental impact assessment in a transboundary context, with a view to its possible adoption on the occasion of the 5th Ministerial Conference "Environment for Europe" at an extraordinary meeting of the Parties to the Convention, scheduled for May 2003 in Kiev, Ukraine. The systems operating within the Community for environmental assessment of plans and programmes should ensure that there are adequate transboundary consultations where the implementation of a plan or programme being prepared in one Member State is likely to have significant effects on the environment of another Member State. The information on plans and programmes having significant effects on the environment of other States should be forwarded on a reciprocal and equivalent basis within an appropriate legal framework between Member States and these other States.

(8) Action is therefore required at Community level to lay down a minimum environmental assessment framework, which would set out the broad principles of the environmental assessment system and leave the details to the Member States, having regard to the principle of subsidiarity. Action by the Community should not go beyond what is necessary to achieve the objectives set out in the Treaty.

(9) This Directive is of a procedural nature, and its requirements should either be integrated into existing procedures in Member States or incorporated in specifically established procedures. With a view to avoiding duplication of the assessment, Member States should take account, where appropriate, of the fact that assessments will be carried out at different levels of a hierarchy of plans and programmes.

(10) All plans and programmes which are prepared for a number of sectors and which set a framework for future development consent of projects listed in Annexes I and II to Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment(7), and all plans and programmes which have been determined to require assessment pursuant to Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild flora and fauna(8), are likely to have significant effects on the environment, and should as a rule be made subject to systematic environmental assessment. When they determine the use of small areas at local level or are minor modifications to the above plans or programmes, they should be assessed only where Member States determine that they are likely to have significant effects on the environment.

(11) Other plans and programmes which set the framework for future development consent of projects may not have significant effects on the environment in all cases and should be assessed only where Member States determine that they are likely to have such effects.

(12) When Member States make such determinations, they should take into account the relevant criteria set out in this Directive.

(13) Some plans or programmes are not subject to this Directive because of their particular characteristics.

(14) Where an assessment is required by this Directive, an environmental report should be prepared containing relevant information as set out in this Directive, identifying, describing and evaluating the likely significant environmental effects of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme; Member States should communicate to the Commission any measures they take concerning the quality of environmental reports.

(15) In order to contribute to more transparent decision making and with the aim of ensuring that the information supplied for the assessment is comprehensive and reliable, it is necessary to provide that authorities with relevant environmental responsibilities and the public are to be consulted during the assessment of plans and programmes, and that appropriate time frames are set, allowing sufficient time for consultations, including the expression of opinion.

(16) Where the implementation of a plan or programme prepared in one Member State is likely to have a significant effect on the environment of other Member States, provision should be made for the Member States concerned to enter into consultations and for the relevant authorities and the public to be informed and enabled to express their opinion.

(17) The environmental report and the opinions expressed by the relevant authorities and the public, as well as the results of any transboundary consultation, should be taken into account during the preparation of the plan or programme and before its adoption or submission to the legislative procedure.

(18) Member States should ensure that, when a plan or programme is adopted, the relevant authorities and the public are informed and relevant information is made available to them.

(19) Where the obligation to carry out assessments of the effects on the environment arises simultaneously from this Directive and other Community legislation, such as Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds(9), Directive 92/43/EEC, or Directive 2000/60/EC of the European Parliament and the Council of 23 October 2000 establishing a framework for Community action in the field of water policy(10), in order to avoid duplication of the assessment, Member States may provide for coordinated or joint procedures fulfilling the requirements of the relevant Community legislation.

(20) A first report on the application and effectiveness of this Directive should be carried out by the Commission five years after its entry into force, and at seven-year intervals thereafter. With a view to further integrating environmental protection requirements, and taking into account the experience acquired, the first report should, if appropriate, be accompanied by proposals for amendment of this Directive, in particular as regards the possibility of extending its scope to other areas/sectors and other types of plans and programmes,

HAVE ADOPTED THIS DIRECTIVE:

Article 1

Objectives

The objective of this Directive is to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment.

Article 2

Definitions

For the purposes of this Directive:

(a) "plans and programmes" shall mean plans and programmes, including those co-financed by the European Community, as well as any modifications to them:

- which are subject to preparation and/or adoption by an authority at national, regional or local level or which are prepared by an authority for adoption, through a legislative procedure by Parliament or Government, and

- which are required by legislative, regulatory or administrative provisions;

(b) "environmental assessment" shall mean the preparation of an environmental report, the carrying out of consultations, the taking into account of the environmental report and the results of the consultations in decision-making and the provision of information on the decision in accordance with Articles 4 to 9;

(c) "environmental report" shall mean the part of the plan or programme documentation containing the information required in Article 5 and Annex I;

(d) "The public" shall mean one or more natural or legal persons and, in accordance with national legislation or practice, their associations, organisations or groups.

