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Is Environmental Impact Assessment fulfilling its potential? The case of climate change in renewable energy projects

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Abstract:
One of the topics receiving much attention in recent years is climate change and the potential of its integration in impact assessment, both in terms of achieving mitigation and adaptation. Renewable energy projects are part of the efforts to mitigate climate change, replacing use of fossil fuel with CO_2-neutral energy sources. A variety of these projects are subject to environmental impact assessment (EIA), which raises the question of what role an impact assessment plays, when the project is environmentally friendly? How are climate change related impacts assessed in projects with inherent positive effects on climate change? This paper reviews practice, and takes up these questions based on a document study of 19 EIA reports of renewable energy projects in Denmark. The results show that climate change mitigation is included in 18 of the EIA reports reviewed, while adaptation is absent. Also, the results show an emphasis on positive impacts in the reports, and in a few cases discussions of enhancements. Identification and assessment of negative climate change impacts are less apparent. This leads to a discussion of the results in the light of the purpose of EIA.

Keywords: Environmental impact assessment, climate change, renewable energy, positive impacts, enhancement

1. Introduction

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*" (European Union 2009, Article 2a). The use of fossil fuels is found to be one of the main reasons for the environmental problem of climate change, which the world now faces because it releases greenhouse gasses (Raes and van Minnen 2008). One of the possible solutions to the problem of climate change according to the

IPCC is use of renewable energy (IPCC 2011). Others are energy conservation and efficiency, fossil fuel switching, nuclear energy and carbon capture and storage (IPCC 2011). The IPCC also stresses that the use of renewable energy has other benefits, such as securing a positive social and economic development, improving energy access, securing energy supply and mitigating negative impacts on environment and health (IPCC 2011).

The transition to renewable energy is high on the political and scientific agenda, and according to the IPCC (IPCC 2011, p. 7) "*development of RE (renewable energy red.) technologies have increased rapidly in recent years, and their share is projected to increase substantially under most ambitious mitigation scenarios.*" As an example, the EU has a goal of having a 20% share of renewable energy in 2020, in 2008 the share was 10% (European Union 2011). As a result of the expansion of renewable energy large projects are introduced. The IPCC (2011, p. 17) states that the transition to renewable energy "*includes investment in enabling infrastructures*". These could be for example wind turbines on- and off-shore, biomass based power plants, wave energy plants as well as the grid infrastructure needed to connect the system. In relation to such development projects, environmental impact assessment may have a role to play.

1.1 Environmental Impact Assessment (EIA)

The aim of EIA is inclusion of environmental concerns in decision-making and ultimately promoting a more sustainable development (Kørnøv, Christensen and Nielsen 2007). Specifically EIA has been defined by the International Association for Impact Assessment (IAIA) 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). In the EU the implementation of EIA is based on the EU Directive 85/337/EEC on "*the assessment of the effects of certain public and private projects on the environment*". According to the directive, EIA includes analysing "*the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project.*" (European Union 1985, Annex IV). Thus an EIA should focus on both the positive and negative impacts of a project as well as the direct and indirect impacts.

To this the IAIA has added a number of principles for best practice EIA, namely for EIA to be: Purposive, rigourous, 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 for the purpose of EIA to focus on significant impacts and at the same time deal with issues that are helpful for solving problems or making improvements to projects.

Included in the European Union directive in EIA is a list of projects, which, subject to a screening for significant impacts, may be subject to EIA (European Union 1985, Annex II). Included in this list are for example:

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

These overall project types include projects on wind turbines, hydropower and other types of renewable energy installations, such as biogas facilities and biomass-based power plants. For these projects listed in Annex II to the directive, the individual member states determine the need for EIA either using a case-by-case examination or thresholds or criteria (European Union 1985). In Denmark, this decision is made mainly through a case-by-case examination (Danish Ministry of Environment 2013).

