MASTER THESIS

Biodiversity Considerations in Environmental Impact Assessments in the Netherlands: Case Study Nij Hiddum Houw

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ABSTRACT

As the world races to combat climate change and its effects on the global ecosystem, renewable energy sources have been promulgated as a major key to fight this global menace. However, this quest to increase the share of renewables in the energy mix certainly comes at a cost to biodiversity. In the wake of this, Environmental Impact Assessments (EIAs) , are facing increasing amounts of criticism regarding their ability to effectively mitigate the negative impact of renewable energy installations on biodiversity. This research was conducted to determine the extent to which EIAs in the Netherlands consider impacts of renewable energy projects on biodiversity. The study employed the use of a single case study of wind farm Nij Hiddum Houw, a controversial case in the province of Friesland. In addition, primary and secondary data sources were obtained through review of existing literature and in-depth interviews with key informants from academia, NCEA, the Friese Millieu Federatie, and province of Friesland. The analysis of the research objective was done from an ecological and social perspective. Results from the study revealed that, EIAs are primarily focused on protecting endangered and extinct species and were found to be lacking in accurately reporting on the accumulated impacts of projects which affected the quality of mitigation measures employed. This results in employing more impact reduction measures; the second step in the mitigation hierarchy, instead of focusing on avoidance. On the social front, it was revealed that certain renewable energy projects, particularly wind mills, faced resistance from locals because public opinion and subsequent social impacts local residents are not taken into consideration by EIA. The study concludes by making recommendations on how EIAs could be more sensitive to biodiversity.

LIST OF ABBREVIATIONS

1. EIA: Environmental Impact Assessment
2. RE: Renewable Energy
3. NHH: Nij Hiddum Houw
4. UNEP: United Nations Environment Programme
5. EU: European Union
6. NCEA: Netherlands Commission for Environmental Assessment
7. FMF: Friese Millieu Federatie
8. CBD: Convention on Biological Diversity
9. PIP: Provincial Integration Plan

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CHAPTER 1: INTRODUCTION

1.1 OVERVIEW

In 2010, parties of the United Nations Convention on Biological Diversity (CBD) adopted the Aichi Targets for 2020, with goals to "reduce the direct pressures on biodiversity" and "improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity "(Tallis, Kennedy, Ruckelshaus, Goldstein, & Kiesecker, 2015). However, a mid-term assessment conducted revealed that biodiversity is facing increased threats both locally and on a global scale(Bezombes, Gaucherand, Spiegelberger, Gouraud, & Kerbiriou, 2018). All dimensions of biodiversity; genetic, species, ecosystem and functional diversity are under pressure (Hugé et al., 2017). One of the major effects of biodiversity erosion has been found to be natural habitat loss and destruction as a result of large development projects (Bigard, Pioch, & Thompson, 2017a).

Environmental Impact Assessments[1] (EIAs) have been identified as important analytical tools for identifying and potentially alleviating project risks that have negative environmental and societal impacts on the environment, especially where biodiversity is concerned (Williams & Dupuy, 2017). In fact, one of the CBD's Aichi targets specifically deals with the inclusion of biodiversity in policy, and calls for the application of environmental assessments which will adopt the costs and benefits of biodiversity conservation and sustainable use in decision-making (Tallis et al., 2015). Even though EIA is an established tool to promote sustainable development, the extent to which it fully addresses the identification of impacts and conservation stakes that are associated with biodiversity loss has been under increasing scrutiny over the years globally. A few of the most frequently debated problems are: low quality of the impact assessments, weak public participation and project delays(Dias, Fonseca, & Paglia, 2017). In the Netherlands, EIAs have been practiced for over 20 years with the central goal of ensuring that environmental information is incorporated in a transparent and sound decision making process; however, in recent years the Netherlands Commission for Environmental Assessment (NCEA) has recorded that 30-40% of the

[1] Henceforth will be referred to as EIA

assessments lacked vital information related to the intended project[2] (). A study conducted by Runhaar, van Laerhoven, Driessen, & Arts (2013), indicated that EIA in the Netherlands was viewed as a legal requirement and nothing more and thus it was only effective in protecting the environment but not in the optimization of environmental values.

Climate change[3] consideration on large scale projects which require EIAs has been increasingly discussed controversially in international literature. In the recent of the EIA directive by the EU, climate change is identified as an important challenge whose impacts on projects and vice versa (impacts of projects on climate change) should be assessed(Jiricka et al., 2016). Renewable Energy, according United Nations Environment Programme (UNEP)[4] has been identified as the key solution to climate change mitigation and establishing a green economy. In 2014, a total of 164 countries had adopted one type of renewable energy policy or another (Gasparatos, Doll, Esteban, Ahmed & Olang, 2017). In Europe, the European Union (EU) in 2007 adopted ambitious climate change and energy objectives- to increase renewable energy utilization to 20%, reduce greenhouse gas emissions by 20%, which could potentially rise to 30% if conditions are right and to maintain a 20% energy efficiency improvement by the year 2020 (Commission of the European Community, 2009). Renewable energy[5] sources have been found to reduce greenhouse gas emissions considerably when compared to fossil fuels, however there are some interplays between renewable energy and the environment, particularly biodiversity that tend to be mostly under-appreciated in policy making. In renewable energy set-up, it has been discovered that most of the time, not all environmental impacts are thoroughly assessed (Holma et al., 2018). There is also no comprehensive assessment on the effects and dangers of renewable energy production that considers all probable environmental impacts (Costa-Campi, del Rio, & Trujillo-Baute, 2017). There is always a struggle to maintain balance in the people-planet-profit nexus when drawing up sustainability driven policies. In the EU strategy document on renewable energy

[2] Sentence adapted from www.commissiemer.nl

[3]Climate change refers to "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (UNFCCC, 2011)

[4] Subsequently referred to as UNEP

[5] In subsequent chapters will be referred to as RE

for example, priority is placed on energy efficiency, energy savings and cost-efficiency as the primary way to meet their climate change policy objectives (Commission of the European Community, 2009).

1.2 PROBLEM STATEMENT

The environment pillar has gained solid ground especially since the Paris Agreement[6], which has reinforced the requirement of a low-carbon transformation of the sector. Although making the energy sector a greener one is a shared aspiration of many governments, the success of this endeavor could potentially present conflicts between biodiversity and energy policies especially in trying to find a balance in the trade-offs which involve reaching a greener energy system. In the Netherlands, EIAs have been a foundational part of the environmental decision-making process since their purpose is to determine whether a proposed project complies with legislative and other standards. However Dutch EIAs have been criticized for having a limited contribution to the development of innovative policy alternatives and solutions to environmental problems (Runhaar et al., 2013). It is therefore imperative to determine the extent to which biodiversity is considered by EIAs especially where it concerns renewable energy installations.

1.3 RESEARCH STRATEGY

The aim of this research is to determine the extent to which biodiversity is considered during environmental impact assessments of renewable energy installations. Particularly, installations that could potentially threaten existing biodiversity. Chapter two mainly deals with literature regarding the history of EIA in the EU and the Netherlands, and discusses the ecological impacts of some RE installations generally. It also highlights the conflicts that exist between biodiversity and RE installations by citing specific examples. Chapter 3 addresses the methodology that was to be employed in the research in terms of research questions, data collection and analysis and an introduction to the case of wind farm Nij Hiddum Houw. Chapter four presents the results

[6] Paris Agreement is an agreement within the UNFCCC that aims to strengthen the global response to the threat of climate change by keeping global temperature rise well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius (UNFCCC, 2014)

and findings obtained from conducting interviews with stake holders and analysis of relevant documentation. Employs case analysis in analysing wind farm Nij Hiddum Houw[7] to serve as an illustration of biodiversity- renewable energy conflict, and the role of EIA in the conflict. Chapter four also discusses the main elements that the research deduced from the data collection using literature as well by answering the four sub questions of the research Chapter analyzes the main research question by discussing the ecological and social aspects of EIA, and how they are related to biodiversity conservation. Finally, chapter six presents a conclusion of the research, recommendations for improvements and limitations of the research.

1.4 RESEARCH GOAL

The research aims identify possible areas where EIAs are deficit in considering impacts of RE projects on biodiversity and ultimately, make recommendations which could contribute towards making EIA more sensitive towards biodiversity. This will add more knowledge to existing literature on biodiversity considerations in renewable energy related EIA and finally, the recommendations made at the end of the research will be helpful to decision makers on their quest to simultaneously promote renewable energy and protect biodiversity.

The main research question is:

"*To what extent do environmental impact assessments consider impacts of renewable energy projects on biodiversity in the Netherlands?*"

The sub research questions are:

1. To what extent do EIA criteria incorporate concern for biodiversity?
2. What conflicts between renewable energy and biodiversity currently exist?
3. To what extent does the final project comply with preserving biodiversity?
4. What role does EIA play in managing conflicts between biodiversity and renewable energy?

[7] In subsequent chapters will be referred to as NHH

CHAPTER 2: LITERATURE REVIEW

This chapter introduces theories on various concepts that are relevant to the research objective and research topic. Section 2.1 discusses the various definitions of environmental impact assessments from several authors who view the concept of EIA from social and biophysical perspectives, but still maintaining the fundamental underlying principle of EIA; 2.2 follows through by highlighting the purpose of EIA in the Dutch context and follows through to discuss the legal framework for Dutch EIAS- in the form of Nature Conservation Act; 2.3 focuses on renewable energy, the various types that there are and their perceived ecological impacts ; 2.4 discusses biodiversity in the policy context and juxtaposes renewable energy against biodiversity by giving examples of situations where both sectors were in conflict; and 2.5 discusses the effectiveness of EIA in dealing with these conflicts, and looks at the influence of the public in EIAs.

2.1 ENVIRONMENTAL IMPACT ASSESSMENTS

Environmental Impact Assessment is a systematic process which examines the environmental consequences of developmental actions in advance according to Dias et al. (2017). They further state that the ideal EIA process is one which occurs before construction and during the installation of development projects. There have also been literature according to Dias et al.(2017) which are of the opinion that EIA procedures should also occur during the operational phase of development projects, as a way to measure compliance[8] of the project with environmental regulations. Several authors have attempted to define and explain EIAs by categorizing them contextually. This is based on the view that, the rationale behind the implementation of an EIA depends on the context within which it is been used, according to Bratman & Dias (2018). In the opinion of Rozema, Bond, Cashmore, & Chilvers, (2012) , any discourse on EIAs should be viewed through the lens of two aspects; the impacts of projects on the biophysical environment and impacts on the social environment.

In explaining EIA in the context of the biophysical environment, several authors have described EIA as planning and/or decision-making tools that are to be used in assessing impacts of projects

[8] An ex post evaluation is conducted to compare the impacts of a project with that which was predicted by the EIA

primarily through scientific analysis. This line of view is seen in the work of Bratman & Dias, (2018) who assert that EIAs were originally intended to mitigate environmental concerns by offering scientific assessments. This line of reasoning is also corroborated by Bigard, Pioch, & Thompson, (2017) who described EIA as a tool which serves the primary purpose of assessing the effect of developmental projects on biodiversity by integrating the potential impacts into the "mitigation hierarchy"[9] (avoidance, reduction and offset measures). However, there were growing criticisms of EIAs concerning their lack of inclusion of projects impacts on stakeholders. According to Larsen, Hansen, & Nielsen, (2018), this in turn, led to citizens protesting against a number of projects especially renewable energy related ones on the premise that EIAs did not include in their assessment the social and socio-economic impacts of such projects. They reported these impacts of such projects to be impacts on local land ownership, visuality of landscape, "place attachment"[10] and recreational possibilities. Larsen et al. (2018) further argued that, since EIAs have been regulated since 1985 by EU Directive on "the assessment of the effects of certain public and private projects on the environment", then the social impact of EIAs must be reported. This is because, "society" is inclusive in and makes up a vital aspect of the environment. Furthermore, Larsen et al. (2018) assert that, the role of EIA is not only to mitigate significant impacts, but to communicate knowledge to the public to encourage participation and dialogue about the project. Following this line of thought, Enríquez-de-Salamanca, (2018) described EIA as a social process, which brings together several stakeholders with different interests and expertise to dialogue and take EIA related decisions on the impact of impending projects on said stakeholders.

From the above definitions, it can be concluded that the overall goal of an EIA is to achieve better developmental interventions through the protection of the human, physical and biotic environments (Mareddy, 2017). According to Mareddy (2017), the results of the assessments are compiled into a document known as an environmental statement (ES), intended to provide

[9] This is a "tool' which aims to help manage biodiversity risk (UNEP, 2010)

[10] Sentimental value that the affected residents attach towards the area in which the new infrastructure would be built (Zaunbrecher, 2018)

decision-makers with a well-informed assessment of environmental implications of the intended action and proposed alternatives.

2.2 EIA IN THE NETHERLANDS

In the Netherlands, EIA is described as a systematic process that seeks to ensure that environmental considerations are assimilated in decision making concerning specific projects. EIA is seen to serve two purposes; long term and short term. In the short term, EIA aims to inform the decision-making process through identification of significant environmental risks of projects. The long-term goal of EIA is to promote sustainable development by ensuring that ecological functions, essential resources and the dependents on said resources are not undermined by development proposals[11].

Generally, EIAs have a common structure which involve processes outlined in figure 1 below:

[11] Entire paragraph adapted from https://www.eia.nl/en/environmental-assessment

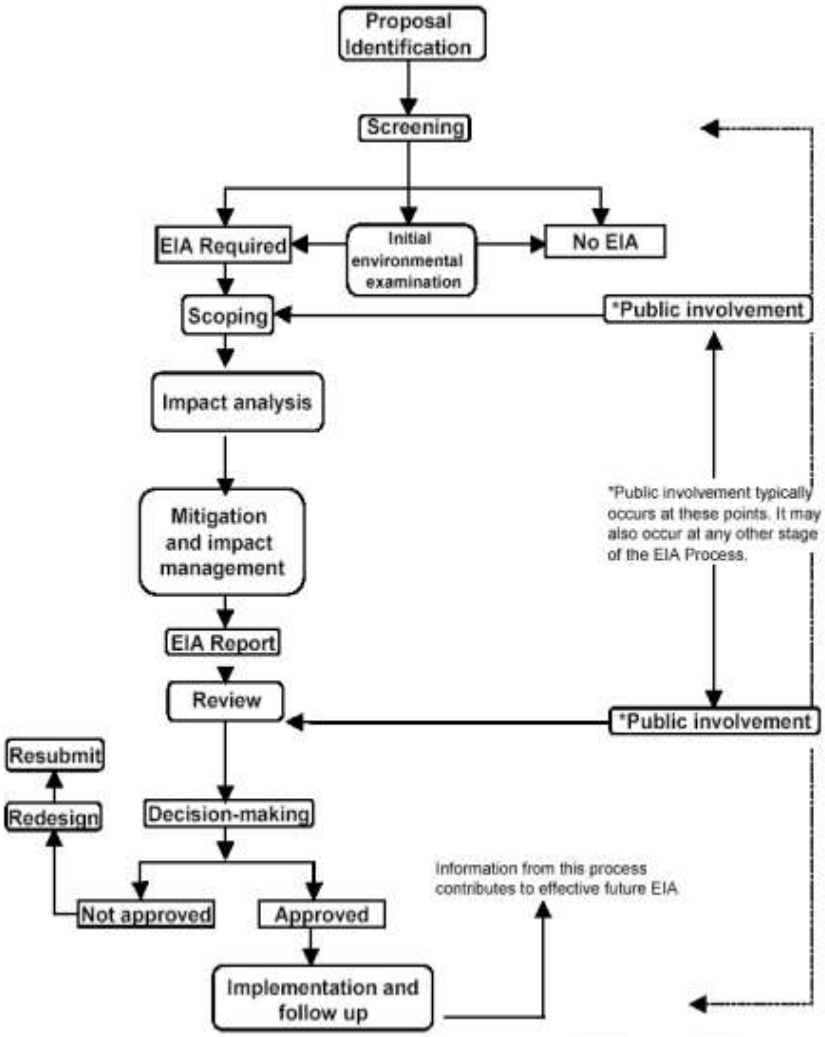


Figure 1: EIA Process Flow Chart

Source: Ogola, (2007)

2.2.1 NATURE CONSERVATION ACT

The Nature Conservation Act[12] is a legislation in the Netherlands which protects nature areas, wild animals and plants. According to the nature conservation act, if an initiator wants to develop a project in a Natura 2000[13] site that is likely to have a harmful impact on protected natural assets[14], a permit is needed under the act (*natuurbeschermingswetvergunning*) from the concerned provincial authority[15] . The Netherlands applies a permit system for the protection of Natura 2000 sites. The act specifies that it is forbidden for projects to be carried out without a permit or to carry out projects which will in view of the conservation goals for Natura 2000 sites, deteriorate or have significant disturbing effects on the quality of the habitats or the species for which those areas were designated adopted (*Milieueffectrapport (MER) Bijlagenrapport, NHH[16]*). Additionally, the act states that an integration plan should not be without an appropriate assessment of the impact on the Natura 2000 site, considering the conservation objectives for that area. Effects on Natura 2000 sites are assessed on the basis that the conservation objectives set for the designation decisions in the areas concerned have been adopted (*Milieueffectrapport (MER) Bijlagenrapport, NHH*).

Concluding remarks about EIA

The purpose of this section was to introduce varying literature on EIA by highlighting the environment in the contexts of both biophysical and social aspects. Hence the need for EIA reporting to take the social impacts as serious as the biophysical impacts. The section also mentioned the long and short-term purpose of EIA in the Netherlands, and illustrated the general EIA process because Dutch EIA is central to the research. Finally, the section touched on the legal

[12] Came into effect on 1 January 2017. The new Act replaces 3 other laws: The Nature Conservancy Act 1998, the Flora and Fauna Act and the Forestry Act

[13]A network of essential breeding and resting sites for rare and threatened species. (http://ec.europa.eu/environment/nature/natura2000/index_en.htm)

[14] A protected area is a clearly defined geographical space, recognized and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (IUCN, 2008)

[15] Adopted from www.government.nl

[16] Milieueffectrapport (MER) Bijlagenrapport, NHH was downloaded from https://www.commissiemer.nl/adviezen

framework which serves as a guiding principle for the EIA criteria in the Netherlands; the Nature Conservation Act.

