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# Mitigating for nature in Danish infrastructure projects

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## Abstract

This paper presents results of a Danish study of mitigation efforts directed at nature protection in EIA of Danish infrastructure projects. The projects included in the study comprise road, rail, bridges, tunnels cables and oil- and gas-pipes. The study is based on a document analysis of EIA reports, a workshop held with EIA professionals, a study of two cases and a survey among EIA professionals. The study reveals whether and how the mitigation hierarchy has been adhered to and what types of mitigation measures have been suggested. The study digs a bit deeper in discussing the dynamics in which mitigation measures are suggested and implemented. Based on this the paper concludes with a discussion of how practice of mitigating impacts on nature can be developed leading to better nature protection.

## 1. Introduction

An important part of achieving the goals of EIA, in terms of creating more sustainable solutions, is pointing out measures that can mitigate any potential negative impacts identified and analysed in the assessment (Tinker et al. 2005; Glasson, Therivel and Chadwick 2005). Mitigation measures can take many shapes, in this paper they are divided into five categories: Avoid, minimise, repair, compensate, and enhance. These categories are explained in the following table 1.

Categories of mitigation measures	Explanation	Examples of measures
Avoid	Avoiding that a negative impact on nature arises.	Adjusting the location or tracks of the structure for example to avoid impacts on protected natural areas.
Minimise	Minimising a negative impact on nature.	Constructing wildlife passages to minimise the impact of the structure as a barrier to wildlife.
Repair	Repairing a negative impact on nature after it has occurred.	Re-establishing natural areas, after the construction works has impacted them negatively.
Compensate	Compensating for an unavoidable negative impact on nature.	Constructing natural areas as a replacement for nature destroyed by the construction of the structure.
Enhance	Enhancing a positive impact on nature.	Designing and management of road borders to make them suitable habitats for sand lizards.

Table 1 Explanations and examples of the categories of mitigation measures applied in this paper. Inspired by (Mitchell 1997; Glasson, Therivel and Chadwick 2005; Tinker et al. 2005).

The categories of mitigation measures are often arranged in a mitigation hierarchy as the one in figure 1.

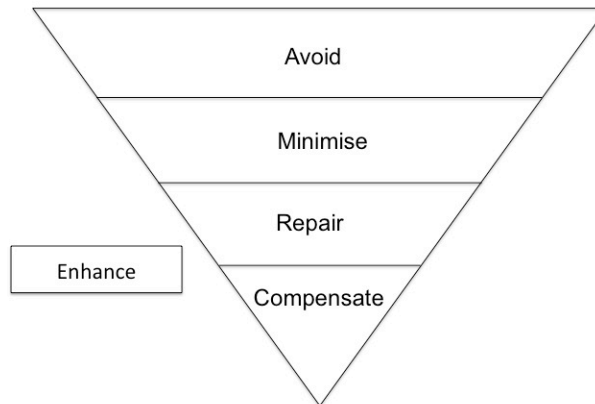


Figure 1 Mitigation hierarchy. Inspired by (Mitchell 1997; Tinker et al. 2005).

Placing the mitigation measures in a hierarchy means that the first priority is to avoid impacts, second priority to minimise impacts and so forth. Enhancement, which is placed outside the hierarchy, is increasingly focussed upon in international literature, but does not fit directly into the hierarchy (see e.g. Joao, Vanclay og Broeder 2011).

In this paper the focus is on the application of mitigation measures in EIA of Danish infrastructure projects. Here, infrastructure projects are defined as the physical structures that make up connections between places, and through their linear design provide possibilities for transport of something from one place to another. In a Danish context infrastructure projects are special in two senses:

1. They potentially have significant impacts on nature because of their geographical spread
2. There is very limited follow-up and monitoring, including of whether mitigation measures are implemented and how effective they are.

Based on this, for the EIA statements of infrastructure projects two questions are first pursued: *What types of mitigation measures are typically used in EIA statements? How do these results reflect the mitigation hierarchy?* However, as indicated one thing is what is proposed in the EIA statement, another thing is whether the mitigation measures are implemented. On this basis the paper goes on to discuss: *What are the mechanisms behind which mitigation measures are chosen and implemented?* In the following section, the methodology applied to shed light on these issues is presented.

## 2. Methodology

The study, which this paper draws upon, is divided into three overall methods for data collection: A document study, a workshop, and a case study.