Other authors have pointed out the relevance of doing EIA and SEA of renewable energy projects, despite their environmental benefits in terms of mitigating climate

change, since they can also result in negative social and ecological impacts. For example wind farms can result in light and noise emissions and impact on birds and bats (Geissler, Köppel and Gunther 2013) or cause public controversy and negative social impacts (Langbroek and Vanclay 2012). Thus there may be conflicts arising between climate change mitigation and other considerations, for example biodiversity. As stated by Geissler, Köppel and Gunther (2013, p. 72), "*Considering climate change, renewable energies address a globalised good (less carbon dioxide) but can result in environmental impact as well*". According to Masden et al. (2010) these impacts are also exacerbated by the increasing number of projects. Taking the UK as an example, there are concerns over impacts on birds from the increasing number of wind farms, which calls for assessments of the cumulative effects from the projects (Masden et al. 2010). Margheritini, Hansen and Frigaard (2012) directly state that wave energy projects implemented in full scale are expected to be subject to a full EIA.

Different studies have been made on the procedures and frameworks of EIA for renewable energy projects (see for example Geissler, Köppel and Gunther 2013) and on methodology development, for example for focussing on scoping or assessment of cumulative impacts in EIA (see for example Masden et al. 2010; Margheritini, Hansen and Frigaard 2012). Other authors have focussed on the capability of EIA to promote renewable energy technologies (see for example Lund and Hvelplund 1997). One of the issues apparently not touched upon is the assessment of climate change in EIA of renewable energy projects.

1.2 EIA and climate change

Climate change is an emerging issue in EIA and various actors and authors have pointed out the potential of EIA as a tool to mitigate climate change and adapt to its consequences (Sok, Boruff and Morrison-Saunders 2011; Agrawala et al. 2013). As summarised in the IAIA International Best Practice Principles for integrating climate change in impact assessment: "*Impact Assessment tools and methodologies for evaluating the environmental and social consequences of proposed policies, programs, plans and projects can be useful in formulating appropriate mitigation measures to reduce greenhouse gas emissions and resilient adaptation measures to reduce and manage the negative effects of climate change and enhance any positive effects*" (Byer et al. 2012, p. 1). Several authors have also dealt with the integration of climate change in EIA and suggested and discussed different methodologies for this (see for example Duinker and Greig

2007; Byer and Yeomans 2007; Agrawala et al. 2012). Further, various organisations have published guidance for incorporating climate change into EIA (see for example Federal-Provincial-Territorial Committee 2003; IEMAa [date unknown]; IEMAb [date unknown]), and notably in the European context, the EU Commission in spring 2013 issued its *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*. The guidance stresses the potential of integrating climate change in EIA, as it states "*EIAs are legally required. They are an opportunity to systematically integrate climate change and biodiversity into a wide range of public and private projects*" (European Commission 2013, p. 11). Despite this opportunity the guidance states that climate change is not currently being systematically integrated in EIA in the EU, and continues to guide practitioners on how to improve this (European Commission 2013).

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 Kørnøv 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 on the climate change agenda, and has until recently received less attention, though it may have been practiced for a long time on a local scale (see for example Biesbroek, Swart and Knaap 2009; Howard 2009).

So far fairly few studies that evaluate the current practice of integrating climate change in EIA appear to have been published. Recent exceptions are for example Agrawala et al. (2012) who review cases of EIA in Canada and Australia and Watkins and Durning (2012) who review use of climate change terminology in EIAs from a number of developed and transitional countries. Further, Yi and Hacking (2011) review integration of climate change in EIA specifically in urban

development projects in Korea. This paper adds to this research by reviewing integration of climate change in EIA of renewable energy projects in Denmark.

2. Research question and methodology

Based on the above-mentioned rules in the EU Directive, a variety of renewable energy projects are, depending on a screening, subject to EIA in the EU. Also, EIA is seen as having a potential for handling climate change challenges. However, one of the main purposes of renewable energy projects is to mitigate climate change, so how is the potential of EIA to handle climate change impacts utilised in renewable energy projects that inherently have a large positive impact in climate change? Or in more general terms: how is environmental impact assessment of projects that have improvements to the environment as an important part of their purpose projects deal with? Through probing how climate change is integrated and analysed in EIAs of renewable energy projects in Denmark; this paper attempts to discuss these issues.

The research specifically focuses on examining two questions:

- Is climate change mitigation and adaptation integrated in the assessment?
- Are the climate change impacts of or on the project assessed as positive or negative?

Examining the Danish EIAs in terms of these two questions, will contribute to a discussion of the above-mentioned overall issues.