2.3 RENEWABLE ENERGY

This section identifies and discusses the impacts of different renewable energy pathways on ecosystems and biodiversity under the following drivers of biodiversity loss identified by Gasparatos et al. (2017): habitat loss/change, pollution, overexploitation, climate change and introduction of invasive species

2.3.1 Overview

Energy quality (cleanliness and of energy source) and accessibility are important factors for any developmental process. According to Sen & Ganguly (2017), in order for sustainable development to be achieved, there should be continuous flow of clean and secure energy which has lesser significant environmental impacts. Gasparatos et al. (2017) identified an increase in energy efficiency as a key strategy for developing a Green Economy. They explained that, an increase in energy efficiency translates to a reduction of resource intensity and environmental impact on economic sectors which are dependent on the transformation of natural resources. Examples of these sectors are the transport, construction, mining and manufacturing sectors (Gasparatos, Doll, Esteban, Ahmed, & Olang, 2017).

Since renewable energy sources can be used in the production of energy again and again, it is believed that a large scale infiltration of renewable energy is a key intervention for developing a green economy(Holma et al., 2018). More especially when the potential of these renewable energy sources to mitigate climate change, save fossil energy and generate “green jobs” is taken into consideration (Gasparatos et al., 2017). Examples of such renewable energy sources are solar energy, biomass, geothermal, wind energy, biofuel energy and many others (Hussain, Arif, & Aslam, 2017). Sen & Ganguly (2017) report that, that RE accounted for an estimated 12.9% of primary energy supply in 2008 globally. In the EU, the major RE contributors according to Sen & Ganguly (2017) has been biomass (10.2%), and hydropower (2.3%) with the others accounting

for 0.4%. In 2008, a special report on Renewable Energy Sources and Climate Change Mitigation stated that RE contributed to 19% of electricity supply globally with 2% of global transport fuel supply coming from biofuel supply and 27% of global demand for heat being supplied by biomass, solar and geothermal energy (Sen & Ganguly, 2017).

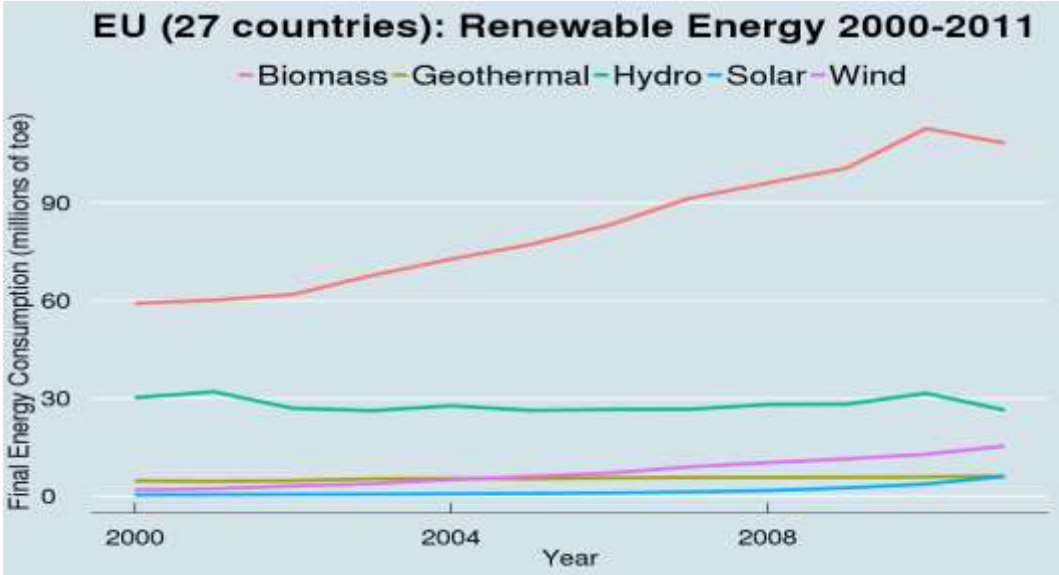


Figure 2: Renewable Energy Mix of 27 EU countries

Source: (https://breakingenergy.com/2014/05/14/biomass-the-worlds-biggest-provider-of-renewable-energy/)

2.3.2 Types of RE technologies

2.3.2.1 Solar Energy

Background

Naeem et al. (2009) explain that solar energy generates electricity from the sun either directly by means of photovoltaic (PV) cells or indirectly by using concentrated solar power (CSP). Cardinale et al. (2012) further explain that CSP technologies use arrangements of mirrors which track the sun and reflect its rays continuously to a point called heliostats- which are able to heat a working liquid that is used to generate electricity in a conventional turbine. In comparison with photovoltaics and wind, Hussain et al. (2017) state that CSP equipped with thermal storage

guarantees a significantly higher capacity factor as well as dispatchability but requires large areas to be effective. As a result of this, they are not widely deployed.

Solar PV panels on the other hand may be distributed and fixed on any surface which has access to exposure from the sun, hence making them ideal for incorporation into the urban environment or any man-made structures (Naeem et al., 2009). The use of large-scale solar energy generation, usually referred to as Utility Scale Solar Energy (USSE) has increased rapidly over the years especially due to its lifespan of 25-40 years according to Gasparatos et al. (2017) Many a time, the ecological impacts of solar energy are assumed to be negligible, however studies have shown that USSE can affect ecosystems in multiple ways throughout its lifecycle according to Katzner et al. (2013).

Ecological impacts

Gasparatos et al. (2017) report that biodiversity impacts of solar energy manifest through the loss of and change in habitats- due to the significant amounts of land modification and habitat fragmentation that the development of solar infrastructure tends to take up in the process. Additionally, supporting infrastructure (access roads, electrical equipment) and the spacing requirements of panels can result in the space requirements of the installations occupying more area than the actual solar panels (Katzner et al., 2013).

With regards to habitat change, Turney & Fthnakis (2011) report that land preparation activities such as vegetation clearing for the installation of USSE structure have been found to cause habitat fragmentation, restrict movement of species, affect preying strategies and ultimately the availability of food. These effects are due to the limited amount of land space left for biodiversity (plant and animals) to thrive and since the USSE are known to be the preferred choice due to their longer lifespan, their installations are more widespread and thus more species are being affected (Gasparatos et al., 2017). Secondly, studies conducted by Hernandez et al. (2013) have been able to identify bird mortality as a result of direct collision with heliostat collisions and burns from solar rays directed to the central receiving point. Additionally, the studies also revealed that the polarized light that is found at solar facilities can confuse insects into laying their eggs on the

panel and ultimately affecting their reproduction chances. Furthermore, the bright glare from CSP plants tend to attract insects which in turn attract birds, subjecting them to higher-level predators. CSP also uses large quantities of water, thereby having a dramatic effect in environments which suffer from water scarcity (Gasparatos et al., 2017).

Regarding pollution, the cleared land is often maintained with dust suppressants and herbicides in order to ensure accessibility of the panels to the sun (Hernandez et al., 2013). This in turn causes an increase in the run off and a change in the key chemical properties of adjoining waterways when they are washed out eventually causing pollution of these waterways (Gasparatos et al., 2017).

2.3.2.2 Wind Energy

Background

Wind energy is generated from turbines which are powered by large rotating blades with the diameter of the largest blades currently being >100m, rotating at 100-120m above the ground and generating more than 5MW of power globally (Gasparatos et al., 2017).

Wind power according to Tabassum et al. (2014) has been one of the fastest growing renewable energy generation technologies over the last twenty years for several reasons. The main reasons being the relatively low costs involved in electricity production from onshore wind energy, the short remuneration time of wind turbines, and a higher energy yield per unit of land (Langer, Decker, Roosen, & Menrad, 2018).

Ecological impact

Tabassum et al. (2014) report that, wind energy installations result in the loss of habitat area either directly, through occupying of land by the towers or indirectly by species avoiding the areas close to wind power facilities. Furthermore, wind energy installations have also been reported to contribute to degradation of the land and vegetation because just like any other installation they require road networks, transmission lines and infrastructure (Schuster, Bulling & Koppel, 2015). The development of offshore wind energy has also led to the introduction of as invasive species

of plants and other organisms which threaten to disrupt the ecosystem (Asaad, Lundquist, Erdmann, & Costello, 2017). Langhamer, (2012) reported on the effects of rapid growth of offshore wind energy installations that provide marine organisms which grow on rocky surfaces with an alternative hard substrate, also known as artificial reefs. These artificial reefs have been found not only to potentially introduce hard substra in what should have been sandy-dominated bottoms, but provide new habitats for non-indigenous (invasive) species which could spread and potentially displace indigenous species from their natural habitat(Langhamer, 2012).

Regarding the issue of habitat loss, studies by Peste et al. (2015) have reported that different bat species tend to avoid and/or abandon areas where wind generators have been installed. On the issue of habitat change, the main threats to biodiversity identified by Peste et al. (2015) are from the collision of birds and bats with the wind generators (especially the raptors), and from the strong downward current of air (downdraught) occurring from the spinning blades. Gasparatos et al. (2017) explain that, the downdraught causes a change in air pressure which damages the internal organs of said species and ultimately leading to barotrauma.

Generally, the greatest risks from wind turbine deployment are faced from the following groups of birds: endangered bird species or birds that have long lifespans but a low reproduction rate and larger birds, less swift birds and birds who fly in lower light conditions (dawn/dusk) are also at huge risk (Gasparatos et al., 2017). Gasparatos et al. (2017) further report that the latter are prone to more danger especially because they are less likely to detect and evade wind turbines. Holma et al. (2018) assert that, birds are known to be an important indicator of biodiversity changes due to the fact that since they are high up in the food chain and are more mobile than other groups; they are more likely to respond to ecosystem changes in terms of changes in their breeding and migratory routes. Overall, they reflect environmental quality on a broader scale (Holma et al., 2018).

2.3.2.3 Bioenergy (biomass/biofuel)

Background

Bioenergy refers to the use of organic (plant and animal based) matter to generate renewable energy. Bioenergy sources can come from diverse sectors such as wood and residues from the forestry/agricultural sector, waste from the manufacturing sector and food/household/municipal waste from the residential sector (Gasparatos et al., 2017). Globally, bioenergy accounts for 10% total global energy consumption with traditional bioenergy such as wood fuel, charcoal and dung which is often associated with poor households accounting for 54-60% (Dobber, Jones & Stout, 2010). According to Pedroli et al. (2013), modern uses of bioenergy such as bio-heating, bio-power and biofuels for transport are usually associated with the transition from the use of fossil fuels towards a "Green Economy".

Ecological Impacts

According to Gasparatos et al. (2017), the most important ecological impacts of biomass production are changes in and loss of habitats. Pedroli et al. (2013) report that, the use of land for expansion of biomass feedstock for production of energy have resulted in habitat and biodiversity loss. They assert that this is more so especially when mono-cultural feedstock production using a large-scale land conversion is adopted. Habitat change according to Christensen, Rayamajhi & Meilby (2009) caused by bioenergy is associated with a number of mechanisms such as tree canopy closure, rapid change in the size and shape of plants, loss of soil and an alteration of important landscape features such as riparian forests.

Several life-cycle assessments according to Zah et al. (2007) have demonstrated that most biomass energy production pathways emit greenhouse gases (GHG's) and air/water pollutants which have potential significant negative impacts on ecosystems and biodiversity. Examples of such effects are eutrophication[17] , acidification[18] and toxicity which occur as a result of the release of molecules such as carbon dioxide, nitric oxide and nitric dioxide into the atmosphere

[17] excessive richness in nutrients in water bodies
[18] absorption of carbon dioxide by the ocean to produce acid

(Gasparatos et al., 2017). These molecules get deposited into water bodies and serve as primary substrates for harmful algal blooms and cyanobacteria to multiply, and eventually threaten the existence of marine organisms (Zah et al., 2007). Additionally the shells of certain aquatic organisms have been found to be dissolved in acidic seawater and atmospheric emissions from biomass energy have been found to contribute to tropospheric ozone formation.(Odhiambo & Routh, 2016).

Life Cycle Assessment (LCA)[19] is an effective way to measure holistic environmental assessments (Curran, 2013). Comparative Life Cycle Assessments (LCA's) have confirmed that different biofuel options could have widely divergent GHG emissions depending on the type of feed stock, the agricultural practices and the production area (Zah et al., 2017). Furthermore, fertilizers/agrochemical run-offs and industrial wastes from biofuel production have been identified as major sources of water pollution in several countries globally (Gasparatos et al., 2017).

2.3.2.4 Hydropower

Background

Gasparatos et al. (2017) define hydropower as power that is generated through the use of fresh flowing water to run turbines with the aim of generating electricity. They further report on the different hydropower technologies that can be adapted depending on human demand and geographical constraints. These technologies are: hydropower from dams, run-of-river hydropower and pumped- storage hydropower (Gasparatos et al., 2017). In recent years, Botelho et al.(2017) report hydropower as currently representing the largest contributor of renewable energy generation in Europe. They assert that, the multifunctional nature of hydropower remains a major reason as to why it has gained increased significance. That is, aside being a renewable energy source, hydropower is useful in other areas such as agricultural irrigation, flood/drought control and water supply regulation (Botelho et al., 2017).

[19] an analytical tool which captures the overall environmental impact of a product or process from raw material acquisition, through production and use, to waste management (Curran, 2013)

Ecological Impacts

For Hydropower, the most significant impacts on biodiversity as reported by Botelho et al. (2017) are loss of habitat and change in habitat. Regarding habitat loss, Breeze, (2018) reports hydropower plants, particularly dams and reservoirs can flood extensive upstream areas thus destroying habitats and species they harbor, and the ecosystem as a whole. On the issue of habitat change, Botelho et al. (2017) assert that hydropower infrastructure has been identified to pose obstacles to diadromous[20] fish during their migration to spawning area. Aside diadromous fish, other individual and/or community species of fish, insects, invertebrates and plants have been negatively affected by the change in the water flow regime caused by the hydropower infrastructure (Gasparatos et al., 2017). In addition, Breeze (2018) and Gasparatos et al. (2017) report on the emission of methane, a potent greenhouse gas from the reservoirs of hydropower plants which has been found to be comparable to methane emissions form conventional power plants.

2.3.2.5 Geothermal Energy

Background

Geothermal energy is basically heat that is derived from the earth's crust which includes high temperature hydrothermal sources, deep aquifer systems with low and medium temperatures and hot rock sources (Gasparatos et al., 2017). The overall global geothermal energy potential that has been realized is 6.5%. Geothermal resources are often located in virgin areas of rampant biodiversity according to Bayer et al. (2013). Other direct uses of geothermal energy as reported by Cook, Davíðsdóttir, & Már, (2017) are district heating, space heating, heating swimming pools and spas, industrial and agricultural processes.

[20] category describing fish that spend portions of their life cycles partially in fresh water and partially in salt water (https://nctc.fws.gov/pubs5/web_link/text/int_fish.htm)

Ecological Impacts

Shortall, Davidsdottir, & Axelsson, (2015) emphasize on the importance of geothermal systems in the ecosystem. They report that, since geothermal ecosystems are made up of various plant and animal species adapted to extreme environments, geothermal systems by providing unique climatic conditions - create a delicate habitat for the survival of these ecosystems. With regards to habitat loss, Hunt (2001) state that drilling and seismic surveys during construction may result in erosion, runoff and noise which in turn affect the breeding, foraging and migration of certain species. Hunt (2001) also reports on the possibility of topsoil erosion which inadvertently causes a loss of native vegetation species and a decrease in existing biodiversity. Habitat change that occurs due to the construction activities of geothermal infrastructure cause a change in the ecosystem associated with geothermal changes. Since geothermal ecosystems are adapted to such an extreme environment and cannot cope with even the slightest habitat change, their population declines rapidly and they run the risk of being endangered (Shortall et al., 2015)

Concluding Remarks:

The purpose of this section was to highlight the common renewable energy sources according to Gasparatos et al. (2017) being adopted in Europe and their (potential) impact on terrestrial and aquatic ecosystems. That is not to say that renewable energy technologies only have negative impacts on biodiversity, however it is to point out that promoting renewable energy technologies solely on the reason that they promote climate change mitigation and in turn encourage biodiversity is untrue.

2.4 BIODIVERSITY POLICY

Biodiversity according to the CBD (1992) is the “variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are a part of; this includes diversity within species, between species and of ecosystems”. Biodiversity targets are perceived to be targets that are running parallel to

emissions and renewable energy targets. In 2001, Parties to the Convention on Biological Diversity (CBD) pledged to achieve a significant reduction in the then current rate of biodiversity loss on a global scale (UNCBD, 2002). The EU also adopted a more ambitious target which sought to stop biodiversity loss in the EU by 2010 (European Council, 2001). Both the EU and CBD missed their targets which led to a revision of both aims. The revised global aim is to take "effective and urgent action to stop the loss of biodiversity to ensure that systems are resilient by 2020 and continue to provide essential services" (UNCBD, 2010). The EU's revised target even more ambitious than before is to "stop biodiversity loss and ecosystem services degradation in the EU by 2020, restore them in so far as achievable, while stepping up the EU contribution to preventing global biodiversity loss" (European Commission, 2011).

2.4.1 Renewable Energy and Biodiversity Policy Conflicts

Even though policymakers argue that RE policies and biodiversity policies should be complementary, in practice, this is not always the case (Jackson, 2011). The following illustrate practical examples where biodiversity and renewable energy installations were in (potential) conflict.