The document study was carried out in autumn 2014 and included 67 EIA statements for infrastructure projects. The EIA statements were dated from 1991 to 2014, with the bulk of statements being from the years after 2000. The statements covered projects concerning roads, railways, bridges/tunnels, oil- and gas pipes, cables and

rail signals. Each EIA statement was read using an analytical framework and the results registered in a spreadsheet. In order to explore and nuance the results from the document study, a workshop and a case study was conducted.

The workshop took place in May 2014 in Copenhagen, attended by 17 practitioners within the field of EIA, including consultants, authorities, and research institutions. At the workshop a discussion was facilitated around two main questions: 1) Which mitigation measures are implemented/not implemented, why and what is the effect of the measures? 2) How can mitigation and monitoring in relation to EIA form the basis for improved nature protection? Discussions were recorded partially by rapporteurs, and partly by posters produced by the participants.

Two case studies were also carried out in autumn 2014 and spring 2015. First a major road project carried out by the national Danish road agency was analysed and second a high voltage cable connection carried out by the utility and two regional authorities. For each, the mitigation measures found in the EIA statement were traced in subsequent document such as permits and tenders. For the road project, a combined field trip and interview was carried out with the project manager for the construction project in autumn 2014. For the cable connection project an interview was carried out with the project manager in spring 2015.

### 3. Results: Mitigation measures and the mitigation hierarchy

The results show first of all, that mitigation measures for nature protection are included in all of the 67 EIA statements in the study. This varies from an EIA statement including one mitigation measure for nature to an EIA statement including 98 mitigation measures. Looking to the categories of mitigation measures, figure 2 shows how many mitigation measures in the different categories were found in the EIA statements.

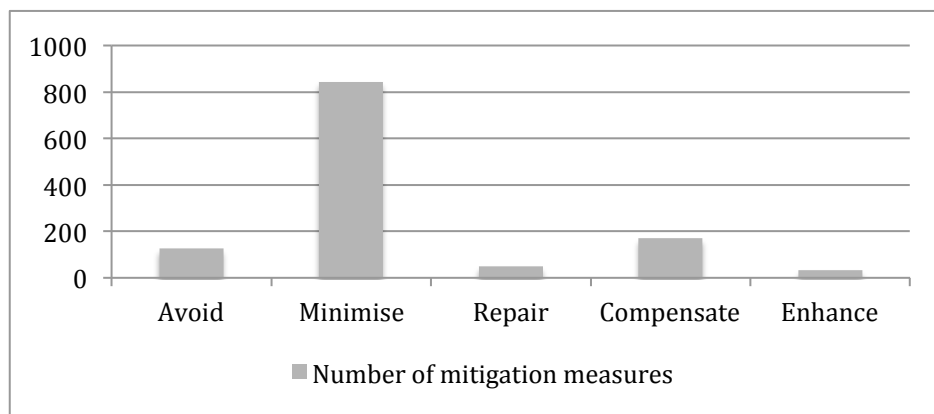


Figure 2 Number of mitigation measures in the categories found in the EIA statements

It can be seen that most of the mitigation measures found were on minimising impacts, also there are relatively many measures meant to compensate for an impact. More specifically what kind of mitigation measures are found in the EIA statements can be seen in figure 3.

