

Climate Change in Environmental Impact Assessment of Renewable Energy Projects

Sanne Vammen Larsen, Assistant Professor Ph.D., The Danish Centre for Environmental Assessment, Aalborg University

Abstract:

Many renewable energy projects are subject to EIA. However a relevant question is what purpose an impact assessment has when the project is 'good for the environment'? One of the topics receiving much attention in impact assessment is climate change and how this is integrated. This warrants the question: How do we assess the climate change related impacts of a project that inherently has a positive effect on climate? This paper is based on a document study of EIA reports from Denmark. The results show that climate change mitigation is included in most of the EIA reports reviewed, while adaptation is absent. Also the results show a focus on positive impacts, while the indirect negative impacts are less apparent. This leads to a discussion of the results in the light of the purpose of EIA.

Keywords: EIA, climate change, renewable energy, positive impacts

EIA and renewable energy

EIA is used worldwide, with among others the aim to include environmental concerns in decision making and ultimately promote a more sustainable development (Kørnøv, Christensen and Nielsen 2007). Specifically EIA has been defined by the International Association for Impact Assessment as *"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"* (Senécal et al. 1999). To this can be added a number of principles of what EIA should be, namely: Purposive, rigorous, practical, relevant, cost-effective, efficient, focused, adaptive, participative, interdisciplinary, credible, integrated, transparent, and systematic (Senécal et al. 1999). For the purpose of this paper, two principles are highlighted:

Practical: *The process should result in information and outputs which assist with problem solving and are acceptable to and able to be implemented by proponents*

Focussed: *The process should concentrate on significant environmental effects and key issues; i.e., the matters that need to be taken into account in making decisions.*

(Senécal et al. 1999)

Hence it is important in EIA to focus on the most significant effects and at the same time deal with issues that are helpful for solving problems or making improvements to projects. Further it is important to recognise that according to the EU the Directive 85/337/EEC on '*the assessment of the effects of certain public and private projects on the environment*', EIA includes analysing among others indirect and positive impacts (Directive 85/337/EEC).

When turning to renewable energy projects, renewable energy can be defined as "*energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases*" (Directive 2009/28/EC) From this follows that renewable energy generally does not contribute to greenhouse gas emissions and climate change. Included in the European EIA directive is a list of projects which, subject to a screening for significant impacts, may be subject to EIA (Directive 85/337/EEC Appendix II). Included in this list are for example:

- Industrial installations for the production of electricity, steam and hot water
- Installations for the harnessing of wind power for energy production (wind farms)

Through these two project types in the list, projects regarding wind turbines and other types of renewable energy installations, such as biogas facilities, biomass-based power plants and hydro power plants are included for screening and possible full assessment in the EIA system in the EU.

EIA and climate change

Climate change is an emerging issue in EIA. Several authors have dealt with the integration of climate change in EIA and discussed different methodologies for this (see for example Duinker and Greig 2007; Byer and Yeomans 2007). Further, various authorities have published guidance for incorporating climate change into EIA (see for example Federal-Provincial-Territorial Committee 2003) and notably the EU Commission is currently working on such guidance.

Much of the literature on impact assessment and climate change points to at least two approaches; Mitigation and adaptation, which can be defined as follows:

Mitigation: What are the expected emissions of greenhouse gasses resulting from the project and how can they be reduced?

Adaptation: How may the project be impacted by the consequences of climate change and how can the project be adapted to this?

(Larsen and Kjørnø 2009)

For renewable energy projects, mitigation could, for example, be about reducing impacts from transport of biomass to a power plant, and adaptation could be adapting the foundations of off-shore wind turbines to rising sea levels. Compared to mitigation, adaptation is a relatively new

concept, which has until recently received less attention (see for example Biesbroek, Swart and Knaap 2009; Howard 2009).

Research question and methodology

Based on the above, renewable energy projects are, depending on a screening, subject to EIA in Denmark, and a relevant issue for assessment is climate change. However, one of the purposes of renewable energy projects is to mitigate climate change, and how do we assess climate change impacts of renewable energy projects that inherently have a positive impact? Or in more general terms how do we deal with impact assessment of projects that are ‘inherently’ good for the environment?

This paper attempts to discuss these issues, through probing how climate change is integrated and analysed in EIAs of renewable energy projects in Denmark. The questions asked are

- Is climate change mitigation and adaptation integrated in the assessment?
- Is it integrated in connection to a positive and/or negative impact?

A sample of 19 cases of EIA of renewable energy projects have been gathered and analysed. The cases are described in table 1.