2.4.1.1 Wind farm in Ireland

In October 2003, construction activities at a large off shore wind farm in Derrybrien, Ireland appeared to have triggered a landslide which caused an ecological catastrophe, when a mass of peat which was removed polluted the *Owendalulleegh* river, causing the death of over 50,000 fish and damage to fish spawning beds (Jackson, 2011).

2.4.1.2 Sabor Dam in Portugal

The dam which was being constructed on the Sabor river was expected to produce electricity in 2014. The main dam upon completion was expected to be >120m high, and located near the mouth of the Sabor river in the north-eastern Portugal. It was also going to create a reservoir around 50km long, almost entirely within two Natura 2000 sites (Jackson 2011).

An EIA which was conducted revealed the potential negative impacts the dam was going to have on Natura 2000 sites. Upon revelation of this EIA, Portugal's Statutory Nature Conservation Agency published a report stating that the Sabor dam would be an unlawful pursuant to the Habitats Directive[21], given the projected impacts of the project on Natura 2000. In spite of these reports, in June 2004, the Portugese government formally approved the construction of Sabor dam (Jackson, 2011).

The Sabor dam was officially completed in 2015, and reports state that an entire valley has been inundated alongside two bridges and several small villages. Additionally, a free-flowing river which contained rare species of fish has been replaced by a stagnant reservoir[22] .

2.4.1.3 The Severn Barrage in the United Kingdom

The attraction of the Severn estuary as a potential renewable energy source is in relation to its tidal range, which at a mean of 8.2m high makes it the second highest in the world. While the estuary's tidal range makes it ideal in terms of renewable energy, the estuary's tidal system has simultaneously created a collection of species and habitats that are described as "dangerous and rare", and important in EU terms (DECC, 2010). This led the UK government to designate two Natura 2000 sites in the estuary. Even though the largest barrage option (Cardiff-Weston) under consideration would have been capable of generating up to 4.4% of the UK's electricity needs and eventually contributed sizeably to the UK's 2020 renewable energy targets, it would inevitably have triggered Article 6(4) of the Habitats Directive (Jackson, 2011). Also, a feasibility study conducted by the UK government revealed the adverse damage that the barrage was going to have on the Natura 2000 sites. This together with the enormous challenge regarding the cost and extent of compensatory habitat required made it legally impossible for the UK to grant permission for the construction of the Cardiff-Weston barrage (SDC, 2007).

[21]Directive which guarantees the preservation of a wide range of rare, threatened or endemic animal and plant species (http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm)

[22] Paragraph adapted from https://patagonia.com

Reflections from the examples cited above:

Hodas (2008) stated that in developing climate change law, the need to protect and enhance biodiversity should not be forgotten. Instead, he advocates for win-win sustainable development solutions which reduce greenhouse gases whiles promoting and enhancing biodiversity. Seeking win-win situations are good but policy makers are put in a tough position when the plan area is a Natura 2000 area; an area which covers almost 18% of EU territory (Jackson, 2011). Therefore, as EU countries push to meet their 2020 emission reduction and renewable energy generation targets whiles considering their land mass and population density, conflicts between Natura 2000 areas and renewable energy projects are bound to be inevitable.

Heller and Zavaleta (2009) report that over the course of the next century, climate change is expected to become the greatest driver of global diversity loss. Therefore, in light of this fact, Jackson (2011) poses the question: "are the circumstances in which we might tolerate relaxation of legal provisions aimed at biodiversity protection in order to pursue "broader" climate change goals?" This question also begs the questions: "what does this mean for EIA criteria? Should EIA be lenient when it comes to RE projects because they are perceived to be for the greater good?"

These questions are legitimate questions that policy makers will need to address more especially in the coming years, as populations increase and pressures on existing resources surmount.

Concluding Remarks

This section demonstrated that, although in theory, policy makers are to seek a win-win situation for both biodiversity and renewable energy, practically there are hard cases which policy makers are going to have to make complex trade-offs. On one hand, biodiversity integrity has to be preserved at all cost but on another hand, climate change is becoming the number one driver of biodiversity loss. Therefore, this raises some tough questions regarding what policy makers are actively trying to pursue (i.e. biodiversity or renewable energy) and consequently justify their choice.

2.5 EFFECTIVENESS OF EIA

Effectiveness of EIA is described by Larsen et al. (2018) as the extent to which the environmental targets set by a country or organization have been realized. In other words, the significant role that EIA has played in ensuring that a country's environmental goals have been met as a measure of promoting sustainability (Larsen et al., 2018b). Ideally, there should be a common yardstick to measure the effectiveness of an EIA procedure, however given the multidimensional nature of the term "effective", several criteria have been used to evaluate EIA effectiveness over the years (Loomis & Dziedzic, 2018). There is however, still an ongoing debate within EIA literature as to how EIA effectiveness should be measured. There have been arguments that EIA suffers from weak conceptual foundations which hampers its pragmatic effectiveness. The most crucially identified "weak concept" has been a lacking consensus about the purpose of EIA (Smart, Stojanovic, & Warren, 2014). These arguments according to Smart et al. (2014) stem from the scarcity of literature on whether the process or purpose of EIA should differ depending on the nature of predicted impacts from developments. However, Fonseca & Venticinque, (2018) are of the opinion that, in recent times especially, the extent to which individual EIA processes will be effective appear to be context specific.

The literature gathered on the effectiveness of EIA is discussed in this section under the following perceived purposes: EIA as an information tool, EIA as a political tool and EIA as a social tool.

EIA as an information tool

Smart et al., (2014) have argued that EIA should be regarded primarily as an information tool to relay information to the various stakeholders regarding impending projects. They further assert that, because EIAs are limited to only considering environmental issues, they cannot make holistic decisions. However, the flaw in this line of argument is that, since the authors did not consider the social aspect of the environment, the explanation treats the environment as a mere biophysical one. There are behavioural and ideological factors that differ from one community to another, therefore merely informing stakeholders of potential environmental impacts may prove to be ineffective (Nilsson & Dalkmann, 2001). Nilsson & Dalkmann (2001) further explain that,

the EIA process generates a significant amount of technical data, which may create a possible situation of information overload amongst community stakeholders due to knowledge constraints. This eventually leads to the information presented being ignored or distorted.

EIA as a Political Tool

Enríquez-de-Salamanca, (2018) explains EIA as a process which brings together several stakeholders, each with different interests and depending on these interests may lead to bias in their opinions. Fonseca, Sánchez, & Ribeiro,(2017) corroborate this line of thought by asserting that, the effectiveness of EIA to influence decisions depends to a large extent on the actors involved, their interests as well as positions of power. In other words, the role that EIA may play in the decision-making process will depend on the extent to which decision makers are open to environmental values and the extent to which alternatives and measures developed in EIA coincide with the interests of said actors (Larsen, Hansen, & Nielsen, 2018a)

EIA as a Social Tool

Research as reported by Larsen et al.(2018) has shown that there is a slight apprehension among the public when it comes to the RE installations. This is primarily because the concerned community groups do not trust that EIAs are transparent enough especially when it comes to renewable energy installations. They doubt the “transparency” of EIAs because they believe that EIAs downplay the impacts of large infrastructural projects on their quality of life and community ownership of land (Langer, Decker, & Menrad, 2017). Rozema et al., (2012) attribute this distrust to the inability of decision makers to deliberate on impending projects with the concerned residents. As a consequence, it has narrowed down the purpose of EIA to pursuing only ecological interests without the aid of the concerned community groups. Wynne (2007) introduced the notion of ‘participatory turn’ which debunks the viewpoint that the public do not bear the required competence for participations in EIA. The notion of participatory turn instead advocates for intense interaction between policy makers and community groups.

2.5.1 Public Influence of EIA on RE projects

The role of EIA according to Enríquez-de-Salamanca, (2018) is not only to identify and assess significant (negative and positive) impacts of a project on the surroundings but also to communicate knowledge of the projects to the decision-makers for an informed decision and to the public- for backing and dialogue about the project. However, (Larsen et al., 2018a) report that many EIAs which are related to the implementation of RE projects have been subject to dispute in Europe, particularly in Denmark where some RE projects have led to citizens forming protest groups and authorities eventually abandoning plans. This is because EIA procedures fail to effectively include concerned parties of projects in the planning of projects and only usually, involve them towards the end of the EIA exercise (Hasan, Nahiduzzaman, & Aldosary, 2018). This severely places a limit on the ability of stakeholders to contribute effectively and in turn raises questions about the legitimacy of the attempt (to seek public opinion). Typical examples include the installation of wind turbines causing conflict and the extension of electric grids proving to be problematic among citizens of affected neighbourhoods (Larsen et al., 2018b).

Research as reported by Hasan et al. (2018) has addressed specific characteristics of EIA that may influence the contentiousness of RE projects, for instance: how alternatives are treated, how much of information is given out to relevant stakeholders, the somewhat complex and technical nature of EIA which could potentially make it inaccessible to all actors and the ways in which public participation is carried out. Concurrently, previous research identifies different potentially significant impacts on local communities which could potentially breed acceptance or conflict on the implementation of RE projects according to (Larsen et al., 2018a). These impacts are grouped into environmental and social/socioeconomic. Larsen et al. (2018) report environmental impacts to include impacts on noise, air, water quality and landscape. Their report on social and socioeconomic impacts include impacts on local ownership, job creation, place attachment, landscape, local identity and recreational facilities.

2.5.2 Case Study from Denmark

A study was conducted by Lyhne, van Laerhoven, Cashmore, & Runhaar, (2017) to analyze the effectiveness of the Danish EIA system. Some key features of the Danish EIA system are: the competent authority rather than the initiator of the project undertakes the EIA reporting. Additionally, the public, rather than the experts play a pivotal role in quality control- this has the tendency to influence community dynamics in particular ways especially given that the Danish population is a relatively small one compared to countries such as the Netherlands and the United Kingdom.

The results from the study showed that there was high agreement among the public that knowledge of EIA made them choose the most environmentally friendly alternative for their projects. There was also the perception that EIA primarily results in (minor) changes in decisions which favour the environment and thus EIA was of importance in protecting the environment. This study supported an earlier study conducted in 2003 which also reported that changes made in 86% of projects were as a result of the EIA process. In examining the extent of EIA effectiveness in terms of awareness, the study showed that EIA awareness was most prominent among the competent authority and less prominent among the proponent (initiator). The study concluded that the more extensive role that the competent authority plays may be the principal reason as to the perceived higher EIA effectiveness mostly when it aligns with their interests. Also, the powerful complaints system in Demark amplifies the influence of the public in EIA related issues.

Concluding Remarks

Essentially, EIA is only as effective as the context within which it is being addressed therefore it is up to decision makers to design EIA procedures with clear objectives. In this way, the objectives of the EIA will be the benchmark against which the impact of EIA approved projects will be measured against to determine how effective the EIA is. Having said this, it is essential that the role of the public in EIA procedure is not watered down since public support is pivotal to the success of a lot of projects, especially large infrastructural projects.

CHAPTER 3: RESEARCH DESIGN

In this chapter, the methodology that was used to select, collect and analyze data is presented. The chapter begins with the description of the research framework, research questions and definition of concepts. After that, the methods used for collection and data analysis are elaborated. The nature of this research is qualitative; all research questions are addressed in a qualitative manner. The analytical framework for assessing the factors which determine the extent to which biodiversity is considered in EIAs in relation to policies is based on secondary data sources. Primary data is obtained from empirical knowledge and experience of persons working in the Friesland Province, environmental federation, Netherlands Commission for Environmental Assessment and academia on the extent to which biodiversity is considered and the role that EIA plays in resolving biodiversity-RE conflicts.

3.1 RESEARCH FRAMEWORK

A research framework made up of six steps is shown below:

Step 1: Brief definition of research objective

The objective of this research is to contribute to existing literature by analyzing the extent to which biodiversity is considered in environmental impact assessments in the Netherlands. The study focuses mainly on conflicts between biodiversity and renewable energy and concludes by making recommendations which could contribute towards making EIA more sensitive towards biodiversity.

Step 2: Determining the research object

The research object in this study is the factors that determine the extent to which biodiversity is considered in existing Dutch Environmental Impact Assessment.

Step 3: Establishing the research perspective

Research perspective as defined by Verhuren and Doorewaard (2010) is the “lens” that is used to closely view the research object. The research analyzes biodiversity considerations through the review of elements that drive/hinder the extent to which biodiversity is considered by EIAs of renewable energy projects. It also reviews factors

that (could) potentially trigger conflict between biodiversity and renewable energy were – and this knowledge was obtained from policy documents and legal frameworks that spell out the goals for both biodiversity and renewable energy in the Netherlands.

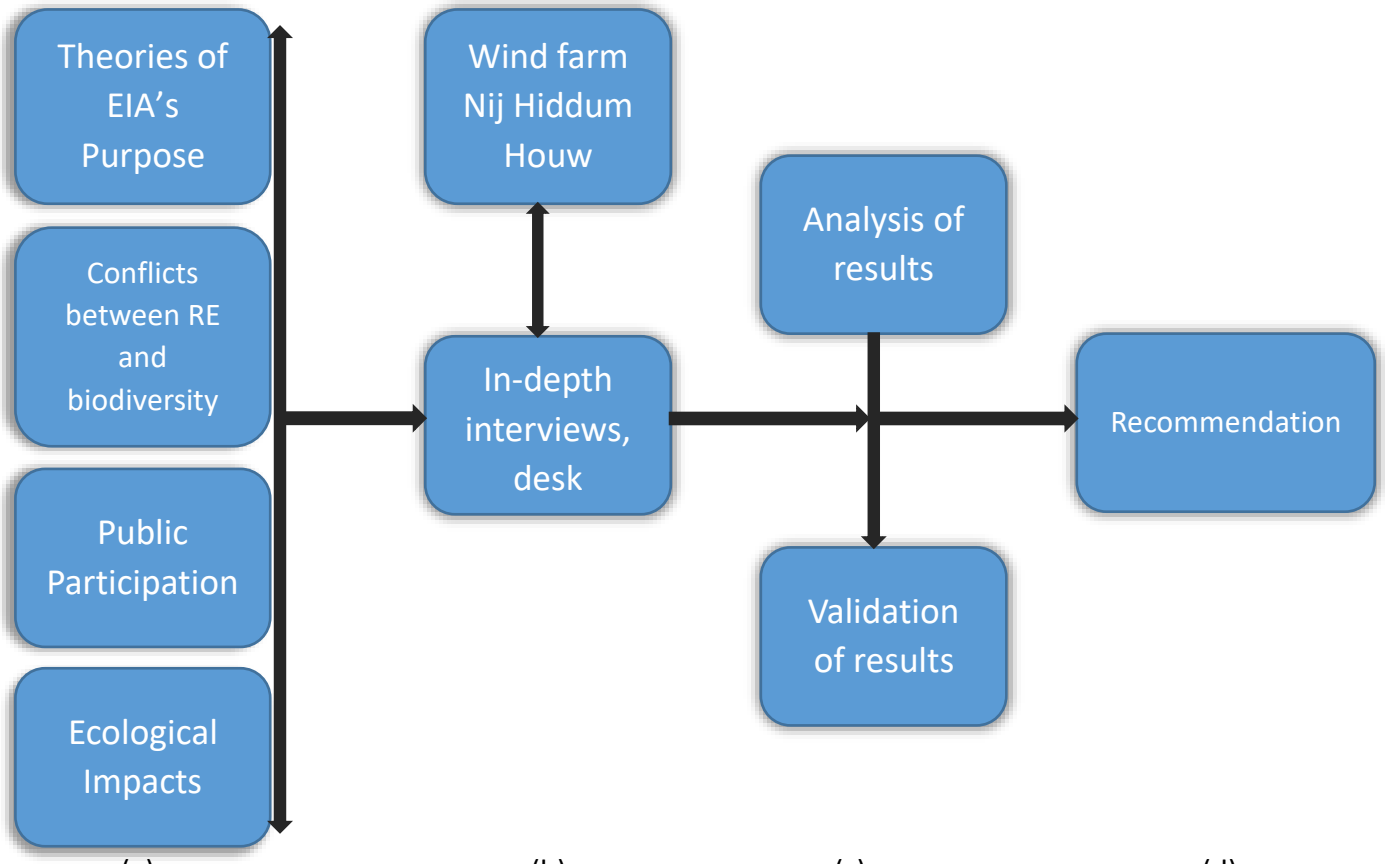
Step 4: Determine the sources of research perspective

The research used scientific literature to develop a conceptual model. The right-hand column of Table 1 shows the theoretical frameworks studied for the research whiles on the left-hand column are the key concepts used to specify the research object.

Table 1: Sources of Research Perspective

Key Concepts	**Theories and documentation**
Environmental Impact Assessment Renewable Energy Biodiversity	Theories on purpose of EIAs Conflicts between biodiversity and RE Public Participation Ecological Impact

Step 5: Schematic representation of the research framework



3.2 RESEARCH QUESTION

The Main Research Question

"*To what extent do environmental impact assessments consider impacts of renewable energy projects on biodiversity in the Netherlands?*"

Sub-Research Questions

1. To what extent do the criteria incorporate concern for biodiversity?
2. What conflicts between renewable energy and biodiversity currently exist?
3. To what extent does the final project comply with preserving biodiversity?
4. What role does EIA play in managing conflicts between biodiversity and RE?

3.3 DEFINITION OF CONCEPTS

For the purpose of this research, the following key concepts are defined:
Environmental Impact Assessments (EIAs): This is the extent to which the environmental targets set by a country or organization have been realized (Lyhne et al., 2017). This concept is important because EIAs are important analytical tools for identifying and preventing potential negative environmental impacts of various projects. However, Williams & Dupuy (2017) assert that their usefulness is dependent on how they are implemented and on the extent to which the findings are used in public decision-making.