A sample of 100 Danish EIA reports have been gathered through an online search, since there is no common database of EIA reports in Denmark. From this pool, all the EIAs of renewable energy projects are selected, amounting to 19 EIA reports in the sample that is analysed. Because there is no database or statistics of EIAs in Denmark[1], it is unfortunately not possible for this study to get a complete overview of how many EIAs have been made in total and how many of these have been made of renewable energy projects.

The 19 cases are described in table 1.

Year	No. of cases	Project type	Project details

[1] The same is the case for SEA in Denmark, which was documented by COWI (2009)

1999	1	Wind turbines (off-shore)	Installation of 20 wind turbines (each 2MW and 111m tall) located at Middelgrunden, including a cable connection to shore.
2000	2	Wind turbines (off-shore)	1. Installation of 80 wind turbines (total of 150MW and each 93-110m tall) located at Horns Rev, including a cable connection to shore. 2. Installation of 72 wind turbines (each 2,1MW and 110m tall) located at Rødsand.
	1	Wind turbine test facility	Facility for testing prototypes of wind turbines with room for up to 5 turbines (max. 165m tall), located in a rural coastal area.
2006	1	Bioethanol facility	Industrial facility for production of 500.000l of ethanol a day primarily based on wheat. Located in connection to the existing power plant Studstrupværket 18km from the centre of the city Aarhus in a coastal area.
	1	Wind turbines (on-shore)	Installation of 2 wind turbines (each 2-2,3MW and 118-121m tall) located in a rural non-coastal area.
2007	2	Wind turbines (on-shore)	1. Installation of 7 wind turbines (total of 13-21MW and each max. 127m tall) located in a rural non-coastal area. 2. Installation of 3 wind turbines (total of 6MW and each 107m tall) located in a rural coastal area.
2008	2	Wind turbines (on-shore)	1. Installation of 3 wind turbines (each 3-6MW) located in an urban coastal location. 2. Installation of 4 wind turbines (total of 9,2MW and each max. 127m tall) located in a rural non-coastal area.
	1	Wind turbines (off-shore)	Installation of 7 wind turbines (total of 21MW and each 135m tall) located at Sprogø.
2009	1	Bioethanol facility	Industrial facility for production of 160.000t of ethanol a year primarily based on wheat. Located 1km from the city of Grenaa in a harbour area.
	1	Wind turbine test facility	Facility for testing prototypes of wind turbines with room for up to 7 turbines (max. 250m tall), located in a rural coastal area.
	3	Wind turbines (on-shore)	1. Installation of 7 wind turbines (each 4-8MW and 93-119m tall) in a rural coastal location. 2. Installation of 4 wind turbines

			(each 2,3MW and max. 135m tall) located in a rural coastal area. 3. Installation of 3 wind turbines (each 3,6MW and max. 135m tall) located in a rural coastal area.
2010	1	Wind turbines (on-shore)	Installation of 8 wind turbines (each 2MW and 100m tall) located in a rural non-coastal area.
	1	Fuel change in power plant	Installation of facilities for using biomass (410.000t wood pellets a year) in an existing power plant. Located in an urban coastal area.
	1	Wind turbines (off-shore)	Installation of 80-174 wind turbines (total of 400MW) located at Anholt.

Table 1 Overview of EIA cases

In Denmark state or municipal authorities are responsible for the EIA process. Thus, the Danish Energy Agency is responsible for EIA of the off-shore wind turbine projects, the Ministry of the Environment is responsible for EIA of the wind turbine test facilities as well as two of the larger on-shore wind turbine projects and the change of fuel in a power plant. The local municipalities are responsible for the smaller on-shore wind turbine projects, and before 2007 the responsibility was placed with the regional authorities (counties).

Each EIA report has been searched for the keywords *climate*, CO_2 and *greenhouse gas*. For each occurrence, it has been analysed whether it deals with mitigation and adaptation; and whether the impact it is connected to is assessed as positive or negative (examples can be found in the following section). Further, the positive and negative impacts have been viewed more closely to see if they appear to have any common features. An assessment of a specific impact is only included once, even though it is repeated in the report.