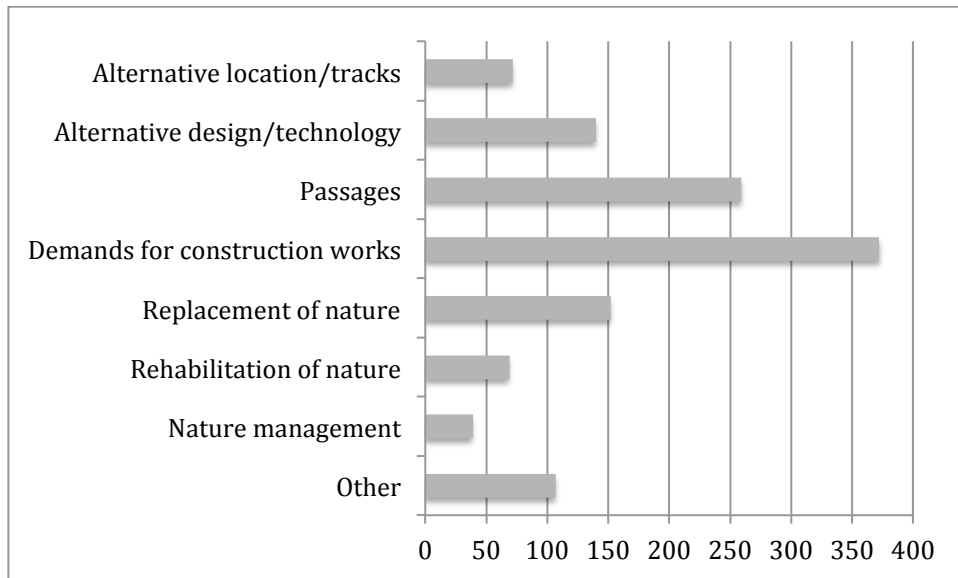


Figure 3 Number of specific types of mitigation measures found in the EIA statements

It can be seen that there are relatively many mitigation measures that are specific demands for construction works, for example demands for when to carry out construction jobs or where to place machinery. Also there are many mitigation measures in the form of passages for wildlife.

Compared to the mitigation hierarchy it is especially interesting that there are relatively few mitigation measures concerned with avoiding impacts, and rather many on minimisation. This could be seen to fit with the results that demands for construction and passages are mostly found in the EIA statements, as these would often be aimed at minimising impacts. Mitigation measures such as alternative locations/tracks and alternative design/technology might be more aimed at avoiding impacts. These are among the least used, which reflects the relatively few mitigation measures found to avoid impacts.

#### 4. Results: Choice and implementation of mitigation measures

The results here show much focus in the EIA statements on minimising impacts and compensating for impacts. This seems critical compared to the mitigation hierarchy, which stresses a need to emphasise avoidance of impacts. However, the case study takes point of departure only in the EIA statements, and not what goes on beforehand. Some of the measures to avoid negative impacts may lie in the project planning stages before the EIA is started, and then not documented in the statement. Another issue is that the analysis of alternative has not been considered as a mitigation measure in the document study, which means that some of the types of mitigation measures mainly concerned with avoidance, such as alternative tracks/placement and alternative design/technology, may not have been captured in the document study. This emphasises the fact that there can be a long and important process before the EIA. For example in the case study of a high voltage cable connection, the planning process has spread over 20 years, including a reservation of land in 1980, an analysis of 7 proposals for the track in 1995-6, and finally the publication of the EIA statement in 2000. During this time period, the

discussions and analysis may have led to many instances of avoiding environmental impacts.

The results also show that the use of mitigation measures for repair is relatively rare, and especially nature management is among the types of mitigation measures rarely used in the EIA statements. The case study of the road project showed that management of nature is not built into the project for two reasons. First, because it is costly. Second, because the department within the road agency, with responsibility for managing the road after it has been constructed, do not want what they see as extra work. This resonates with the results from the workshop, where the participants emphasised that mitigation measures in the form of long-term management of nature is rarely implemented. At the workshop, one of the main barriers for not implementing mitigation measures were extra costs, but also the participants discussed the large focus the proponents have on EIA as a tool for getting their permit and implementing the project – in contrast to working with how to get positive impacts from the project. They pointed to how nature management is rarely implemented even if it is pointed out as a mitigation measure in the EIA. These issues may help explain the lack of mitigation measures in the categories of repairing and enhancement as well as nature management.

## **5. Conclusion**

The results presented in this paper, show that the use of mitigation measures in EIA statements for Danish infrastructure projects do not reflect the intentions of the mitigation hierarchy. This is especially due to the relatively common use of mitigation measures for minimising and compensating negative impacts.

The results and discussion also highlights that the process before and after the EIA process is very important in terms of what measures are actually implemented to mitigate any negative effects of the projects. The process before the EIA is important, because many of the measures for avoiding impacts may actually be taken in the initial design phases of the projects. The process after the EIA is also important, as this is where the decision is taken, to implement or not implement the measures pointed out in the EIA. As shown in the example of nature management measures, there can be various reasons for implementing or not implementing measures.

This point towards two issues: One is a need for EIA practitioners and researchers to understand the entire project process, in order to best contribute to better and more sustainable projects. The other is the importance of EIA follow-up, in terms of monitoring of impacts, but also follow-up on whether mitigation measures are implemented or not, and how the intended nature protection is then to be ensured.

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