Article 3

Scope

1. An environmental assessment, in accordance with Articles 4 to 9, shall be carried out for plans and programmes referred to in paragraphs 2 to 4 which are likely to have significant environmental effects.

2. Subject to paragraph 3, an environmental assessment shall be carried out for all plans and programmes,

(a) which are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications, tourism, town and country planning or land use and which set the framework for future development consent of projects listed in Annexes I and II to Directive 85/337/EEC, or

(b) which, in view of the likely effect on sites, have been determined to require an assessment pursuant to Article 6 or 7 of Directive 92/43/EEC.

3. Plans and programmes referred to in paragraph 2 which determine the use of small areas at local level and minor modifications to plans and programmes referred to in paragraph 2 shall require an environmental assessment only where the Member States determine that they are likely to have significant environmental effects.

4. Member States shall determine whether plans and programmes, other than those referred to in paragraph 2, which set the framework for future development consent of projects, are likely to have significant environmental effects.

5. Member States shall determine whether plans or programmes referred to in paragraphs 3 and 4 are likely to have significant environmental effects either through case-by-case examination or by specifying types of plans and programmes or by combining both approaches. For this purpose Member States shall in all cases take into account relevant criteria set out in Annex II, in order to ensure that plans and programmes with likely significant effects on the environment are covered by this Directive.

6. In the case-by-case examination and in specifying types of plans and programmes in accordance with paragraph 5, the authorities referred to in Article 6(3) shall be consulted.

7. Member States shall ensure that their conclusions pursuant to paragraph 5, including the reasons for not requiring an environmental assessment pursuant to Articles 4 to 9, are made available to the public.

8. The following plans and programmes are not subject to this Directive:

- plans and programmes the sole purpose of which is to serve national defence or civil emergency,

- financial or budget plans and programmes.

9. This Directive does not apply to plans and programmes co-financed under the current respective programming periods(11) for Council Regulations (EC) No 1260/1999(12) and (EC) No 1257/1999(13).

Article 4

General obligations

1. The environmental assessment referred to in Article 3 shall be carried out during the preparation of a plan or programme and before its adoption or submission to the legislative procedure.

2. The requirements of this Directive shall either be integrated into existing procedures in Member States for the adoption of plans and programmes or incorporated in procedures established to comply with this Directive.

3. Where plans and programmes form part of a hierarchy, Member States shall, with a view to avoiding duplication of the assessment, take into account the fact that the assessment will be carried out, in accordance with this Directive, at different levels of the hierarchy. For the purpose of, inter alia, avoiding duplication of assessment, Member States shall apply Article 5(2) and (3).

Article 5

Environmental report

1. Where an environmental assessment is required under Article 3(1), an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated. The information to be given for this purpose is referred to in Annex I.

2. The environmental report prepared pursuant to paragraph 1 shall include the information that may reasonably be required taking into account current knowledge and methods of assessment, the contents and level of detail in the plan or programme, its stage in the decision-making process and the extent to which certain matters are more appropriately assessed at different levels in that process in order to avoid duplication of the assessment.

3. Relevant information available on environmental effects of the plans and programmes and obtained at other levels of decision-making or through other Community legislation may be used for providing the information referred to in Annex I.

4. The authorities referred to in Article 6(3) shall be consulted when deciding on the scope and level of detail of the information which must be included in the environmental report.

Article 6

Consultations

1. The draft plan or programme and the environmental report prepared in accordance with Article 5 shall be made available to the authorities referred to in paragraph 3 of this Article and the public.

2. The authorities referred to in paragraph 3 and the public referred to in paragraph 4 shall be given an early and effective opportunity within appropriate time frames to express their opinion on the draft plan or programme and the accompanying environmental report before the adoption of the plan or programme or its submission to the legislative procedure.

3. Member States shall designate the authorities to be consulted which, by reason of their specific environmental responsibilities, are likely to be concerned by the environmental effects of implementing plans and programmes.

4. Member States shall identify the public for the purposes of paragraph 2, including the public affected or likely to be affected by, or having an interest in, the decision-making subject to this Directive, including relevant non-governmental organisations, such as those promoting environmental protection and other organisations concerned.

5. The detailed arrangements for the information and consultation of the authorities and the public shall be determined by the Member States.

Article 7

Transboundary consultations

1. Where a Member State considers that the implementation of a plan or programme being prepared in relation to its territory is likely to have significant effects on the environment in another Member State, or where a Member State likely to be significantly affected so requests, the Member State in whose territory the plan or programme is being prepared shall, before its adoption or submission to the legislative procedure, forward a copy of the draft plan or programme and the relevant environmental report to the other Member State.