Biodiversity Conservation: This is the preservation, maintenance, recovery and enhancement of the components of biological diversity. This concept is selected because, decisions regarding (biodiversity) conservation are made under conditions of serious constraints and trade-offs according to Fonseca & Venticinque, (2018). More especially in a climate where resources are limited and decision makers tend to go for more cheaper solutions than what is deemed as more expensive(Fonseca & Venticinque, 2018).

Ecological Impacts: This refers to the impact of renewable energy infrastructure on biodiversity. The aim of increasing amount of electricity generated from renewables requires that there is a

change in the electricity supply system on many levels (Zaunbrecher, 2018). That is, there has to be an electricity generating infrastructure from renewables, a transmission grid and increased electricity storage facilities. These infrastructure have an "ecological footprint" which is their specific impact on local ecosystems, hence the importance of this concept (Zaunbrecher, 2018).

Renewable Energy: By definition, this is energy generated from sources which do not emit carbon dioxide and hence do not contribute to climate change(Kim, Park, & Lee, 2018). This concept is selected because, many countries are transitioning to low carbon energy-mix by investing more in renewable energy generating sources as a measure of tackling climate change(Kim et al., 2018). These transitions are considered to be not only expensive, but also come at a certain cost to the environment. Not only that, they have also been met with some measure of resistance by local residents for varying reasons identified by Zaunbrecher (2018)such as landscape impact (visual change in landscape), physical wellbeing (noise emission, light pollution, shadow casting) and environmental impact (collision of bird and bat with wind turbines).

Conflict: In this context is defined as incompatibility between two sectors namely biodiversity and renewable energy. This concept is important because, renewable energy related policies and projects have been met several times by disputes and disapproval by stakeholders in affected areas. The concerns raised are the environmental and social impacts of certain renewable energy installation on some ecosystems and residents who inhabit the affected areas. This sometimes leads to governments postponing or totally abandoning intended projects(Larsen et al., 2018a). However, managing conflicts well could create opportunities to address pressing issues so that a positive outcome is achieved(Larsen, Hansen, & Nielsen, 2018b).

Endangered species: A species, a subspecies, or a "distinct population segment" that is at risk of extinction throughout all or a significant portion of its range (Avise, 2016).

3.4 RESEARCH STRATEGY

The research uses the single case study approach. In this approach, profound insight is gained into one process, object or organization (Vershuren and Doorewaard, 2010). The research focused deeply on one case; Nij Hiddum Houw in Friesland.

In this case, the factors which determine the extent to which biodiversity is incorporated into renewable energy related EIAs are analyzed through semi-structured interviews with various stakeholders and data generated from existing literature and documentation. A holistic approach is applied to determine to what extent biodiversity is considered by EIA in the Netherlands. Triangulation of methods and sources is hereby used. In the table below, the people interviewed were representatives from Province of Friesland, a representative from the environmental NGO in Friesland (Friese Millieu Federatie), EIA advisor at the NCEA and a person from academia.

The researcher was able to gain a holistic view by gathering information from these different perspectives. The selection of academia was due to expertise in subject area of ecology thus it was imperative to get the perspective of academia on biodiversity and renewable energy goals and explore possible avenues for resolving such conflicts. The NCEA was also selected due to knowledge and experience in providing advice on EIA documents for both governmental and non-governmental organizations as an independent third-party organization. Furthermore, it was important to seek the opinion of the environmental NGO. Snow balling technique was applied. During the interview with Friese Millieu Federatie, the case of wind park Nij Hiddum-Houw was highlighted. The interviewee at Friese Millieu Federatie directed the researcher to the project leader of the wind park at the province of Friesland. The project leader also directed the researcher to the EIA expert at the province of Friesland for further questioning at a later date. Face to face interviews were conducted with all interviewees. The table below describes the interviewees, their affiliations and roles

Table 2: List of Interviewees, their affiliations and roles

Interviewee	Affiliation	Role
David Goldsborough	Van Hall Larenstein, University of Applied Sciences	Senior Researcher in Marine Policy; Senior Lecturer Coastal and Marine Management
Sjoerd Harkema	Netherlands Commission for Environmental Assessment (NCEA)	Senior Technical Secretary on the team of experts who advise on EIA reports at the commission
Arnoud de Vries	Friese Millieu Federatie	Biodiversity advisor at the federation, instrumental in legal proceedings against Nij Hiddum Houw
Harm Jan Bouwers	Province of Friesland	Wind Energy Project Leader under the Sustainable Energy Program
Paul Westerbeek	Province of Friesland	Senior Consultant in Ecology A decade of experience with analyzing and evaluating EIAs of on-shore and off-shore wind farms, at both the national and provincial level.

Semi-structured questions for the various organizations can be found in the appendix II. For each interview, questions are adapted to the interviewee's expertise. All interviews were conducted openly, and in all, the elements of the models of the analytical framework were used to form the basis of the interview questions. The interviewees signed a consent form (appendix I) and were well informed about the nature of the research.

3.4.1 Validity

In order to assure validity of the results, all information stated about Nij Hiddum Houw and other correspondents is transcribed word for word and located in Appendix III.

3.4.2 Research Boundary

Research boundary is used to determine the limitation of the study so that the goal of the study can be achieved with the specified time.

The following boundary is used in the research:
Not every aspect of biodiversity consideration can be advised upon due to time constraints
Stakeholder willingness to participate in interviews. The use of triangulation method to validate information obtained from interviews is part of the research methodology.

3.5 RESEARCH MATERIAL AND ACCESSING METHOD

Research material according to Verschuren and Doorewaad (2010) is defined as the means of definition and operationalization of the key concepts of the research objectives and the set of research questions. The data and information used to address each research question was collected by the following means:

Document Review: Documents relating to environmental impact assessments particularly of wind farm Nij Hiddum-Houw (NHH), reports on the National Conservation Act and how it incorporated the Bird & Habitat Directive, consultancy reports on the environmental impact of NHH by the Friese Millieu Federatie and academic reports by renowned experts and researchers.

In-depth Interviews: A total of 5 interviews were conducted comprising of two actors from the province of Friesland and an actor each from the Friese Millieu Federatie (NGO), Netherlands Commission on Environmental Assessment (NCEA) and academia. These interviews were to gain insight into the opinion of the interviewees as to extent to which EIAs considered biodiversity; and the existing conflicts between biodiversity and renewable energy. The actors interviewed

play a very central role to activities regarding EIAs and the trade-offs which are considered when renewable energy and biodiversity are in conflict.

Literature: Scientific journals written by several authors which provided various theoretical insights about biodiversity, environmental impact assessments, renewable energy and reasons for existing conflicts between both sectors. These were primarily used as a knowledge source for the researcher.

Data collected using the above methods was analyzed using content analysis; an approach used to analyze qualitative data. Content analysis was applied in analyzing literature on environmental impact assessments and their consideration of biodiversity and factors which seem to promote conflict between renewable energy and biodiversity. Content analysis was also used to analyze the in-depth interviews conducted with the various stakeholders from the various governmental and non- governmental organizations, and academia. Consent was obtained from the various interviewees for the interviews to be recorded and subsequent word-for-word transcribing was done.

In order to guide the interview preparation, the table below informed the type of data and information required and the method of accessing this information.

Table 3: Data required to answer each RQ and the means of accessing the data.

Research Question	Data/Information Required to Answer the Question	Data Sources	Accessing Data
To what extent does EIA criteria incorporate the concern for biodiversity?	-The current EIA procedure. -The factors that are considered by EIA procedure before granting a permit. -How legislation influences EIA.	Primary Data: Representatives from the various institutions Secondary Data: Literature and documentation.	Questioning: Interviews Content analysis
What conflicts between renewable energy and biodiversity currently exist?	-current renewable energy and biodiversity goals -the role of stakeholders in promoting/preventing conflict	Primary Data: Representatives from the various institutions Secondary Data: Documentation and Literature	Questioning: Interviews Content analysis
To what extent does the final project incorporate concern for biodiversity?	-ex-post evaluation criteria and how it promotes effective mitigation	Primary Data: Representatives from the various institutions Secondary Data: Documentation and Literature	Questioning: Interviews Content analysis
What role does EIA play in managing the conflict between RE and biodiversity?	-the function of EIA - factors which determine whether RE or biodiversity has the upper hand and how influential these factors are	Primary Data: Representatives from the various institutions Secondary Data: Documentation and Literature	Questioning: Interviews Content analysis

3.6 DATA ANALYSIS

Data analysis is the process of evaluating data using analytical and logical framework and reasoning. The method for analysis is further explained in the next point.

3.6.1 Integrative Matrix

The table below presents an integrative matrix that summarizes the research design and expected outcome of the research. For all stages qualitative review is conducted as the method of data analysis. Also, case study analysis is applied for all stages.

Table 4: Integrative Matrix.

Research Questions	**Sources**	**Method**	**Outcome**
To what extent does EIA criteria incorporate the concern for biodiversity?	Literature, documentation, In-depth interviews	Content analysis	Current state of biodiversity consideration in EIA
What conflicts between biodiversity and renew-able energy currently exists?	Literature, documentation, In-depth interviews	Content analysis	Possible avenues for conflict resolution between both sectors
To what extent does the final project incorporate concern for biodiversity?	Literature, documentation, In-depth interviews	Content analysis	The extent to which mitigation measures are applied for projects
What role does EIA play in managing conflict between biodiversity and renewable energy?	Literature, documentation, In-depth interviews	Content analysis	To establish the exact role of EIA as a means of adding to existing literature
Main Question: *To what extents do environmental impact assessments consider impacts of renewable energy projects on biodiversity?*	Literature, documentation, In-depth interviews	Validation of findings, feedback, analysis of results	Recommendations and advise on the way forward as to how EIA can be more sensitive to biodiversity

3.7 ETHICS

The researcher is aware of ethical considerations during the conduct of this master thesis. This thesis not only relies on secondary data, but also primary data. The gathering of primary data is primarily done via in depth-interviews. Therefore, human beings are involved and the information gathering has to be executed with care.

To ensure the ethical conduct of research the master thesis guarantees the following:

1. Quality and integrity
2. The provision of informed consent to the interviewee
3. The confidentiality of the participants
4. The anonymity of the participants if requested
5. That participation is always on a voluntarily basis
6. The avoidance of harm to participants
7. The independency and impartiality of the research

3.8 INTRODUCTION TO THE CASE OF WIND FARM NIJ HIDDUM HOUW

Windpark Nij Hiddum-Houw (NHH) is an initiative of Nuon Wind Development BV and the local parties Windpark A7 BV and Brouwer Windturbines BV (friesland.gemeentedocumenten.nl). This new wind farm will serve as a replacement for the current wind farms in the area. The new wind turbines will have a total installation capacity of 42 Megawatts. This capacity contributes to the objective for the generation of wind energy of 530.5 Megawatts from the province of Friesland by the year 2020 (www.nijhiddumhouw.nl). Since provinces are legally responsible for wind farms larger than 5MW and less than 100MW the province of Friesland was responsible for drawing up the zoning plan, also known as Provincial Integration Plan (PIP) (friesland.gemeentedocumenten.nl).

The wind farm has been met with resistance by both the local residents and environmental NGO, Friese Millieu Federatie for a number of reasons. Local residents are against NHH because they believe that it will alter the flat, open visual landscape they are used to, they are concerned about

the nuisance from noise emissions and the drop shadows due to the height of the turbines (>200m). They are also concerned about disturbance from the light which will be installed on the turbines because of the turbine height (Harm Jan Bouwers; Arnoud de Vries, Personal Communication). The Friese Millieu Federatie is also questioning the analysis of the impact report as it believes that the report did not consider the cumulative effect of the activities of other projects in the area on the biodiversity. The federation is also of the view that the EIA report concluded prematurely on the effects of the wind farm on the bird and bat population; most particularly the ones protected under Natura 2000(*brf zienswijze WP Hiddum Houw definitief*)[23]. It is important to note that the plan is of the park falls within two Natura 2000 protected areas; Ijsselmeer lake and the Wadden sea.

Presently, there is now a fixed 'zoning plan' and the necessary permits have been granted to build the wind farm. This can still be appealed to the Council of State, but the initiators can in the meantime continue with their plans. The initiators will apply for a SDE+[24] subsidy in October, 2018. However, they can only start building after the subsidy has been granted and the Council of State has ruled on any appeals against the integration plan or permits. The earliest that this is expected (i.e. building the park) is at the end of 2019.

3.8.1 Area Description

The plan area is located at the head of the *Afsluitdijk*[25] in the Ijseelmeer area. This is almost immediately adjacent to the Wadden Sea area, which has been designated as Habitats Directive area and Birds Directive area. The figure below shows the boundary of the Natura 2000 area. The red circle shows the plan area for wind farm Nij Hiddum-Houw (*Milieueffectrapport (MER) Bijlagenrapport*).

[23] *brf zienswijze WP Hiddum Houw definitief* is a document obtained by the researcher directly from the informant from Friese Millieu Federatie

[24] Subsidy Scheme for Renewable Energy (https://www.rvo.nl/actueel/nieuws/marktconsultatie-sde-2019-van-start)

[25] A strip of land that separates the Ijsselmeer and Wadden Sea (*Windenergie in Fryslân, Nij Hiddum Houw Locatie*).

Figure 3: Limitation of IJselmeer Natura 2000 area (brown).

Source: Milieueffectrapport (MER) Bijlagenrapport

CHAPTER 4: RESULTS AND FINDINGS

This chapter presents the research findings based on data collected through content analysis of documentation and semi-structured interviews with key informants from the province of Friesland, Netherlands Commission for Environmental Assessment, Friese Millieu Federatie and academia. This chapter also incorporates secondary data in the form of existing literature to answer the research sub questions presented in chapter 1. The first research sub question is answered in section 4.1 which discusses the extent to which the EIA criteria for approving RE installations incorporates biodiversity, 4.2 highlights the existing conflicts between renewable energy and biodiversity, 4.3 illustrates the extent to which the final projects comply with preserving biodiversity and 4.4 discusses the role that EIA plays in managing conflicts between renewable energy and biodiversity. Each subchapter begins with a brief introduction and concludes with a summary of the main findings that enabled the researcher to ultimately answer the main research question indicated in chapter 1.

4.1 THE EXTENT TO WHICH BIODIVERSITY IS INCORPORATED INTO EIA CRITERIA

This section discusses the elements that stood out as the factors that determine the extent to which biodiversity is considered in EIAs.

4.1.1 Legal and Institutional Framework

Information obtained from the interviews pointed to the fact that, biodiversity considerations are taken into serious account by EIAs only when it concerns endangered species which are listed as such under the EU Birds and Habitats Directive. Hence, the setting up of the legal framework protecting Natura 2000 sites and species inhabiting them - in the form of the Nature Conservation Act. The act forbids permits to be granted to a project that has potential to cause disturbance to a designated protected site unless the “ADC criteria” are met (*Milieueffectrapport (MER) Bijlagenrapport*).

The ADC criteria are: that alternatives are not possible, there is a compelling reason for the project enough to generate a large public interest and that the necessary compensatory measures will be taken in order to ensure that the overall integrity of the Natura 2000 site was preserved (www.government.nl). Another stipulation of the act was to transfer the legal responsibility of granting or denying a permit from the national government to the local (provincial) governments (www.government.nl).

The general rule of thumb is that if a project is not having a profound impact on a Natura 2000 site, and the species in and around that area, then the decision to grant the permit or not is left to the discretion of the competent authority- of course using the EIA document and advise from the NCEA as a guide (Sjoerd Harkema, Personal Communication). It is in this light that Arnoud de Vries disagreed with the perceived notion that EIA considered to a large extent the impacts on biodiversity. A notion which is corroborated by Prip (2017) who was of the opinion that legislation set up for biodiversity may benefit biodiversity and ecosystem services either explicitly or implicitly. However, since these regulations tend to focus on biodiversity with a narrow geographical scope, their main focus is always on protecting threatened species and habitats only.

Secondly, this rule of thumb does not fully satisfy one of the CBD's Aichi targets which calls for inclusion of biodiversity in environmental assessments that will adopt the costs and benefits of conservation and sustainable use in decision making (Tallis et al., 2015). In the sense that, the concern is more for protecting endangered species and not really caring about the others which are not. One would assume that the "nonchalant" attitude adopted for the non-endangered species would eventually lead to a point where they will face a threat of becoming endangered. Here, Prip (2017) suggests that legal approaches of a more "cross-cutting" nature need to be adopted. It is however important to note that trying to develop such a system puts a large strain on policy and legal systems because, the institutional environment is made up of both intertwined legal and political systems, which for the Netherlands include broad governance systems; international law, EU law and national policy and law(Tallis et al., 2015).

This means that, the Netherlands aside EU legislation has her own legislation. This in turn means that just as any other EU country, the Netherlands sets biodiversity goals which are aligned with EU directives and have their national goals as well which are independent of the EU. In an attempt to realize these goals, policy frameworks that are put in place have to be tailored to suit the Dutch governance system and culture (acceptability by the citizens). Having said that, the Netherlands has renewable energy targets to realize, of which they are lagging behind mainly due to the dense population[26] and insufficient land space. Paul Westerbeek was of this opinion and this was corroborated by Sjoerd Harkema; they both had the opinion that the EIA system was fine as it is especially owing to the above-mentioned challenges. The reason they gave for their opinion was that EIAs equally weigh the impacts of (renewable energy projects) on biodiversity and provide the best possible solution there is to protect biodiversity and renewable energy owing to the current circumstances.

Therefore, setting up 'cutting edge" legal approaches could have an effect on other sectors aside the renewable energy sector like agriculture and forestry sectors. This puts pressure on the legal and political system to settle for trade- offs that seem to produce a win-win for other sectors. This could be a possible reason as to why the general rule of thumb: "if the project has no impact on threatened species then we do not bother" exists and there has not been any legal or political attempt to "fight" it.