3. Results and discussion

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

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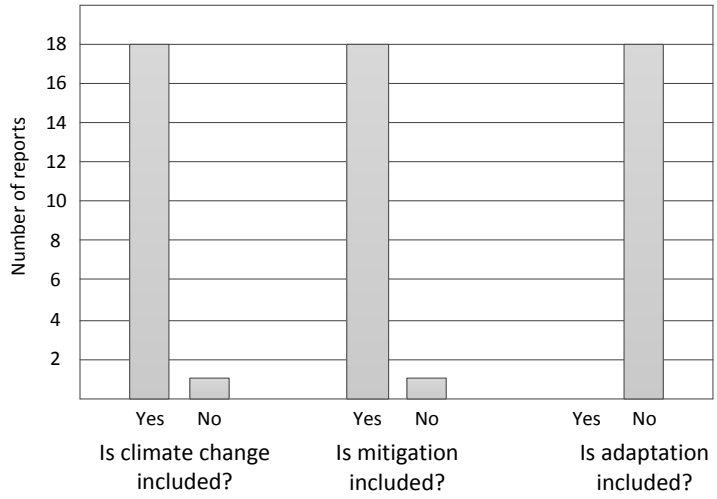

Figure 1 Number of EIA reports including climate change

The relatively high level of integration of climate change mitigation in EIA can be seen as a part of the development in Denmark. Since the 1980s a more holistic focus on the environment has developed, in Denmark and elsewhere, encompassing to an increasing degree also global environmental problems such as climate change (Kørnøv, Christensen and Nielsen 2005). Further, in the last decade Denmark has seen an increasing focus on climate change specifically, driven e.g. by the UN 15th Conference of Parties (COP15) which was held in Copenhagen in 2009 (Wejs et al. 2013). In Denmark, the responsibility for an EIA rests with the authorities, either municipal or state (as mentioned in section 2 Methodology), and the high focus on climate change could be influenced by the responsibilities that the authorities have for living up to international and national agreements and goals on reduction of CO_2 emissions. This is opposed to a situation where the responsibility lies with for example private companies who do not necessarily have these responsibilities, at least in a Danish context.

Looking at climate change adaptation, none of the reports include this. Agrawala (et al. 2012) based on review of case studies, exemplifies possibilities of using EIA to consider climate change adaptation. It can be questioned whether adaptation is not relevant specifically for the renewable energy projects, and if this is the reason why it has not been considered in the EIA reports. As an example, one of the analysed EIA reports assesses the installation of wind turbines on the shoreline in a low-lying area on the island of Lolland (Environmental Centre Roskilde 2009). Other reports assess the installation of off-shore wind farms (see section 2 Methodology). For such projects it seems relevant to consider the effects

of climate change on the project in the form of sea level rise, and examine how the projects could be adapted to this. As an example, an EIA of a new bridge spanning Roskilde Fjord takes into consideration the climate change induced sea level rise when calculating the dimensions of the bridge (Danish Road Directorate 2010). At the same time, climate change adaptation has been on the agenda for a shorter time than mitigation, and there might be a development underway, where adaptation is more commonly integrated in EIA. Such a trend had been observed for SEA (Larsen, Kørnøv and Wejs 2012) and for the climate change agenda in general, as stated in section 1. The fact that the aim of the projects is climate change mitigation might also be part of the explanation, since the EIA also ends up with this focus, while adaptation, as the other angle on climate change, receives less focus.

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	**Negative**
Number of impacts	15	7

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

The positive impacts assessed, all concern the positive effects on GHG emissions that are a direct effect of renewable energy production. As stated in an EIA report 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, p. 9). The other reports contain different wordings of the same issue.

Identifying and assessing the positive impacts in an impact assessment can be seen as an opportunity to suggest and implement measures for further enhancement (see for example McCluskey and Joao 2011; Joao, Vanclay and den Broeder 2011). Enhancement can be defined as: "*deliberate attempts taken in the design and subsequent phases of the project, policies, plans and programmes to ensure the success of a wider range of direct and indirect benefits that could*

possibly flow from the project or policy" (Joao, Vanclay and den Broeder 2011, p. 171). Four of the EIA reports include discussions of enhancement. Three of these reports are on wind turbines. In one report, alternative locations are assessed in terms of wind potential and thus maximising positive contribution (National Planning Authority 2000). In the two other reports, two different alternatives on number and size of wind turbines are assessed in terms of potential for reduction of CO_2-emissions (Environmental Centre Odense 2010; Kerteminde Municipality 2009). The fourth EIA report concerns a biofuel production facility. Here it is discussed how the CO_2 produced in the process (although viewed as CO_2-neutral) might be collected and used for different purposes, thus maximising the potential of the project for reducing CO_2 emissions. This is though not deemed profitable at the time of the assessment. (Drejer et al. 2009)