2. Where a Member State is sent a copy of a draft plan or programme and an environmental report under paragraph 1, it shall indicate to the other Member State whether it wishes to enter into consultations before the adoption of the plan or programme or its submission to the legislative procedure and, if it so indicates, the Member States concerned shall enter into consultations concerning the likely transboundary environmental effects of implementing the plan or programme and the measures envisaged to reduce or eliminate such effects.

Where such consultations take place, the Member States concerned shall agree on detailed arrangements to ensure that the authorities referred to in Article 6(3) and the public referred to in Article 6(4) in the Member State likely to be significantly affected are informed and given an opportunity to forward their opinion within a reasonable time-frame.

3. Where Member States are required under this Article to enter into consultations, they shall agree, at the beginning of such consultations, on a reasonable timeframe for the duration of the consultations.

Article 8

Decision making

The environmental report prepared pursuant to Article 5, the opinions expressed pursuant to Article 6 and the results of any transboundary consultations entered into pursuant to Article 7 shall be taken into account during the preparation of the plan or programme and before its adoption or submission to the legislative procedure.

Article 9

Information on the decision

1. Member States shall ensure that, when a plan or programme is adopted, the authorities referred to in Article 6(3), the public and any Member State consulted under Article 7 are informed and the following items are made available to those so informed:

(a) the plan or programme as adopted;

(b) a statement summarising how environmental considerations have been integrated into the plan or programme and how the environmental report prepared pursuant to Article 5, the opinions expressed pursuant to Article 6 and the results of consultations entered into pursuant to Article 7 have been taken into account in accordance with Article 8 and the reasons for choosing the plan or programme as adopted, in the light of the other reasonable alternatives dealt with, and

(c) the measures decided concerning monitoring in accordance with Article 10.

2. The detailed arrangements concerning the information referred to in paragraph 1 shall be determined by the Member States.

Article 10

Monitoring

1. Member States shall monitor the significant environmental effects of the implementation of plans and programmes in order, inter alia, to identify at an early stage unforeseen adverse effects, and to be able to undertake appropriate remedial action.

2. In order to comply with paragraph 1, existing monitoring arrangements may be used if appropriate, with a view to avoiding duplication of monitoring.

Article 11

Relationship with other Community legislation

1. An environmental assessment carried out under this Directive shall be without prejudice to any requirements under Directive 85/337/EEC and to any other Community law requirements.

2. For plans and programmes for which the obligation to carry out assessments of the effects on the environment arises simultaneously from this Directive and other Community legislation, Member States may provide for coordinated or joint procedures fulfilling the requirements of the relevant Community legislation in order, inter alia, to avoid duplication of assessment.

3. For plans and programmes co-financed by the European Community, the environmental assessment in accordance with this Directive shall be carried out in conformity with the specific provisions in relevant Community legislation.

Article 12

Information, reporting and review

1. Member States and the Commission shall exchange information on the experience gained in applying this Directive.

2. Member States shall ensure that environmental reports are of a sufficient quality to meet the requirements of this Directive and shall communicate to the Commission any measures they take concerning the quality of these reports.

3. Before 21 July 2006 the Commission shall send a first report on the application and effectiveness of this Directive to the European Parliament and to the Council.

With a view further to integrating environmental protection requirements, in accordance with Article 6 of the Treaty, and taking into account the experience acquired in the application of this Directive in the Member States, such a report will be accompanied by proposals for amendment of this Directive, if appropriate. In particular, the Commission will consider the possibility of extending the scope of this Directive to other areas/sectors and other types of plans and programmes.

A new evaluation report shall follow at seven-year intervals.

4. The Commission shall report on the relationship between this Directive and Regulations (EC) No 1260/1999 and (EC) No 1257/1999 well ahead of the expiry of the programming periods provided for in those Regulations, with a view to ensuring a coherent approach with regard to this Directive and subsequent Community Regulations.

Article 13

Implementation of the Directive

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive before 21 July 2004. They shall forthwith inform the Commission thereof.

2. When Member States adopt the measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such reference shall be laid down by Member States.

3. The obligation referred to in Article 4(1) shall apply to the plans and programmes of which the first formal preparatory act is subsequent to the date referred to in paragraph 1. Plans and programmes of which the first formal preparatory act is before that date and which are adopted or submitted to the legislative procedure more than 24 months thereafter, shall be made subject to the obligation referred to in Article 4(1) unless Member States decide on a case by case basis that this is not feasible and inform the public of their decision.

4. Before 21 July 2004, Member States shall communicate to the Commission, in addition to the measures referred to in paragraph 1, separate information on the types of plans and programmes which, in accordance with Article 3, would be subject to an environmental assessment pursuant to this Directive. The Commission shall make this information available to the Member States. The information will be updated on a regular basis.

Article 14

Entry into force

This Directive shall enter into force on the day of its publication in the Official Journal of the European Communities.

Article 15

Addressees

This Directive is addressed to the Member States.

Done at Luxembourg, 27 June 2001.