4.1.2 Cumulative Effects

Information gathered revealed that all interviewees except Arnoud de Vries from the Friesland environmental NGO (Friese Millieu Federatie) had confidence in the current EIA system. In that, they believed that the current EIA system equally incorporated both biodiversity and renewable energy. However, one distinct weakness that stood out was the inability of the EIA to consider the accumulated effect of other projects in a designated area on the ecosystem. This is consistent with the findings of Slootwerg and Kolhoff (2003) who cite inconsistencies in methodology and

[26] The total land area is 33,720 km² with a population density of 507 people per km² (http://www.worldometers.info)

reporting of methodologies and results as some of the reasons which have hampered knowledge on the accumulated impacts on related and unrelated projects on existing biodiversity.
Bigard, Pioch, & Thompson, (2017b) also attribute the inability to report on cumulative impacts to the fact that usually, the study scope is not properly demarcated hence the impacts of other projects are under reported. The ecologist at the Friesland Province stated that in EIA reporting, external factors outside of the plan area which were most likely going to have a profound impact on the plan area- especially if it is a Natura 2000 area have to be included in the report. One of the criticisms of the EIA report of Nij Hiddum Houw by the environmental federation was that, the collective noise impacts of all the already existing projects (which are unrelated to renewable energy installations) in the study area wind farm were not effectively considered. This should have been one of the important features of the EIA since, noise emission which one of the major reasons for resistance by the residents (*brf zienswijze WP Hiddum Houw*). Paul Westerbeek from the Friesland Province was of the opinion that the severed link lay in the transfer of authority to the local (governments) to issue permits based on the initiator's EIA report. He explained that a lack of communication among several competent authorities does not allow for the full impacts of the accumulated effects be made known.

It should be noted that, before the accumulated impact of a project can be determined, there should be an efficient system in place by EIAs to measure the negative significant impacts of a singular project. Most EIAs tend to fail in this regard and Bigard et al., (2017b) attribute this to the fact that many studies only assess biodiversity in terms of the species' population. That is, they are mostly concerned with keeping the species number at a certain threshold and do not pay much attention to preserving and promoting genetic variation. In light of this, it is difficult to actually define what "significant" impact means in EIA because there is not much clarity in how to define it.

In the Netherlands, quantification of species which are especially threatened and/ or protected species are of utmost importance in biodiversity reporting (Sjoerd Harkema, Personal Communication). For every threatened species, there is a threshold number that needs to be maintained, and so if in setting up for instance a wind farm, the casualties involved are going to

exceed the threshold, then the permit will most likely not be issued (Paul Westerbeek, Personal Communication). This feature is seen to be very useful by Moortbeg et.al (2006) who state in their paper that biodiversity needs to be quantified, in order for accurate prediction and assessment of the consequences of destruction caused by infrastructure development. This quantification in turn requires biodiversity indicators that are sensitive to these quantification processes. As it stands, there are no clear standardized biodiversity indicators in Europe to measure the impact of activities and as such properly account for loss in biodiversity(Bezombes et al., 2018). Moortbeg et al. (2006) cited in their study, indicators such as network of species that are specialized to certain habitats, have large area requirements, and/or have low dispersal capacity.

The above mentioned are examples of some indicators that can be employed in measuring activity impact on biodiversity which can collectively represent a variety of landscape characteristics and species. It is important to note that indicators can be adapted to suit a particular climate or habitat. Due to the vast and complex nature of biodiversity, to develop general biodiversity indicators will prove to be challenging. The more feasible approach would be to develop criteria that will guide the making of useful and effective indicators. The following criteria are cited in a study by Cipullo (2016). The indicators should be;

- Measurable;
- Able to respond to changes in the ecosystem over time;
- Gradable on both global and national levels;
- As much as possible based on existing data.

4.1.3 Mitigation

According to the Ecologist at the Province of Friesland and officer at the NCEA, in EIA reporting in the Netherlands, one of the key components of the report is reporting on mitigation and compensatory measures (Paul Westerbeek, Personal Communication). In other words, a good EIA report should have researched and provided realistic alternative measures that seek to reduce the impact of their project should the intended measure fail (*Views and Experiences,*

2012)[27]. The alternatives should not be limited to only biodiversity, but should cover the environment at large; nuisance from noise emission, changes in air quality and any other aspect of the environment that the project could have an impact on (*Views and Experiences 2012*). David Goldsborough from academia stated that currently there are experimental offshore wind energy projects that are being stimulated by policy makers responsible for wind at sea aimed at "nature inclusive building". The initiative is as part of measures to reduce the impact of offshore wind energy on marine habitats, by incorporating nature incorporating nature into building as a means of stimulating the ecosystem in a positive way. An example would be including live shells and mussels as part of the construction materials when building a wind turbine (David Goldsborough, Personal Communication). The ecosystem is stimulated positively because these "nature materials" help to filter the water and create a new surface on the wind turbines for aquatic species to inhabit (David Goldsborough, Personal communication). Whiles on one hand this initiative seems promising, on the other hand there is the concern for a significant reduction in the natural habitat of aquatic organisms through large number of wind turbine constructions. Aside this concern, there is also the possibility that the construction of these turbines will introduce an increased population of invasive species who adapt to the same habitat as the native species. Invasive species are mostly introduced by the movement of the already built turbines from the point of construction, through a vessel and to the area where the turbines will be mounted(Asaad, Lundquist, Erdmann, & Costello, 2017). Invasive (flora and fauna) species have the tendency to reproduce quickly, compete with native species for space and food and eventually, sometimes taking over the habitat completely (Holma et al., 2018). This is one of the crucial areas to be thoroughly investigated especially as this initiative is still in the experimental stages.

In the selection of alternatives, EIAs have hitherto been criticized by Bigard et al.(2017a) for the motives upon which the preferred choice among alternative options is made. In the study, Bigard et al.(2017a) are of the opinion that selected choices are based more on socio-economic considerations than on ecological arguments. For instance, in the Netherlands, a lot of wind

[27] *Views & Experiences, 2012* was downloaded from api.commissiemer.nl/docs/mer/diversen/views_experiences_2012.pdf

energy projects are cited along nature protected areas because they are believed to be ideal locations (Sjoerd Harkema, Personal Communication). As a matter of fact, the location for the wind farm Nij Hiddum Houw was selected primarily because of the characteristics of the landscape. The criteria for selecting the ideal location was that it should be "large scale and open". At last, the Ijsselmeer area was selected as eligible for placing wind mills (*Windenergie in Fryslân, Nij Hiddum Houw Locatie*)[28]. In providing justification for selecting the location for Nij Hiddum Houw, the main reason was placed on landscape type, visuality of the landscape, and cultural history (*Milieueffectrapport (MER) Bijlagenrapport*). There was no biodiversity justification for selecting the location of Nij Hiddum Houw and this was one of the criticisms of the report by the environmental federation.

Secondly, in drawing up the plan for NHH, three alternatives A, B and C of wind turbines were given; 18 small turbines, 11 turbines (>18) and 9 turbines (larger than the first two). The latter, alternative C was selected. Here, the justification for C was that the combined height of the turbine and the rotor diameter were enough to realize the goal of contributing to 36MW of power hence the will be no need to set up another wind farm elsewhere in Friesland (*Toetsingsadvies over het milieueffectrapport en de aanvulling daarop, NCEA*)[29] Again, there was no report on the biodiversity impact- temporary or permanent of having these three alternatives or as the reason for selecting alternative C. This was another one of the criticisms by the environmental federation. Lastly, in evaluating the impact of the wind farm on the Natura 2000 sites and the birds and bats that forage, migrate and breed in that area, the EIA report concluded that, mitigation measures were not necessary. The reason they cited was none of the potential effects; disruption (of movement, foraging), barrier effect and collision had been identified as leading to having significant effects on conservation objectives of protected species from surrounding areas of Natura 2000 sites (*Milieueffectrapport (MER) Bijlagenrapport*).

[28]*Windenergie in Fryslân, Nij Hiddum Houw Locatie* was downloaded from https://www.commissiemer.nl/adviezen
[29] *Toetsingsadvies over het milieueffectrapport en de aanvulling daarop, NCEA* was downloaded from from https://www.commissiemer.nl/adviezen

The above scenarios defeat the purpose of having mitigation and compensatory measures in an EIA document and are a reflection that EIA compensatory measures are not necessarily enforced in practice. They also depict how lacking the principle of avoidance (of impact) in the mitigation hierarchy is used in the EIA system. This assertion is enforced by Bigard et al.(2017a) who in their study cited that majority of EIAs did not dwell much on the principle of avoidance, rather they focused more on alternatives that serve to reduce impact . Overall, it creates doubt on the overall importance of EIAs to protect and preserve the integrity of biodiversity. Furthermore, this is not aligned with the jurisprudence for conservation of Natura 2000 targets indicates that, it is not only necessary to assess whether there are no significant effects. Rather, the initiator and competent authority must assess whether by employing mitigation measures, the negative effects can be reduced. In other words, there should be research as to whether it is possible to employ mitigation measures.

4.2 CONFLICTS BETWEEN RENEWABLE ENERGY AND BIODIVERSITY

There was a unanimous agreement by the interviewees that biodiversity was given lesser consideration when renewable energy was involved. For instance, in the case of Nij Hiddum Houw, it can be deduced that the province the province is bent on carrying out the construction in the Natura 2000 area of the Ijsselmeer lake (despite protests) because of the pressure to meet the total wind energy goal of Friesland (530.5MW). Therefore, this section explores the driving forces behind conflicts of biodiversity and RE, which in principle should be aligned but in reality, are treated as mutually exclusive and always seem to be in conflict.

4.2.1 Political Influence

The officers with the NCEA and the Friese Millieu Federatie both stated that politics was very influential in determining whether biodiversity or renewable energy was going to hold all the cards when a conflicting issue between the two arose. For instance, in the EIA procedure, the officer with the NCEA stated that after giving advice on EIA reports presented to them, the decision to grant a permit or not lie solely with the competent authority (government authority) (Sjoerd Harkema, Personal Communication). The officer with the NGO was of the opinion that,

biodiversity was not given much consideration by politicians because they do not see the importance of for example bird species especially if they were not endangered.

Notable inferences of how politics can influence projects can be drawn from two cases stated in chapter two; the Sabor Dam in Portugal and the Seven Barrage in the United Kingdom. In the former, the EIA report clearly pointed out the significant negative impact that the construction of the dam was going to have on some Natura 2000 sites, not only that, the construction of the dam was in clear violation of the EU Habitats Directive. However, the government did not pay heed to any of these and went ahead to authorize the construction of the dam. In the latter, the government, upon conducting an EIA realized that constructing a barrage over the Severn estuary was going to collectively harm two Natura 2000 sites and the habitats (rare and protected) that resided there, decided not to go ahead with the construction. Juxtaposing these two situations, the outstanding thing is that politics has the final say and decides the direction towards which judgment will go regardless of the advice of the EIA report.

Looking at the first example of Sabor Dam and comparing it to Nij Hiddum Houw, a difference would be seen in the system of democratic governance (and an independent judiciary) in the Netherlands (Paul Westerbeek, Personal Communication). In the sense that, per the EIA procedure, concerned parties are allowed to go to the law court for their case to be heard if they disagree with the decision taken on the EIA report pertaining to a project (*Views and Experiences, 2012*). In the case of Nij Hiddum Houw for instance, the environmental NGO together with the local residents appealed against the EIA report in the high court. However, there is some amount of skepticism as to how much of a role the law court can play in helping to preserve biodiversity. Morand & Lajaunie, (2018) explain that, in the law court, “scientific” evidence is difficult to prove especially when it is based on estimates of project impacts and not backed by “hard” evidence.

The relationship between EIA and political processes and relations have been under-studied. McCullough (2017) stated that a reason for this is the rationalist view that many authors employ in writing about the literature of EIA. In the sense that, much literature on EIA is based on the “assumption” that accurately predicting the environmental consequences of a range of

alternatives will lead to better decisions by policy makers. Since EIA is viewed in this way by most, then it can be concluded that, the supposed (intended) purpose of EIA is to provide decision-makers with scientific analysis of likely environmental impacts. Any way that decision-makers interpret the EIA report is outside the "concern" of EIA (McCullough, 2017).

The above statement could be assigned as likely a reason that can be attributed to the assertion that in the Netherlands, politics is the main determinant for where the favourable decision will be skewed towards. Regardless of the advice about an EIA report concerning a given project especially when it is a renewable energy project. As a matter of fact, Spiegel (2017) in his paper describes EIAs for large infrastructural projects as "tokenistic" tools for approving developments rather than engaging the concerns of interested and affected groups.

The inference drawn from the above statements is that there is a relationship that exists between EIA and politics; they are both crucial instruments for environmental management in many situations. Since EIAs are viewed as universal decision-making tools, they are left open for interpretation as decision makers deem fit.

4.2.2 Renewable Energy versus Biodiversity

Even though biodiversity and renewable energy theoretically have the same end goal; to preserve the environment, in practice they always seem to be in conflict. In a democratic system like the Netherlands where the goals of renewable energy and biodiversity clash most of the time, decision makers are forced to choose more actively what it is that they are keenly trying to conserve (Spiegel, 2017). Especially during situations where trade-offs have to be made, these tradeoffs do not seem to favour the environmental aspect (Sjoerd Harkema, Personal Communication). On one hand, the innate value of biodiversity which lies in the richness and diversity of animal and plant species is ultimately responsible for maintaining ecosystems and basic ecological processes (Zaunbrecher, 2018). In other words, biodiversity is an essential part of life that humans depend on for survival in the sense that it supports ecological processes that purify the air, clean the water and they are relied on for food (agriculture) (Arnoud de Vries, Personal Communication). On another hand, climate change is a global problem which can be

tackled only by reducing greenhouse gas emissions and this can be done through the use of renewable energy. (Sjoerd Harkema, Personal Communication). An example of such incompatibility is the controversy surrounding the wind farm Nij Hiddum Houw. The sole reason for constructing wind park NHH is so that Friesland can reach the goal of generating 530.5MW of renewable energy power (energy security). However, the environmental federation cites reasons why the location of NHH is not such a good idea. Reasons such as inadequate research into the long-term consequences of the wind farm on the flora and fauna surrounding the plan area, and a lack of proper mitigation measures to preserve the integrity of biodiversity (*brf zienswijze WP Hiddum Houw*). In an instance such as the case of NHH where the pro-environmental solution (in this case wind turbines) will potentially impact the environment negatively, it is termed as a "green-on-green" conflict (Zaunbrecher, 2018).

When it comes to choosing between biodiversity and renewable energy when they are in conflict, the ecologist at the Friesland Province was of the opinion that renewable energy should be given the highest priority (Paul Westerbeek, Personal Communication). He further asserted that it will be in the best interest of biodiversity if renewable energy took precedence. His argument was that, it should not be forgotten that biodiversity and renewable energy are both "green" and seek to accomplish the same goal of protecting the environment and promoting nature conservation.

Although this argument sounds convincing, it revealed the fact that renewable energy in itself is treated as a goal, and not as a means to achieving the goal of protecting the environment and conserving biodiversity. It is also evident that, decision makers view renewable energy in this same light (as a goal instead of a means) and hence tend to prioritize it above biodiversity even when it is clear that the impact will be damaging to existing biodiversity(Spiegel, 2017). In the case of NHH, the environmental NGO believes that there are more suitable locations that can be researched into which are not Natura 2000 sites (*brf zienswijze WP Hiddum Houw*). One will most probably conclude that because the province has a goal of 530.5MW total energy generation to reach, they have been persistent in sticking to the head of *Afsluitdijk* as the location for NHH despite the protests from the local residents and the environmental NGO. If renewable energy

policies are treated independently of the very thing they are trying to preserve; biodiversity, then a conflict between the both of them will always be inevitable.

Jackson (2011) raises some key issues worth looking into when biodiversity and renewable energy seem to be in conflict as a means of bridging the gap between these sectors. The first issue to address is whether there is enough justification for the "hierarchy" that exists between renewable energy and biodiversity. Whiles it is obvious that climate change is a global problem which needs to be mitigated as soon as possible, it is problematic to assume that tipping the scale in favour of renewable energy is automatically a win for biodiversity. The ecologist was of the opinion that because renewable energy is one of the surest solutions to aid climate change mitigation, allowing it to take precedence over biodiversity was the right thing to do. Even though he acknowledged that mostly the construction phase of renewable energy installations will definitely go at a cost to biodiversity, he remained confident that the remaining biodiversity will flourish eventually. It is important to bear in mind that various species of flora and fauna have different lifecycles; some reproduce quicker and live longer than others. The species which have a longer reproduction period but shorter lifespan are at a higher risk of going extinct(Asaad et al., 2017). Also, it is worth noting that, renewable energy installations are basically infrastructural developments which have an ecological footprint. This means that they have a specific impact on the ecosystem in which they have been cited. Some ecosystems (species included) may not be able to "bounce back" if the ecological footprint has an adverse effect on them (Zaunbrecher, 2018). It is therefore clear that climate change is addressed synonymously with the entire range of environmental issues. In this respect, (possible) negative outcomes of renewable energy installations are overshadowed by the "optimism" that renewable energy would pose a lower risk to ecosystems than fossil fuels (Gasparatos, Doll, Esteban, Ahmed, & Olang, 2017).This school of thought reinforces the findings of Gasparatos et al.(2017) who shared the view that the environment seems to always be an afterthought when renewable energy policies are being adopted.

The second issue that Jackson (2011) raises is that, in choosing a suitable renewable energy technology, it is important to assess the intensity that the available renewable energy

technologies pose to biodiversity. While some renewable energy technologies have damaging impacts, some have lesser impacts, and some may even be beneficial to biodiversity. Therefore, national authorities should give serious consideration to technologies which have lower impacts on biodiversity whenever such conflicts arise. This statement is in line with research conducted by Gasparatos et al. (2017), who asserted that renewable energy policies should take into consideration the limits of the impact of RE installations that their existing environments can handle.