A study on enhancement in SEA in Scotland showed some interest in enhancing the positive impacts of a strategic action, but the main conclusion was, that "*many of the Environmental Reports failed to describe with any detail how positive environmental effects resulting from the strategic action might be enhanced or monitored*" (McCluskey and Joao 2011, p. 350). This seems to be the case also in this study, as only four of the 19 reports discuss enhancement despite the focus on positive impacts. However, as has been emphasised by Joao, Vanclay and den Broeder (2011, p. 173), EIA (as well as SEA) would benefit from increased focus on enhancement of positive impacts "*and be seen as more than tools to get policies, plans, programmes and projects approved, and instead should strive for better environmental and social outcomes."*

6 of the EIA reports also add an assessment of negative impacts. For example the EIA of a wind turbine test centre 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 CO_2 may be released through the deforestation"* (Ministry of the Environment 2009). Two of EIAs of off-shore wind farms also assess the emissions from the ships used for construction and maintenance of the wind turbines as a negative impact (Energinet.dk 2010; Sund&Bælt Holding A/S 2008). When examining these impacts more closely, some of them appear more indirect, understood as not directly stemming from the renewable energy production. The assessment of indirect impacts has also been emphasised by Byer et al (2012, p. 2) in the IAIA Best Practice Principles, where it is stated that an impact

assessment should "*identify whether and to what extent II) The proposal will, directly or indirectly, increase or decrease greenhouse gas (GHG) emissions*".

4. Conclusion

The investigations presented in this paper indicate an emphasis on climate change in EIA of renewable energy projects, focussed solely on climate change mitigation. This is critical when compared to the potential for EIA to help deal with both mitigation and adaptation, as emphasised by several guidance documents (e.g. Federal-Provincial-Territorial Committee 2003; IEMAa [date unknown]; IEMAb [date unknown]; European Commission 2013). Results from Sok, Boruff and Morrison-Saunders (2011) also show that impact assessment practitioners emphasise the need for both mitigation and adaptation to be considered in EIA reporting. Thus it seems that the potential to implement adaptation measures through EIA is missed, and that an increased focus on adaptation is called for.

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

- Positive impacts of renewable energy replacing fossil fuel based energy
- Negative impacts of secondary activities in the projects

It seems that the assessment of these projects that are inherently have environmental benefits, have a tendency to focus on the very factors that make it environmentally friendly. This is based on the fact that the reports analysed are mainly focussed on the positive impacts stemming from the use of renewable energy. This focus may of course 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 enhance these, as seen in four of the reports. The focus on climate change mitigation could be part of the focus on positive impacts, as it is one of the main points of renewable energy projects, and also where the projects have positive impacts that can be highlighted.

The results though point to a lack of mitigation measures or enhancement related to climate change, as a final result of the EIA process. This corresponds to the findings of Kørnøv et al. (2003) who uncover a trend in Danish EIA, where the scope of assessments start as holistic and broad, but often become more narrow and traditional as the assessments are carried out, and even more so when mitigation measures are chosen. Climate change as a relatively new and global

environmental impact might be part of the initial scope only to be filtered out, as the scope narrows during the process.

Generally, it can be discussed whether the predominant focus on positive impacts is 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. Specifically for climate change, Sok, Boruff and Morrison-Saunders (2011, p. 323) based on their studies state that "*Respondents [members of the International Association for Impact Assessment] recognised the threat of climate change on world health and development suggesting a need to 'act now'*", emphasising the need to utilise the potential of impact assessment to overcome the challenge of climate change. In this light it may be warranted, to seek to increase the focus on either the indirect negative impact in the renewable energy projects, or on enhancement of the positive impacts, in order to use the potential of EIA to make improvements and work towards the aim of creating more sustainable solutions.