For the European Parliament

The President

N. Fontaine

For the Council

The President

B. Rosengren

(1) OJ C 129, 25.4.1997, p. 14 and

OJ C 83, 25.3.1999, p. 13.

(2) OJ C 287, 22.9.1997, p. 101.

(3) OJ C 64, 27.2.1998, p. 63 and

OJ C 374, 23.12.1999, p. 9.

(4) Opinion of the European Parliament of 20 October 1998 (OJ C 341, 9.11.1998, p. 18), confirmed on 16 September 1999 (OJ C 54, 25.2.2000, p. 76), Council Common Position of 30 March 2000 (OJ C 137, 16.5.2000, p. 11) and Decision of the European Parliament of 6 September 2000 (OJ C 135, 7.5.2001, p. 155). Decision of the European Parliament of 31 May 2001 and Decision of the Council of 5 June 2001.

(5) OJ C 138, 17.5.1993, p. 5.

(6) OJ L 275, 10.10.1998, p. 1.

(7) OJ L 175, 5.7.1985, p. 40. Directive as amended by Directive 97/11/EC (OJ L 73, 14.3.1997, p. 5).

(8) OJ L 206, 22.7.1992, p. 7. Directive as last amended by Directive 97/62/EC (OJ L 305, 8.11.1997, p. 42).

(9) OJ L 103, 25.4.1979, p. 1. Directive as last amended by Directive 97/49/EC (OJ L 223, 13.8.1997, p. 9).

(10) OJ L 327, 22.12.2000, p. 1.

(11) The 2000-2006 programming period for Council Regulation (EC) No 1260/1999 and the 2000-2006 and 2000-2007 programming periods for Council Regulation (EC) No 1257/1999.

(12) Council Regulation (EC) No 1260/1999 of 21 June 1999 laying down general provisions on the Structural Funds (OJ L 161, 26.6.1999, p. 1).

(13) Council Regulation (EC) No 1257/1999 of 17 May 1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF) and amending and repealing certain regulations (OJ L 160, 26.6.1999, p. 80).

ANNEX I

Information referred to in Article 5(1)

The information to be provided under Article 5(1), subject to Article 5(2) and (3), is the following:

(a) an outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes;

(b) the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme;

(c) the environmental characteristics of areas likely to be significantly affected;

(d) any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC;

(e) the environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation;

(f) the likely significant effects(1) on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors;

(g) the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme;

(h) an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;

(i) a description of the measures envisaged concerning monitoring in accordance with Article 10;

(j) a non-technical summary of the information provided under the above headings.

(1) These effects should include secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects.

ANNEX II

Criteria for determining the likely significance of effects referred to in Article 3(5)

1. The characteristics of plans and programmes, having regard, in particular, to

- the degree to which the plan or programme sets a framework for projects and other activities, either with regard to the location, nature, size and operating conditions or by allocating resources,

- the degree to which the plan or programme influences other plans and programmes including those in a hierarchy,

- the relevance of the plan or programme for the integration of environmental considerations in particular with a view to promoting sustainable development,

- environmental problems relevant to the plan or programme,

- the relevance of the plan or programme for the implementation of Community legislation on the environment (e.g. plans and programmes linked to waste-management or water protection).

2. Characteristics of the effects and of the area likely to be affected, having regard, in particular, to

- the probability, duration, frequency and reversibility of the effects,

- the cumulative nature of the effects,

- the transboundary nature of the effects,

- the risks to human health or the environment (e.g. due to accidents),

- the magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected),

- the value and vulnerability of the area likely to be affected due to:

- special natural characteristics or cultural heritage,

- exceeded environmental quality standards or limit values,

- intensive land-use,

- the effects on areas or landscapes which have a recognised national, Community or international protection status.

Appendix 5

Article 14. Impact Assessment and Minimizing Adverse Impacts in Convention on Biological Diversity

1. Each Contracting Party, as far as possible and as appropriate, shall:

(a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures;

(b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account;

(c) Promote, on the basis of reciprocity, notification, exchange of information and consultation on activities under their jurisdiction or control which are likely to significantly affect adversely the biological diversity of other States or areas beyond the limits of national jurisdiction, by encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate;

(d) In the case of imminent or grave danger or damage, originating under its jurisdiction or control, to biological diversity within the area under jurisdiction of other States or in areas beyond the limits of national jurisdiction, notify immediately the potentially affected States of such danger or damage, as well as initiate action to prevent or minimize such danger or damage; and

(e) Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity and encourage international cooperation to supplement such national efforts and, where appropriate and agreed by the States or regional economic Integration organizations concerned, to establish joint contingency plans.

2. The Conference of the Parties shall examine, on the basis of studies to be carried out, the issue of liability and redress, including restoration and compensation, for damage to biological diversity, except where such liability is a purely internal matter.