4.3 EX-POST EVALUATION

Post-project assessment are an important aspect of EIA because they represent a crucial point in testing the prognostic strength of the environmental impact assessment procedure (Momtaz & Zobaidul Kadir, 2018). In ex-post evaluations, the predicted effects made in the EIA are compared with the actual measured effects to make sure the predictions were done worst-case and the actual effects are not larger than was predicted in the EIA. If this case is found to be true, then that means that the EIA was done correctly (Paul Westerbeek, Personal Communication).

The ecologist at the Friesland Province stated that after an EIA was approved, and a project issued a permit, a post-EIA evaluation is required. This is to determine if the project had the effect that was predicted by the EIA or it has exceeded the impact predicted by the EIA. However, if for one reason or another, the assumptions in the EIA were not worst-case and the actual effects were larger, additional mitigating measures (or in some severe cases maybe even compensation) will have to be discussed and implemented (Paul Westerbeek, Personal Communication). The risk that a project could exceed the impact predicted by the EIA places emphasis on the importance of following up on an already approved project.

Implementation of mitigation alongside management activities are known to form an integral part of effective environmental impact assessment measures(Tallis et al., 2015). Cashmore et al. (2004) assert that, it is the effective implementation of mitigation measures post-EIA that properly addresses the predicted environmental impacts of projects. This is because adequate institutional arrangements and “quality” EIAs alone cannot fulfill the ultimate aim of

environmental protection. This line of reasoning is corroborated by Dias et al. (2017) who in their study argued that, a low-quality monitoring system coupled with poor follow-up of projects were two of the key elements behind the failure of the Fundão Dam, arguably the worst environmental disaster in Brazil. When the dam collapsed, the iron ore slurry used in the construction of the dam went down the River Doce Basin, covered 835 hectares of environmentally protected areas and 236 hectares of Atlantic Rainforest and reached the mouth of the Doce River 16 days later, affecting numerous marine habitats (Dias et al., 2017). Investigations that followed the tragedy revealed that, after the permit was granted for construction of the dam, the governmental agencies failed in implementing monitoring programs. Dias et al. (2017) argue that the geotechnical flaws of the dam that led to its collapse could have been identified, properly managed and avoided had a proper monitoring system been put in place.

Whiles ex-post evaluations are of utmost importance in determining the impact of projects, Branis & Christopoulos (2004) question the motives of most of these evaluations. They argue that most ex-post evaluations are aimed at monitoring compliance with standards rather than testing impact prediction. However, one could counter argue that the former cannot exist without the latter. In the sense that, it is as a result of identification of the impact of some projects on certain aspects of biodiversity that led to setting of standard threshold of species populations that need to be maintained. Additionally, when there is a need for mitigation, ex-post evaluations focus on selecting the mitigation measures that offer the least impact to the existing ecosystem. For instance, if the actual number of birds killed by a wind farm is higher than the number calculated in the EIA, a possible additional measure could be to stop the turbines during periods of bird migration in order to prevent high numbers of casualties (Paul Westerbeek, Personal Communication).

The ecologist at the Province of Friesland stated that the post-EIA evaluation was done either a few years after the beginning of construction phase of the project or at the start of the operational phase of the project. Perhaps a more effective way to assess the predictive value of estimated impacts of a project will be to compare the environmental impact assessment with

data collected throughout the entire process of preparation, construction and operation (Christopoulos & Branis, 2005).

4.4 THE ROLE OF EIA IN MANAGING BIODIVERSITY-RENEWABLE ENERGY CONFLICTS

When conflicts between biodiversity and renewable energy arise, EIAs are meant to be the ultimate deciding factor for decision makers. This is because according to the Convention on Biodiversity (CBD), stakeholders are required to apply EIA to projects that have the potential to negatively impact biodiversity (Slootweg & Kolhoff, 2003). They are also meant to apply the appropriate procedures for programmes and policies that impact biodiversity negatively(Larsen et al., 2018a). However, findings from the research indicate in practice EIA on its own does not play a significant role in resolving such conflicts. Particularly, in putting to rest the environmental and social concerns of local residents who will be affected when such conflicts arise. In fact, the officer with the Friese Millieu Federatie stated that, although are EIAs good instruments, they are not very effective in protecting biodiversity. This section explores the issues of Not In My Backyard (NIMBY) as an important potential area which needs to be explored by EIA to bridge the gap between RE and biodiversity.

4.4.1 Managing Not in My Backyard (NIMBY) conflicts

NIMBY is defined as opposition of the public to construction of certain public facilities as part of urban development (Sun, Yung, Chan, & Zhu, 2016). Zaunbrecher, (2018) in a study categorized the reasons for public resistance against planned RE projects under four headings; landscape impact, health and well-being of residents, social context and environmental impact. The findings from Nij Hiddum Houw will be used to illustrate under each heading, the reasons for the resistance by local residents.

4.4.1.1 Landscape Impact

The plan area for NHH is an open, old cultural area where the landscape is mostly flat and small. Close to the plan area are some old villages and farms. The local residents believe that erecting the wind park in this area will alter the visual landscape of the area for this reason, the residents

view NHH in a negative light (Harm Jan Bouwers, Personal Communication). Additionally, the economic issues that accompany a change in landscape appearance tend to be overlooked; typically reduced property prices in the vicinity and in most cases no compensation is given to local residents by project developers (Zaunbrecher, 2018). This line of reasoning was corroborated by Arnoud de Vries who stated that many a time, the people who live nearby and suffer the perceived negative impacts of RE projects resist RE developmental projects because they do not get any form of compensation from the initiators.

4.4.1.2 Health and Physical Well-being

Another reason for opposition towards NHH by the residents is the perceived health impacts of the wind park on them (Harm Jan Bouwers, Personal Communication). This pertains to nuisance from noise emissions, light pollution and shadows cast from the turbines especially due to their height (Zaunbrecher, 2018). For these reasons, the local residents do not want wind turbines near their homes especially these ones that are higher than 200m and therefore will have lights[30] installed on them (Harm Jan Bouwers, Personal Communication). Arnoud de Vries corroborated these statements by stating that about majority of windmill constructions are stopped because they are sited near people's homes and tend to disturb the citizens by making a lot of noise.

4.4.1.3 Social Context

According to Sun et al. (2016) attitudes towards new RE installations also depend on the "attachment" that the residents have towards the area in which the installation will be put up. For instance, the Frisians love the fact that the plan area for NHH is a flat and open one. They believe that siting of the wind park in that location does not fit into their landscape, and hence will mar the beauty of the landscape (Harm Jan Bouwers, Personal Communication). Also, the degree to which locally affected residents can participate in energy projects can be a factor which influences their acceptance of projects (Zaunbrecher, 2018). According to the EIA procedure for large infrastructural projects such as NHH, the public have two opportunities to voice out their concerns. The first opportunity is after the publication of the notification of intent by the initiator

[30] For aviation safety

(scoping report) and after the completion of the EIA report (before the competent authority decides on it) (*Views and Experiences, 2012*). It is important to note that, the public opinion is deliberated upon by the competent authority only when a decision is about to be taken regarding whether to issue a permit or not. It is the competent authority who will decide if the concerned parties have a legitimate cause to complain or not (Harm Jan Bouwers, Personal Communication). This procedure however will not suffice, especially if the competent authority has a certain amount of interest in the impending projects such as NHH. The concerns of the public could be completely watered down and treated as irrelevant. The affected parties need to be included in the designing of the planning and decision-making process. Additionally, their inputs need to be fairly addressed in the outcome of the EIA report. It is by this means that local residents will not show resentment towards RE installations.

4.4.1.4 Environmental Impact

Contrary to the opinion that ecological impacts of RE infrastructure are a concern of only ecologists, local residents are interested in the impact that RE projects have on the local biodiversity (Zaunbrecher, 2018). The concern for the environmental impact is a contributing factor that determines the acceptance of local residents towards new RE projects. The plan area for Nij Hiddum Houw is close to Natura 2000 areas; Ijsselmeer lake and Wadden sea which are key migratory routes for a number of bird and bat species. There is therefore the concern for the impact of the wind turbines on the population of these species, especially the endangered ones (Arnoud de Vries, Personal Communication).

Overall, public support for RE based projects are essential for the realization of the projects. In the same way that overwhelming public resistance for projects (especially wind mills) could potentially lead to postponing or complete abandonment of the projects (Larsen et al., 2018a). Therefore, EIAs also need to focus on the impacts of projects on the local residents as they do the biophysical impacts of projects. This is because, many a time, focusing on these social impacts have a direct or indirect correlation with preservation of the natural biodiversity especially when the study area concerns a protected area as has been demonstrated in the above points (Slootweg & Kolhoff, 2003).

CHAPTER 5: DISCUSSION

This chapter focuses on answering the main research question of the study based on secondary data and analysis of the findings in Chapter 4. The crosslinks between the applied analytical framework findings in Chapter 2, interviews findings in Chapter 4 and secondary data provides answers to the main research question stated in chapter 1; “to what extent do extent do EIAs consider impacts of renewable energy projects on biodiversity?” The chapter attempts to answer the main research question by analyzing “extent” from two points of view: ecologically and socially.

5.1 ECOLOGICAL EXTENT

Bigard et al., (2017) described EIA as a tool whose primary purpose was to assess the effect of developmental projects on biodiversity. They are to do this by integrating the potential impacts into the “mitigation hierarchy” and analyzing negative impacts based on the avoidance, reduction and offset measures of the hierarchy. All of this analysis is geared towards pursuing and maintaining the No Net Loss Objective (Jacob, Pioch, & Thorin, 2016). Ideally, the analysis of extent to which biodiversity is considered should be analyzed using the three steps in the mitigation hierarchy however, the findings from the research were centred more on the first two steps; avoidance and minimization. Hence the discussion will be focused on the first two.

Avoidance, the first step in the mitigation hierarchy comprises of measures that are taken to prevent creation of impacts from the outset according to Jacob, Pioch, & Thorin (2016). Avoidance also requires that there should be careful consideration given to the location in which the infrastructure will be cited as well as the spatial plan of the project to ensure that, biodiversity of particularly endangered ecosystems is not harmed. However, the findings from the research were an illustration of the argument of Bigard et al. (2017) that EIAs were side stepping the first and most important step of avoidance in the mitigation hierarchy. In the instance of Nij Hiddum Houw, the plan area is situated in the Natura 2000 areas of the Ijsselmeer lake and Wadden Sea there. One would have expected that, given the nature of the intended project, right from the early stages of the plan, more suitable, alternative locations would have been selected with

similar characteristics of “large scale and openness” to the *Afsluitdijk.* Especially given the importance of the intended plan area. Additionally, it was revealed that the siting of wind energy projects along nature protected areas is not an uncommon practice and that due to the “openness” of such areas, they are seen to be ideal (Sjoerd Harkema, Personal Communication). As a result, alternatives in EIA knowingly/ unknowingly tend to focus more on reducing impact; the second step in the mitigation hierarchy. This raises some important questions about EIAs and their intention. The first question is whether there is a semantic confusion in the EIA procedure as to the context within which avoidance is used in the mitigation hierarchy and why it is critical for achieving “no net loss”. Secondly, it questions the legitimacy of EIAs as to whether it is applied to truly preserve the integrity of biodiversity or they are applied as a mandatory checklist as part of a legal procedural requirement (Runhaar et al., 2013).

Overall, the absence of a thorough search for alternative options in the early phases of developmental projects, in the opinion of Kujala et al. (2015) clearly indicates the need for a systematic conservation planning approach. One which tackles avoidance measures and truly ensures biodiversity conservation on a broader scale. That is, beyond the scale of individual projects.

In the reduction step of the mitigation hierarchy, although it is the most commonly utilized step in the mitigation hierarchy, one cannot help but express concern over the priority placed on endangered species to protect them above other non-listed species. Whiles concern for endangered species in itself has a significant positive effect on the quality of the EIA, Elliot & Whitfield, (2011) assert that the “common” habitats and species provide important ecological services that are overlooked. Secondly, it seems to be forgotten that these “common” habitats and species play a major role by being part of a habitat used by these endangered species (Gaston & Fuller, 2008). With respect to the selection of alternative measures in EIA that seek to reduce the significant negative impact of projects on the environment, there is still the question of how exactly the term “significant” is classified. This is important because, it directly links the capacity of EIAs to consider environmental issues and how alternatives ought to be treated. In the Netherlands, quantification of species is used as an important determinant when determining

the impact of projects; there is a threshold level at which species (endangered ones in particular) have to be kept at, hence effective mitigation measures are determined by the impact they have on numbers (Sjoerd Harkema; Paul Westerbeek, Personal Communication). Whiles the importance of quantification should not be downplayed, there also needs to be a deeper understanding of ecological processes and their inter-linkages with each other in order to bring clarity in understanding of what "true" significance means and how it should consequently be applied in order to define such (significant) impacts. It is only then that alternatives will be treated with the aim of effecting true impact minimization of projects on all biodiversity irrespective of whether it is listed as endangered or not.

Bigard et al. (2017) assert that, the general rule of thumb to prioritize endangered species over other species could also be linked to the inability of EIAs to effectively consider the cumulative impacts of projects. Even when quantification of impacts seemed to be likened to accumulation of impacts, Arnoud de Vries stated that EIAs reporting of cumulative impacts of projects perceived to be minor and unrelated to the impending project was found to be lacking. EIA reports tend to ignore the fact that, these minor, unrelated projects each have individual impacts on existing biodiversity. Hence if they are numerous projects, collectively they have a huge impact on biodiversity, more especially on the endangered species which EIA is actively trying to protect. In essence, accumulated impacts are about considering the impacts of individual projects, no matter how "small" it may be perceived to be. The practice of only reporting on accumulated impacts of large infrastructural projects in the view of Gaston & Fuller (2011) represents another major reason why the no net loss objective is proving difficult to achieve within the mitigation hierarchy.

The issue of how to correctly assess cumulative impacts of projects therefore, calls for research into standardized methods that will incorporate completely the effects of all projects; related or perceived to be otherwise when determining cumulative impacts of projects.

5.2 SOCIAL EXTENT

EIAs are increasingly being criticized over their limited reporting on the impacts of impending projects on the communities who will be directly or indirectly affected by these projects. The motive of public participation in EIAs are also being questioned; do EIAs really consider the views of the affected parties or again, is public participation just applied as a mandatory checklist? This section compares the findings on public with a case study in chapter 2 conducted by Lyhne et al. (2017). In this section, the comparison will be centered on the effects of public participation in Denmark as against public participation in the Netherlands.

In the Danish EIA system, public participation is central to the EIA procedure. This means that, the public is involved from the onset of the planning process until the decision-making step. In this, because dialoguing between community groups, developers and the decision makers occurs from the early stages, there is hardly ever any conflict over (renewable energy) projects. As a matter of fact, the respondents in the case study conducted by Lyhne et al. (2017) revealed that that their EIA procedure was very instrumental in spreading environmental awareness among the general populace. Secondly, there is a strong public complaints system in Denmark which inherently amplifies the influence of the public in EIA related issues. This is a social characteristic of how effective collective environmental protective action can be when local residents and community groups are armed with knowledge through effective communication about EIA procedures of impending projects in their locality. Again, this rightly proves the notion of participatory turn introduced by Wynne (2007) that the public actually bear the required competence to participate in EIA deliberations. As a matter of fact, the research by Lyhne et al. (2017) revealed due to strong public advocacy and intense public participation, majority of the developers admitted that these influenced their decision to choose more environmentally friendly alternatives for their impending project.

Comparatively, public participation in the Netherlands is not as central to EIA procedure. As a matter of fact, the research revealed that there is no dialoguing between developers, decision makers and community groups in the EIA procedure. The concerned parties send in their opinions

or criticisms concerning a project through written letters to the competent authority after the EIA report is published (as advertisements in the newspaper) and before a decision is taken concerning the intended project (Paul Westerbeek; Harm Jan Bouwers, Personal Communication). This form of communication is not effective enough to propose proper mitigation measures because it lacks dialoguing and negotiations, two essential characteristics of effective communication. As a result, the lack of public participation in EIA procedures accounts for a majority of resistance to renewable energy projects, particularly wind mills by the local residents (Arnoud de Vries, Personal Communication). Sun et al., (2016) attribute a lack of public participation in EIA procedures as to the increasing amount of NIMBY conflicts between developers and community groups. A typical illustration of how NIMBYism is directly linked to EIA related conflicts when the affected residents are not given a say in the EIA proceedings is the case of Nij Hiddum Houw. Arnoud de Vries was of the opinion that, EIAs are meant to consider "real" environmental effects, however it seems to have been forgotten that people also make up an essential part the environment and will be on the receiving end of the effects (negative/positive) of impending projects. Hence, they should play an integral part in EIA processes which directly/indirectly affect them. Moreover, in the EU legal framework, Larsen et al. (2017) argue that, there are no clear demands for how governments should include local participation. In this light, it can be argued that the Danish government took advantage of this "open interpretation" factor and designed their EIA procedure to be centred on public participation. There is no reason why the Netherlands cannot design a similar EIA procedure which will actually give concerned parties an opportunity to dialogue with other stakeholders for a compromise to be reached, specifically when it concerns large RE projects.

Overall, the society plays a pivotal role in renewable energy related EIA conflicts, hence it should be of importance for Dutch EIAs to find a "golden middle" that brings social and ecological aspects together equally when addressing the impacts of impending projects.

CHAPTER 6: CONCLUSIONS & RECOMMENDATIONS

The purpose of this research was to identify the possibilities of making EIAs more sensitive to biodiversity. The immediate aim was to determine the extent to which biodiversity was considered in RE related EIAs, and to link this analysis to managing existing conflicts between biodiversity and renewable energy. This chapter brings the most important results of the research together. The concluding remarks are presented in section 6.1 which addresses and integrates the sub research questions to the previous sections. Section 6.2 presents recommendations for EIA to make biodiversity more inclusive and better protected. Section 6.3 critically reflects on the research methods applied and discusses the gaps identified for future research.