References:

Aalborg Municipality. 2007. Vindmøller ved Lyngdrup – VVM redegørelse og miljørapport (Wind turbines at Lyngdrup – EIA statement and SEA report). Aalborg: Aalborg Municipality

Agrawala S, Kramer A, Prudent-Richard G, Sainsbury M, Schreitter V. 2012. Incorporating climate change impacts and adaptation in environmental impact assessment: Opportunities and challenges. Climate and Development 4(1): 26-39

Biesbroek G, Swart R, Knaap W. 2009. The mitigation – adaptation dichotomy and the role of spatial planning. Habitat International 33: 230-237

Byer P, Yeomans J. 2007. Methods for addressing climate change uncertainties in project environmental impact assessments. Impact Assessment and Project Appraisal 25(2): 85-99

Byer P, Cestti R, Croal P, Fisher W, Hazell S, Kolhoff A, Kørnøv L. 2012. Climate Change in Impact Assessment – International Best Practice Principles. IAIA Special Publication Series No. 8.

COWI. 2009. Study concerning the report on the application and effectiveness of the SEA Directive (2001/42/EC) – Final report. European Commission, DG ENV

Danish Ministry of Environment. 2013. Bekendtgørelse om vurdering af visse offentlige og private anlægs virkninger på miljøet (VVM) I medfør af lov om planlægning. BEK 1654 af 27/12/2013.

Danish Road Directorate (Vejdirektoratet). 2010. Ny fjordforbindelse ved Frederikssund – VVM-redegørelse, sammenfattende rapport (New fjord-link at Frederikssund – EIA statement and summary report). Copenhagen: Danish Road Directorate

Drejer et al. 2009. Danish Biofuel Holding Bioethanolfabrik – VVM-redegørelse (Danish Biofuel Holding Bioethanol production facility – EIA statement). Aarhus: NIRAS

Duinker P, Greig L. 2007. Scenario analysis in environmental impact assessment: Improving explorations of the future. Environmental Impact Assessment Review 27: 206-219

Elsam and Eltra. 2000. Havmøller Horns Rev – Vurdering af virkninger på miljøet VVM-redegørelse (Off-shore wind turbines at Horns Rev – Environmental Impact assessment, EIA statement). Fredericia: Elsamprojekt

Energinet.dk. 2010. Anholt Havmøllepark – Vurdering af virkninger på miljøet (Anholt Off-shore Windfarm – Environmental Impact Assessment). Fredericia: Energinet.dk

Environmental Centre Odense. 2010. Udvidelse af vindmøllepark ved Bølå, Aabenraa Kommune (Expansion of wind farm at Bølå, Aabenraa Municipality). Odense: Ministry of the Enviroment

Environmental Centre Roskilde. 2009. Forslag til Kommuneplantillæg – Vindmøllepark ved Kappel, Lolland (Draft addition to municipal spatial plan – Wind farm at Kappel, Lolland). Roskilde: Ministry of the Environment

European Commission. 2013. Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment. Brussels: European Union

European Union. 1985. Directive 85/337/EEC. Council Directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment. Brussels: European Union

European Union. 2009. Directive 2009/28/EC of the European Parliament and of the Council of 23 april 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Brussels: European Union

European Union. 2011. Energy 2020: A strategy for competitive, sustainable and secure energy. Brussels: European Union

Geissler G, Köppel J, Gunther P. 2013. Wind energy and environmental assessments – A hard look at two frontrunners' approaches: Germany and the United States. Renewable Energy 51: 71-8

Howard J. 2009. Climate change mitigation and adaptation in developed nations: A critical perspective on the adaptation turn in urban climate planning. In: Davoudi S, Crawford J, Mehmood A (eds.). Planning for Climate Change: Strategies for Mitigation and Adaptation. London: Earthscan; p. 19-32

IEMA – Institute of Environmental Management & Assessment A. [unknown date]. IEMA Principles Series: Climate Change Adaptation & EIA [Internet]. [Cited 30 November 2013]. Available from: www.iema.net/eia-climate-change

IEMA – Institute of Environmental Management & Assessment B. [unknown date]. IEMA Principles Series: Climate Change Mitigation & EIA [Internet]. [Cited 30 November 2013]. Available from: www.iema.net/eia-climate-change

IPCC. 2011. Summary for Policymakers. In: Edenhofer O, Pichs_Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlömer S, von Stechow C (eds.). Special Report on Renewable Energy Sources and Climate Change Mitigation. Cambridge, UK and New York, USA: Cambridge University Press