Year	No. of cases	Project
1999	1	Wind turbines (off-shore)
2000	2	Wind turbines (off-shore)
	1	Wind turbine test facility
2006	1	Bioethanol facility
	1	Wind turbines (on-shore)
2007	2	Wind turbines (on-shore)
2008	2	Wind turbines (on-shore)
	1	Wind turbines (off-shore)
2009	1	Bioethanol facility
	1	Wind turbine test facility
	3	Wind turbines (on-shore)
2010	1	Wind turbines (on-shore)
	1	Fuel change in power plant
	1	Wind turbines (off-shore)

Table 1 Overview of EIA cases

Each EIA report has been searched for the keywords *climate*, *CO2* and *greenhouse gas*. For each occurrence it has been analysed whether it deals with mitigation and adaptation and whether an

impact is assessed as positive, neutral or negative. An assessment of a specific impact is only included once, even though it is repeated in the report.

Results

The analysis shows that climate change is well represented, as it is included in 18 of the 19 EIA reports. However, the analysis shows that while all 18 reports cover mitigation, none cover adaptation. This is shown in figure 1.

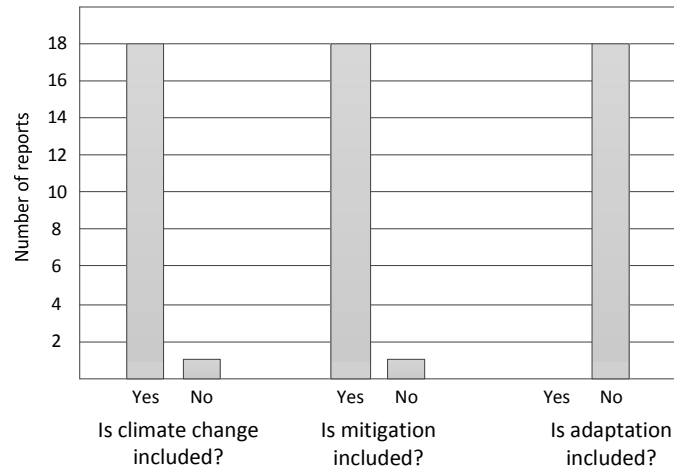


Figure 1 Number of EIA reports including climate change

When looking at the assessment of impacts in relation to climate change, it appears that these are mostly assessed as positive, as shown in table 2.

	Positive	Neutral	Negative
Number of impacts	20	1	6

Table 2 Number of impacts related to climate change that are assessed in the reports as positive, neutral or negative

One example of the issues that are taken up in the reports are the positive effects of renewable energy production. As stated in an EIA of on-shore wind turbines: *“Wind turbines cause no airpollution, but on the contrary spare the environment emissions of greenhouse gasses, since the burning of coal, oil and natural gas in conventional power plants is replaced by the non-polluting production of electricity...In their service life of 20 years, the wind turbines will decrease emissions of greenhouse gasses with 513.704 tonnes of carbon dioxide... (Aalborg Municipality, 2007).* This seems to be a very common positive aspect raised in the EIA reports concerning wind turbines. A few of the EIAs of wind turbines also adds to this an assessment of indirect negative impacts, for example the EIA of a wind turbine test center where it is stated that: *“The deforestation that is*

expected as part of the proposed project will result in emissions of greenhouse gasses. Calculations from the Forest- and Nature Agency show that as much as 0,44 million tonnes of CO₂ may be released through the deforestation.” (Ministry of Environment 2009)

Neutral climate change impacts are also included, for instance in the EIA of a bioethanol project. Here, CO₂ is emitted during the production of bioethanol, however, as stated in the EIA report: *“Since it is CO₂ from renewable sources the emission does not contribute to the general CO₂ effects on the atmosphere. Any other use of the raw material would result in the same CO₂ emission” (Norddjurs Municipality 2009).*

Conclusion and discussion

The investigations indicate a focus on climate change in EIA of renewable energy projects, but this is focussed solely on mitigation. Thus it seems that the potential to assess and improve adaptation measures through EIA is missed and that an increased focus on adaptation is necessary.

Looking at the impacts that are part of the EIA reports, it appears that they can be divided into three categories:

- Positive impacts of renewable energy replacing fossil fuel based energy
- Neutral impacts of renewable energy based on biomass in terms of adding carbon to the atmosphere
- Negative indirect impacts of secondary activities in the projects

It seems that the reports analysed are mainly focussed on the positive impacts stemming from the use of renewable energy. This focus may be warranted, since the benefits of renewable energy is the main purpose for carrying out the projects in the first place. Also the assessment of positive impacts can be used to maximise these, as is seen in one of the reports, where alternative locations are assessed in terms of wind potential and thus positive contribution.

However, it can be discussed whether this predominant focus on positive impacts is the most expedient compared to the principles of EIA? As stated previously, two of the principles of EIA are that it should be practical and focussed; this means among other things that EIA should be focussed on where problems can be solved and improvements be made. In this light it may be warranted to seek to increase the focus on the indirect negative impact in the renewable energy projects, where there is a potential to make improvements and create more sustainable solutions.

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