6.1 CONCLUSIONS

To help in addressing the main research question: "to what extent do environmental impact assessments consider impacts of renewable energy projects on biodiversity?" four sub questions were employed. The first sub question sought to answer how much current EIA criteria incorporated concern for biodiversity by analyzing three sub divisions which that determine the extent to which biodiversity is incorporated into EIA. These subdivisions are legal and institutional framework, cumulative effects and mitigation. Under legal and institutional framework, it was realized that biodiversity impacts were seriously taken into consideration only when the plan area concerned were inhabited by endangered species or were a Natura 2000 site. This premise is allowed under the Nature Conservation Act which essentially asserts guidelines for granting permits only to protected areas. Under cumulative effects, the information gathered from interviews and subsequent analysis diagnosed that EIAs failed to accurately measure the accumulated impacts from other related and unrelated projects in a study area. Hence, reports on cumulative impacts of a project in an area are met with skepticism from environmental NGO's and other concerned parties. Mitigation was analyzed in terms of the motive (socioeconomic or nature protection) behind the selection of alternative measures which are perceived to be of lower impact. It was revealed that alternatives are more concerned with reducing impacts on the

plan area instead of totally avoiding the site (especially if it is a Natura 2000). Hence alternatives are more socioeconomically inclined rather than nature protective.

The second research question explored the factors that contribute to existing conflicts between biodiversity and renewable energy through content analysis of interviews and relevant documentation. It was revealed that there was an interrelation between EIA and politics. In that, the decision to grant or deny a permit for a project lie solely with the government, using the EIA report as a guidance tool. In practice however, EIA was not as effective as a decision-making tool as it is made out to be. Also, biodiversity-renewable energy conflicts, politics was very influential in tipping the scale in favour of renewable energy. The reason for this is because, renewable energy is treated exclusively as a goal towards climate change mitigation and ultimately biodiversity preservation instead of being used as a means of achieving biodiversity preservation goals. Hence, the negative impacts of RE projects on biodiversity are overshadowed by the optimism that RE installations are of a lower threat to biodiversity than fossil fuels.

The third sub question sought to answer the extent to which final projects complied with biodiversity preservation. Interviews revealed that ex-post evaluations are used to determine whether impacts of a project were accurately predicted by the EIA report or if the impacts exceeded the predictions. In situations where the latter occurred, mitigation measures, some as severe as compensation were applied.

The final sub research question explored the role that EIA could play in managing the conflicts between RE and biodiversity. It was found out that, the reason that EIAs failed to consider the impact of RE projects on the social environment i.e. the affected residents. As such there should be a middle ground that addresses NIMBYism as equally as “ecological” impacts are addressed.

Overall, the main research question which sought to determine the extent to which biodiversity is taken into consideration was addressed by revealing that EIAs biodiversity was only prioritized when species involved were endangered, they were lacking in assessing cumulative effects of projects thus in turn affecting the “quality” of mitigation measures that are selected. Lastly, EIAs do not consider the social impact of projects on concerned parties neither are the opinions of the

public taking into serious account when impending projects concern them. Hence, this has been a major cause of conflict as seen in the case of Nij Hiddum Houw.

6.2 RECOMMENDATIONS

The purpose of this research is to identify recommendations which could contribute towards making EIA more sensitive towards biodiversity and managing the conflict between biodiversity and renewable energy in cases where EIA will find it challenging to do so. The recommendations are grouped under the following: Standardization and Monitoring, Strengthening Nature, Social Inclusion.

Standardization and Monitoring

The research revealed that a correct assessment of cumulative impacts of projects is lacking and this inherently affects the quality of mitigation measures. The reason for this incorrect assessment was found to be decentralization of authority from the national government to the provinces and consequently lack of communication among provincial governments. Thus, the research recommends the setting up of a common body that is responsible for checking cumulative impacts of projects. This body should also be responsible for assessing mitigation measures based on the mitigation hierarchy, by placing more emphasis on the avoidance principle. This should be achieved by employing standardized assessment methods.

Strengthening Nature

Whiles renewable energy tends to put pressure on existing biodiversity, it is important to note that there are also several nature pressurizing factors which need to be regulated in order for biodiversity to flourish. Activities such as fishing especially in the North Sea should be strictly regulated. The lesser pressure that is put on fishing, the better the chances of the aquatic ecosystem thriving, population of species will grow and enhance the creation of reserves. Also, there should be stricter regulations against industrial pollution and regulation of agricultural practices. Overall, taking away these pressures from nature will inherently reduce biodiversity

pressure and consequently the impact of renewable energy on the biophysical environment will be a lesser problem.

Social Inclusion

In order to generate positive attitudes in community groups, public participation should be essential in the EIA procedure. More especially in the planning phase, there should be transparency and dialoguing with the local residents. Furthermore, incentives or compensation should be given to local residents to encourage positive attitudes in the local people. Incentives such as setting up recreational facilities like parks, community centres, and pools by developers for the local residents. Alternatively, a fund for nature protection could be set up which could be used to purchase new nature areas also known as biodiversity offsetting.

6.3 LIMITATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH:

Considering the limited time that was available for the research, the research focused a lot more on the ecological aspect and scratched the surface of social aspects of EIA theory. Additionally, due to the vast nature of the topic of biodiversity, the research avoided tackling specific ecosystems but rather approached the biodiversity concept from a broader perspective, by looking at biodiversity wholly. Furthermore, some of the documentation essential for content analysis were in Dutch and the researcher had to resort to using Google Translate to translate them into English. As a result, some contextual information was lost in the process since Google Translate captures the content of the material being translated without considering the context of the original material.

For further research, it is recommended that, there should be more research into the role of EIAs in resolving social conflicts as they have proven to be a central theme in renewable energy-biodiversity conflicts. Secondly, information gathered for the research did not touch on biodiversity offset measures in the mitigation hierarchy. Hence, the researcher recommends that research should be conducted into how effective biodiversity offset measures are in mitigating the negative impacts of projects on biodiversity.

CHAPTER 7: BIBLIOGRAPHY

Asaad, I., Lundquist, C. J., Erdmann, M. V., & Costello, M. J. (2017). Ecological criteria to identify areas for biodiversity conservation. *Biological Conservation*, *213*, 309–316. https://doi.org/10.1016/j.biocon.2016.10.007

Avies, J., (2016). Sketches of Nature. Academic Press: 208. https://doi.org/10.1016/C2014-0-01418-9

Bayer, P., Hähnlein,S., Ferguson,G., Blum,P., (2013).Sustainability and policy for the thermal use of shallow geothermal energy. *Energy Policy*, 59; 914-925

Bigard, C., Pioch, S., & Thompson, J. D. (2017). The inclusion of biodiversity in environmental impact assessment: Policy-related progress limited by gaps and semantic confusion. *Journal of Environmental Management*, *200*, 35–45. https://doi.org/10.1016/J.JENVMAN.2017.05.057

Bratman, E., & Dias, C. B. (2018). Development blind spots and environmental impact assessment: Tensions between policy, law and practice in Brazil's Xingu river basin. *Environmental Impact Assessment Review*, *70*(March 2017), 1–10. https://doi.org/10.1016/j.eiar.2018.02.001

Bezombes, L., Gaucherand, S., Spiegelberger, T., Gouraud, V., & Kerbiriou, C. (2018). A set of organized indicators to conciliate scientific knowledge, offset policies requirements and operational constraints in the context of biodiversity offsets. *Ecological Indicators*, *93*(June), 1244–1252. https://doi.org/10.1016/j.ecolind.2018.06.027

Botelho, A., Ferreira, P., Lima, F., Pinto, L. M. C., & Sousa, S. (2017). Assessment of the environmental impacts associated with hydropower. *Renewable and Sustainable Energy Reviews*, *70*(May 2015), 896–904. https://doi.org/10.1016/j.rser.2016.11.271

Breeze, P. (2018). CHAPTER 9 Hydropower Plants and the Environment. *Hydropower*, 79–87. https://doi.org/10.1016/B978-0-12-812906-7.00009-0

Cardinale, B.J., Duffy, J.E., Gonzalez, A., Hooper, D.U., Perrings, C., Venail, P., et al. (2012). Biodiversity Loss and its Impact on Humanity. *Nature Protection*; 486:59-67.

https:// dx.doi.org/10.1038/nature11148

CBD. Text of the Convention on Biological Diversity, Montreal: Convention on Biological Diversity (CBD);1992

Cashmore, M., Gwilliam, R., Morgan, R., Cobb, D., & Bond, A. (2004). The interminable issue of effectiveness: substantive purposes, outcomes and research challenges in the advancement of environmental impact assessment theory. *Impact Assessment and Project Appraisal*, *22*(4), 295-310. http://dx.doi.org/10.3152/147154604781765860

Christensen, M., Rayamajhi, S., Meilby, H., (2009). Balancing fuelwood and biodiversity concerns in rural Nepal. *Ecol Modell* ,220:522–32. http://dx.doi.org/10.1016/j.ecolmodel.2008.10.014

Cipullo, N. (2016). Biodiversity Indicators: The Accounting Point of View. *Procedia Economics and Finance*, *39*(November 2015), 539–544. https://doi.org/10.1016/S2212-5671(16)30297-0

Christensen, M., Rayamajhi, S., Meilby, H., (2009). Balancing fuelwood and biodiversity concerns in rural Nepal. *Ecol Modell* ,220:522–32. http://dx.doi.org/10.1016/j.ecolmodel.2008.10.014

Cipullo, N. (2016). Biodiversity Indicators: The Accounting Point of View. *Procedia Economics and Finance*, *39*(November 2015), 539–544. https://doi.org/10.1016/S2212-5671(16)30297-0

Cook, D., Davíðsdóttir, B., & Már, D. (2017). Energy for Sustainable Development An ecosystem services perspective for classifying and valuing the environmental impacts of geothermal power projects, *40*, 126–138. https://doi.org/10.1016/j.esd.2017.07.007

Curran, M. A. (2013). Life Cycle Assessment : a review of the methodology and its application to sustainability. *Current Opinion in Chemical Engineering*, *2*(3), 273–277. https://doi.org/10.1016/j.coche.2013.02.002

Commission of the European Communit. (2009). Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee, and the Committee of the Regions: A Mid-Term Assessment of Implementing the EC Biodiversity Action Plan. *Journal Of International Wildlife Law & Policy*, *12*(3), 216-228. http://dx.doi.org/10.1080/13880290903199425

Commison for the Environmental Impact Assessment. Retrieved from http://commissiemer.nl on 23/03/2018

Costa-Campi, M. T., del Rio, P., & Trujillo-Baute, E. (2017). Trade-offs in energy and environmental policy. *Energy Policy*, *104*(February), 415–418. https://doi.org/10.1016/j.enpol.2017.01.053

DECC, (2010). Severn Tidal Power: Feasibility Study Conclusions and Summary Report. (October 2010). Retrieved from http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20energy%20supply/Energy%20mix/Renewable%20energy/severn-tp/621-severn-tidal-power-feasibility-study-conclusions-a.pdf on 18/04/2018

Dauber, J., Jones, M.B., & Stout, J.C., (2010). The impact of biomass crop cultivation on temperate biodiversity. GCB Bioenergy ;2:289–309. http://dx.doi.org/ 10.1111/j.1757-1707.2010.01058.x.

Dias, A. M. da S., Fonseca, A., & Paglia, A. P. (2017). Biodiversity monitoring in the environmental impact assessment of mining projects: a (persistent) waste of time and money? *Perspectives in Ecology and Conservation*, *15*(3), 206–208. https://doi.org/10.1016/j.pecon.2017.06.001

Elliott, M., Whitfield, A.K., (2011). Challenging paradigms in estuarine ecology and management. Estuar. Coast. Shelf Sci. 94 (4), 306e314. http://dx.doi.org/10.1016/j.ecss.2011.06.016

Enríquez-de-Salamanca, Á. (2018). Stakeholders' manipulation of Environmental Impact Assessment. *Environmental Impact Assessment Review*, *68*(July 2017), 10–18. https://doi.org/10.1016/j.eiar.2017.10.003

European Council, (2001). Presidency Conclusions. Retrieved from http://ec.europa.eu/governance/impact/background/docs/goteborg_concl_en.pdf On 18/04/2018

European Commission, (2011). Our life insurance, our natural capital: an EU biodiversity strategy to 2020. Retrieved from http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/2020/1_EN_ACT_part1_v7%5b1%5d.pdf on

Fonseca, A., Sánchez, L., & Ribeiro, J. (2017). Reforming EIA systems: A critical review of proposals in Brazil. *Environmental Impact Assessment Review*, *62*, 90-97. http://dx.doi.org/10.1016/j.eiar.2016.10.002

Gasparatos, A., Doll, C. N. H., Esteban, M., Ahmed, A., & Olang, T. A. (2017). Renewable energy and biodiversity: Implications for transitioning to a Green Economy. *Renewable and Sustainable Energy Reviews*, *70*(August 2016), 161–184. https://doi.org/10.1016/j.rser.2016.08.030

Gaston, K.J., & Fuller, R.A., (2008). Commonness, population depletion and conservation biology. *Trends Ecol. Evol*. 23, 14e19.

Hasan, M. A., Nahiduzzaman, K. M., & Aldosary, A. S. (2018). Public participation in EIA: A comparative study of the projects run by government and non-governmental

organizations. *Environmental Impact Assessment Review*, *72*(November 2017), 12–24. https://doi.org/10.1016/j.eiar.2018.05.001

Heller, N.E., & Zavaleta, E.S., (2009). Biodiversity management in the face of climate change: a review of 22 years of recommendations. *Biological Conservation*:142 (1), 14–32.

Hernandez, R.R., Easter, S.B., Murphy-Mariscal, M.L., Maestre, F.T., Tavassoli,M., Allen, E.B, et al. (2014) Environmental impacts of utility-scale solar energy. *Renew Sustain Energy Rev*, 29:766–79. http://dx.doi.org/10.1016/j.rser.2013.08.041.

Hodas, D.R., (2008). Biodiversity and Climate Change laws: a failure to communicate? In: Jeffery, M.I., Firestone, J., Bubna-Litic, K. (Eds.), Biodiversity, Conservation, Law + Livelihoods: Bridging the North-South Divide. Cambridge University Press, Cambridge, UK, pp. 383–399

Holma, A., Leskinen, P., Myllyviita, T., Manninen, K., Sokka, L., Sinkko, T., & Pasanen, K. (2018). Environmental impacts and risks of the national renewable energy targets – A review and a qualitative case study from Finland. *Renewable and Sustainable Energy Reviews*, *82*(April 2017), 1433–1441. https://doi.org/10.1016/j.rser.2017.05.146

Hugé, J., Rochette, A. J., Janssens de Bisthoven, L., Dahdouh-Guebas, F., Koedam, N., & Vanhove, M. P. M. (2017). Utilitarian framings of biodiversity shape environmental impact assessment in development cooperation. *Environmental Science and Policy*, *75*(February), 91–102. https://doi.org/10.1016/j.envsci.2017.06.003

Hunt, T.M. (2001). Five lectures on environmental effects of geothermal utilization. Taupo, New Zealand: Institute of Geological and Nuclear Sciences, United Nations University, Geothermal Training Program.

Hussain, A., Arif, S. M., & Aslam, M. (2017). Emerging renewable and sustainable energy technologies: State of the art. *Renewable and Sustainable Energy Reviews*, *71*, 12–28. https://doi.org/10.1016/J.RSER.2016.12.033

IUCN (2008). Protected Areas. Retrieved from: https://www.iucn.org/theme/protected-areas/about

Jackson, A. L. R. (2011). Renewable energy vs. biodiversity: Policy conflicts and the future of nature conservation. *Global Environmental Change*, *21*(4), 1195–1208. https://doi.org/10.1016/j.gloenvcha.2011.07.001

Jacob, C., Pioch, S., & Thorin, S. (2016). The effectiveness of the mitigation hierarchy in environmental impact studies on marine ecosystems : A case study in France. *Environmental Impact Assessment Review*, *60*, 83–98. https://doi.org/10.1016/j.eiar.2016.04.001

Jiricka, A., Formayer, H., Schmidt, A., Völler, S., Leitner, M., Fischer, T. B., & Wachter, T. F. (2016). Consideration of climate change impacts and adaptation in EIA practice — Perspectives of actors in Austria and Germany. *Environmental Impact Assessment Review*, *57*, 78–88. https://doi.org/10.1016/j.eiar.2015.11.010

Katzner, T., Johnson, J.A., Evans, D.M., Garner, T.W.J., Gompper,M.E., Altwegg, R., Branch, T.A., Gordon, I,J.,(2013). Pettorelli N. Challenges and opportunities for animal conservation from renewable energy development. *Anim Conserv,*16:367–9.