Joao E, Vanclay F, den Broeder L. 2011. Emphasising enhancement in all forms of impact assessment: Introduction to a special issue. Impact Assessment and Project Appraisal 29(3): 170-80

Kerteminde Municipality. 2009. Miljørapport - Vindmøller på Dræby Fed (EIA statement – Wind turbines at Dræby Fed). Kerteminde: Kerteminde Municipality

Kørnøv L. Christensen P and Nielsen E. 2005. Mission impossible: does environmental impact assessment in Denmark secure a holistic approach to the environment? Impact Assessment and Project Appraisal 23(4): p. 303-314

Kørnøv L, Christensen P, Nielsen E. 2007. Environmental Impact Assessment. In: Kørnøv L, Thrane M, Remmen A, Lund H (eds.). Tools for Sustainable Development. Aalborg: Aalborg Universitetsforlag; p. 353-374

Langbroek M, Vanclay F. 2012. Learning from the social impacts associated with initiating a windfarm near the former island of Urk, The Netherlands. Impact Assessment and Project Appraisal 30(3): 167-178

Larsen S, Kørnøv L. 2009. SEA of river basin management plans: Incorporating climate change. Impact Assessment and Project Appraisal 27(4): 291-299

Larsen S, Kørnøv L, Wejs A. 2012. Mind the gap in SEA: An institutional perspective on why assessment of synergies amongst climate change

mitigation, adaptation and other policy areas are missing. Environmental Impact Assessment Review 33: 32-40

Lund H, Hvelplund F. 1997. Does environmental impact assessment really support technological change? Analyzing alternatives to coal-fired power stations in Denmark. Environmental Impact Assessment Review 17: 357-370

Margheritini L, Hansen A, Frigaard P. A method for EIA scoping of wave energy converters - based on classification of the used technology. Environmental Impact Assessment Review 32: 33-44

Masden E, Fox A, Furness R, Bullman R, Haydon D. 2010. Cumulative impact assessments and bird/wind farm interactions: Developing a conceptual framework. Environmental Impact Assessment Review 30: 1-7

McCluskey D, Joao E. 2011. The promotion of environmental enhancement in Strategic Environmental Assessment. Environmental Impact Assessment Review 31: 344-351

Ministry of the Environment. 2009. VVM-redegørelse: Nationalt testcenter for vindmøller (EIA statement: National test centre for wind turbines). Copenhagen: Ministry of the Environment

National Planning Authority (Landsplanafdelingen). 2000. National prøvestation for store vindmøller – Vurdering af virkninger på miljøet (National test station for large wind turbines – Environmental Impact Assessment). Copenhagen; Ministry of Environment and Energy

Raes F, van Minnen J. 2008. Chapter 2: The climate system and human activities. In: Jol et al. (eds.). Impacts of Europe's changing climate – 2008 indicator-based assessment. Luxemborg: European Environment Agency

Senécal P, Goldsmith B, Conover S, Sadler B, Brown K. 1999. Principles of environmental impact assessment best practice. International Association for Impact Assessment

Sok V, Boruff B, Morrison-Saunders A. 2011. Adressing climate change through environmental impact assessment: International perspectives from a survey of IAIA members. Impact Assessment and Project Appraisal 29(4): 317-326

Sund&Bælt Holding A/S. 2008. Sprogø Havvindmøller: VVM-redegørelse – Vurdering af virkninger på miljøet (Sprogø Off-shore Wind Turbines: EIA statement - Environmental Impact Assessment). Copenhagen: Sund&Bælt Holding A/S

The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment. 2003. Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for

Practitioners. Canada: The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment

Watkins J, Durning B. 2012. Carbon definitions and typologies in environmental impact assessment: greenhouse gas confusion? Impact Assessment and Project Appraisal 30(4): 296-301

Wejs A, Harvold K, Larsen S and Saglie I-L. 2013. Legitimacy building in weak institutional settings: Climaet change adaptation at local level in Denmark and Norway: Environmental Politics: Published Online

Yi J, Hacking T. 2011. Incorporating climate change in to environmental impact assessment: perspectives from urban development projects in Korea. Procedia Engineering 21: 907-914