Kim, J., Park, S. Y., & Lee, J. (2018). Do people really want renewable energy? Who wants renewable energy?: Discrete choice model of reference-dependent preference in South Korea. *Energy Policy*, *120*(April), 761–770. https://doi.org/10.1016/j.enpol.2018.04.062

Kujala, H., Whitehead, A.L., Morris, W.K., Wintle, B.A., (2015). Towards strategic off- setting of biodiversity loss using spatial prioritization concepts and tools: a case study on mining impacts in Australia. *Biol. Conserv*. 192, 513e521

Langer, K., Decker, T., Roosen, J., & Menrad, K. (2018). Factors influencing citizens' acceptance and non-acceptance of wind energy in Germany. *Journal of Cleaner Production*, *175*, 133–144. https://doi.org/10.1016/j.jclepro.2017.11.221

Langhamer, O. (2012). The Scientific WorldJOURNAL Review Article Artificial Reef Effect in relation to Offshore Renewable Energy Conversion : State of the Art, *2012*. https://doi.org/10.1100/2012/386713

Larsen, S. V., Hansen, A. M., & Nielsen, H. N. (2018a). The role of EIA and weak assessments of social impacts in conflicts over implementation of renewable energy policies. *Energy Policy*, *115*, 43–53. https://doi.org/10.1016/J.ENPOL.2018.01.002

Larsen, S. V., Hansen, A. M., & Nielsen, H. N. (2018b). The role of EIA and weak assessments of social impacts in conflicts over implementation of renewable energy policies. *Energy Policy*, *115*(January), 43–53. https://doi.org/10.1016/j.enpol.2018.01.002

Lonsdale, J., Weston, K., Blake, S., Edwards, R., & Elliott, M. (2017). The Amended European Environmental Impact Assessment Directive: UK marine experience and recommendations. *Ocean & Coastal Management*, *148*, 131–142. https://doi.org/10.1016/J.OCECOAMAN.2017.07.021

Loomis, J. J., & Dziedzic, M. (2018). Evaluating EIA systems' effectiveness: A state of the art. *Environmental Impact Assessment Review*, *68*(September 2017), 29–37. https://doi.org/10.1016/j.eiar.2017.10.005

Lyhne, I., van Laerhoven, F., Cashmore, M., & Runhaar, H. (2017). Theorising EIA effectiveness: A contribution based on the Danish system. *Environmental Impact Assessment Review*, *62*, 240–249. https://doi.org/10.1016/J.EIAR.2015.12.002

Mareddy, A. R. (2017). EIA study planning and management. https://doi.org/10.1016/B978-0-12-811139-0.00002-5

Momtaz, S., & Zobaidul Kadir, S. . (2018). *Implementation of Mitigation Measures : EIA Practice*

at Post-EIS (Second). https://doi.org/10.1016/B978-0-12-815040-5.00007-3

Naeem, S., Bunker, D.E., Hector, A., Loreau, M.,& Perrings, C., (2009). Biodiversity, Ecosystem Functioning, and Human Wellbeing: an Ecological and Economic Perspective. Oxford: Oxford University Press; 1057-1236.

Nilsson, M., & Dalkmann, H. (2001). DECISION MAKING AND STRATEGIC ENVIRONMENTAL ASSESSMENT. *Journal Of Environmental Assessment Policy And Management*, *03*(03), 305-327. http://dx.doi.org/10.1142/s1464333201000728

Odhiambo, M., & Routh, J. (2016). Does Black Carbon Contribute to Eutrophication in Large Lakes ? *Current Pollution Reports*, 236–238. https://doi.org/10.1007/s40726-016-0042-4

Ogola, P. F. A. (2007). ENVIRONMENTAL IMPACT ASSESSMENT, 2–17.

Peste. F., Paula. A., da Silva, L.P., Bernardino, J., Pereira, P., Mascarenhas, M., et al. (2015). How to mitigate impacts of wind farms on bats? A review of potential conservation measures in the European Context. *Environ Impact Assess Rev*; 51:10-22

Pedroli, B., Elbersen, B., Frederiksen, P., Grandin, U., Heikkilä, R., Krogh, P.H., et al. (2013). Is energy cropping in Europe compatible with biodiversity? - Opportunities and threats to biodiversity from land-based production of biomass for bioenergy purposes. *Biomass Bioenergy*, 55:73–86. http://dx.doi.org/10.1016/j.biom bioe.2012.09.054.

Prip, C., (2017).The Convention on Biological Diversity as a legal framework for safeguarding ecosystem services, *Ecosystem Services*, Volume 29; 199-204

Rozema, J., Bond, A., Cashmore, M., & Chilvers, J. (2012). An investigation of environmental and sustainability discourses associated with the substantive purposes of environmental assessment. *Environmental Impact Assessment Review*, *33*(1), 80-90. http://dx.doi.org/10.1016/j.eiar.2011.11.003

Runhaar, H., van Laerhoven, F., Driessen, P., & Arts, J. (2013). Environmental assessment in The Netherlands: Effectively governing environmental protection? A discourse analysis.

Environmental Impact Assessment Review, *39*, 13–25. https://doi.org/10.1016/j.eiar.2012.05.003

Schuster, E., Bulling, L., Köppel, J., (2015). Consolidating the state of knowledge: a synoptical review of wind energy's wildlife effects. *Environ Manag* ;300–31. http://dx.doi.org/10.1007/s00267-015-0501-5.

SDC, (2007). Turning the Tide: Tidal Power in the UK. Sustainable Development Commission, London. Retrieved from https://research-repository.st-andrews.ac.uk/bitstream/handle/10023/2215/sdc-2007-turning-the-tide-5.pdf?sequence=1&isAllowed=y on 18/04/2018

Shortall, R., Davidsdottir, B., & Axelsson, G. (2015). Geothermal energy for sustainable development : A review of sustainability impacts and assessment frameworks. *Renewable and Sustainable Energy Reviews*, *44*, 391–406. https://doi.org/10.1016/j.rser.2014.12.020

Smart, D., Stojanovic, T., & Warren, C. (2014). Is EIA part of the wind power planning problem? *Environmental Impact Assessment Review*, *49*, 13-23. http://dx.doi.org/10.1016/j.eiar.2014.05.004

Sen, S., & Ganguly, S. (2017). Opportunities, barriers and issues with renewable energy development – A discussion. *Renewable and Sustainable Energy Reviews*, *69*, 1170–1181. https://doi.org/10.1016/J.RSER.2016.09.137

Spiegel, S. J. (2017). Geoforum EIAs , power and political ecology : Situating resource struggles and the techno-politics of small-scale mining. *Geoforum*, *87*(April), 95–107. https://doi.org/10.1016/j.geoforum.2017.10.010

Sun, L., Yung, E. H. K., Chan, E. H. W., & Zhu, D. (2016). Issues of NIMBY conflict management from the perspective of stakeholders: A case study in Shanghai. *Habitat International*, *53*, 133–141. https://doi.org/10.1016/j.habitatint.2015.11.013

Tabassum, A., Premalatha, M., Abbasi, T., Abbasi, S.A., (2014). Wind energy: increasing

deployment, rising environmental concerns. *Renew Sustain Energy Rev* , 31:270–88. http://dx.doi.org/10.1016/j.rser.2013.11.019.

Tallis, H., Kennedy, C. M., Ruckelshaus, M., Goldstein, J., & Kiesecker, J. M. (2015). Mitigation for one & all: An integrated framework for mitigation of development impacts on biodiversity and ecosystem services. *Environmental Impact Assessment Review*, *55*, 21–34. https://doi.org/10.1016/j.eiar.2015.06.005

Turney, D., & Fthenakis, V., (2011). Environmental impacts from the installation and opera- tion of large-scale solar power plants. *Renew Sustain Energy Rev,*15:3261–70. http://dx.doi.org/10.1016/j.rser.2011.04.023.

UNCBD, (2002). Retrieved from https://www.cbd.int/doc/decisions/cop-06-dec-en.pdf on 16/04/2018

UNCBD, (2010). Annex to COP 10 Decision X/2. Strategic Plan for Biodiversity 2011–2020. Retrieved from http://www.cbd.int/decision/cop/?id=12268 on 16/04/2018

UNFCCC. (2011). Fact sheet: Climate change science - the status of climate change science today. UNFCCC.

UNFCCC. (2014). UNFCCC Paris Agreement. Retrieved from UNFCCC: http://unfccc.int/paris_agreement/items/9485.php

Verschuren, P., & Doorewaard, H., (2010). *Designing a research project*. The Hague: Eleven International Publishing House.

Williams, A., & Dupuy, K. (2017). Deciding over nature: Corruption and environmental impact assessments. *Environmental Impact Assessment Review*, *65*(October 2016), 118–124. https://doi.org/10.1016/j.eiar.2017.05.002

Wynne B (2007). Public participation in science and technology: performing and obscuring a political–conceptual category mistake. J;1:99-110.

Zah .R., Böni. H., Gauch, M., Hischier, R., Lehmann, M., Wäger, P., (2007). Life cycle assessment

of energy products: environmental assessment of biofuels. Lausanne: *EPFL*; 128-134

Zaunbrecher, B. S. (2018). The social and ecological footprint of renewable power generation plants. Balancing social requirements and ecological impacts in an integrated approach. *Energy Research & Social Science*, (July). https://doi.org/10.1016/j.erss.2018.07.015

www.commissiemer.nl. http://commissiemer.nl/english/our-services/types-of-advisory-report Accessed on 18/03/2018

www.breakingenergy.com https://breakingenergy.com/2014/05/14/biomass-the-worlds-biggest-provider-of-renewable-energy/ Accessed on 23/03/2018

www.patagonia.com https://www.patagonia.com/blog/2016/04/stop-the-dams-in-portugal/ Accessed on 08/06/2018

https://www.eia.nl/en/environmental-assessment Accessed on 21/08/2018

https://www.commissiemer.nl/adviezen Accessed on 10/07/2018

http://fryslan.gemeentedocumenten.nl/www.fryslan.frl/nijhiddumhouw.html

Accessed on 14/07/2018

https://www.nijhiddumhouw.nl/ Accessed on 14/07/2018

https://www.government.nl/topics/nature-and-biodiversity/legislation-protecting-nature-in-the-netherlands Accessed on 14/07/2018

APPENDIX I

Consent to take part in research study interview

Dear participant,

Thank you for your willingness to participate in this research study. Please take the time to read this consent form. If you have any questions, please do not hesitate to get in touch.

Project title: Bio-diversity considerations in EIA in the Netherlands

Researcher: Nhyira Owusuaa Manu-Marfo

Project Supervisor: Dr. Victoria Daskalova

Participant: ……..

- I, ……, voluntarily agree to participate in this research study interview.

- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.

- I understand that I can withdraw permission to use data from my interview after it, in which case the material will be deleted.

- I have had the purpose and nature of the study explained to me and I have had the opportunity to ask questions about the study.

- I agree to my interview being audio-recorded.

- I understand that all information I provide for this study will be treated confidentially.

- I understand that in any report on the results of this research my identity will remain anonymous if preferred to be so. This will be done by not explicitly mentioning my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.

- I understand that I am entitled to access the information I have provided after the interview.

- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Contact details of researcher:

Email: n.o.manu-marfo@student.utwente.nl

Tel: 0643860424

Contact details of the supervisor:

Email: v.i.daskalova@utwente.nl

Signature of participant:

Date: ……

APPENDIX II

Semi-Structured Interview Questions for the Various Interviewees

Academia

1. In practice, how complementary would you describe EU biodiversity and climate change goals?
2. In your opinion, to what extent do stakeholders/policymakers take biodiversity into account when RE projects are involved in the Netherlands?
3. What are some of the potential conflicts that arise/ have arisen between biodiversity and RE installation?
4. In situations where trade-offs between biodiversity and RE goals have to be made, what would you describe as the merits and demerits of such trade-offs?
5. What would you suggest as measures to improve the arising conflicts between biodiversity and RE goals?

Netherlands Commission for Environmental Assessments (NCEA)

1. What role(s) does the NCEA play during environmental impact assessments? Advisory? Approvals?
2. What are the ideal criteria for approving/advising the set- up of a renewable energy technology at a particular site during impact assessments
3. Have there been any RE projects that seemed to be in conflict with biodiversity? How does EIA preserve biodiversity in such situations?
4. Any suggestions as to how current EIA practices could be improved so as to create an equal balance of RE installations and biodiversity?

Friese Millieu Federatie

1. What does the federation do?
2. In practice, how complementary are biodiversity and RE goals?

3. Do you think that RE is affecting biodiversity negatively?
4. How inclusive is biodiversity in EIA?
5. To what extent is biodiversity considered by policy makers when it comes to RE installations?
6. What are the effects of wind parks on marine life?
7. How influential are the general public and NGO's in EIAs?
8. What is the way forward for RE and biodiversity?
9. Benefits of trade-off?

Province of Friesland (Wind park Nij Hiddum Houw)

1. What are the Spatial and legal considerations that were considered for the wind park Nij Hiddum Houw?
2. What was the most outstanding reason for people disliking the wind turbines?
3. How did you lay to rest the fears of the environmental NGOs?
4. What trade-offs were considered b/n the park and the environment?

Province of Friesland

1. Are RE projects undertaken with biodiversity goals in mind? To what extent does biodiversity inform RE projects undertaken by the municipality?
2. So, you have experience with EIA? What do you look out for?
3. What role does the province play with respect to EIAs?
4. In cases where trade-offs have to be made between the environment and RE, what informs the decisions that are taken?
5. What are the possible merits of such trade-offs?
6. What would you suggest as measures to improve the arising conflicts between biodiversity and RE goals?
7. Is public opinion considered in EIA?

To what extent do final projects comply with preserving biodiversity?

APPENDIX III

Transcribed Interviews

A1 DAVID GOLDSBOROUGH

In practice, how complementary would you describe EU biodiversity and climate change goals?

There are instances where they can be complementary but I am not sure if they are always complementary. It really depends on resources. Because if we talk about renewable energy goals it might be that we are looking at different resources. Some resources have a positive effect on biodiversity and biodiversity conservation whiles others are debatable. As an example, wind energy at sea is thought to have a positive effect on biodiversity and the ecosystem once in operation, but in construction we are not so sure about it. We think that it could have a negative impact on biodiversity, we are not confident about that. For instance, solar parks there have been instances where they have been shown to have a negative impact on biodiversity; on the location where they have been constructed and are in operation. So, for land based solar parks, it is not certain at all that they have a complementary positive effect. Sometimes it is also difficult to tell because of climate change.

In your opinion, to what extent do stakeholders/policymakers take biodiversity into account when RE projects are involved in the Netherlands?

I would think that biodiversity is specifically considered in construction and operation phase through the carrying out of EIA. These could be very limited but they could also be extensive, I don't know how detailed they are or to what extent they necessarily target biodiversity concepts. I don't think they necessarily go into that much detail. Land based I am not sure if policy makers take biodiversity into account but in the marine environment, policymakers do consider biodiversity. Example. We do have on going experiments that are being stimulated by the policy makers and civil servants responsible for wind at sea where they are talking about nature inclusive buildings for wind mills on sea. So, buildings where you try to include the ecosystem and stimulate the ecosystem in the positive way. As an example, building a wind turbine and

including live shells and mussels to the construction. And that has a positive effect on the local system and that has a positive effect on the local ecosystem. So, they are talking about doing or building these man-made constructions and actually taking the ecosystem into account and seeing if they can have a positive effect on the ecosystem. This is something that is being set up by the government.

How do the live mussels stimulate the ecosystem?

If you would have a bed of mussels linked and attached to a pile, a wind turbine pile, they actually play an important role in filtering the water and in that way they stimulate the ecosystem positively. So you can imagine that you have different types of shells linked to the turbines and shells attract other animals and stimulate an influx thereby stimulating the local system positively.

What are some of the potential conflicts that arise/ have arisen between biodiversity and RE installation?

With regards to land based, I think that the major conflict is that; and I am looking specifically at solar and wind energy the key renewable energy sources. Those two really take up a lot of land space, space that could be used for agriculture, or have value for the ecosystem being nature related so I think that there is a conflict of interest there. Actually we have a conflict of interest in a province where wind turbines are planned to be built in a forest which is a protected area and people visiting the forest are very annoyed. But the forest manager seem to be in favour of it. We also have to pitch in and help out to achieve our RE goals. So this is an interesting conflict of interest

In situations where tradeoffs between biodiversity and RE goals have to be made, what would you describe as the merits and demerits of such tradeoffs?

In my view, dealing with renewable energy and realizing that it could have at least a positive effect on the ecosystem, if we are willing to look at how we construct these installations from the start with biodiversity in mind, there could be win-win situations there. But we really need to be careful about what we are doing because we are “tweaking” a natural ecosystem thus we

need to properly monitor what is being done in terms of what is going on. I do think that there are some benefits however if we would take a deeper look at some of these interactions between renewable energy and biodiversity, like I mentioned earlier about solar parks on land. Some of these RE installations could in the long run have a negative impact on the local biodiversity. Some of the interactions need to be re-thought, example: building solar parks on roof tops instead of in the open areas reduces the impact on biodiversity.

What would you suggest as measures to improve the arising conflicts between biodiversity and RE goals?

We need to have an adaptive management for biodiversity conservation which is not existing currently. This is because in the face of climate change it is difficult to tell whether resources have a positive or negative effect on biodiversity. And as a result, biodiversity frameworks are rigid because of past observations. However, regardless of what is done to protect them they tend to move away due to unfavourable conditions of climate change.

A2 SJOERD HARKEMA

What role(s) does the NCEA play during environmental impact assessments? Advisory? Approvals?

If people want to know if the quality of an EIA/SEA is good and whether the report is complete, they will come to us and we will advise whether it is the case or not. But it is an advice only. At the start of a plan or a project, before the decision on the permit or another type of decision is made, we give an advice on whether the EIA is complete and of adequate quality. It is good to realize that in the Netherlands we have a combined system of EIA and SEA. We have the same system and in other countries that's different, but for SEA you do for plans or programmes. It is in general less detailed, but for EIA you do for permits and you already know how your project will look like and where it will take place and questions on where you can situate a project best. It is necessary that the difficult questions are answered in EIA and not in SEA.

In general, in the Netherlands if you want to start a project say a wind farm, you go to the government first because you need a permit and the first step is that an EIA is required. But it is not always required if you have a small wind farm then it is not necessary or you have to research whether it is necessary or not because it is assumed that an impact assessment is necessary. You will then have to write down what is necessary in your EIA/SEA, this is usually called the scoping report or guidelines or starting notice. It is a research agenda stating what you will look into and what will end up in your EIA report later. That is published in the Netherlands and so everybody can look at it and say if they agree or you should choose another alternative or select a better criterion. You also need to research your facts on landscape. After that the government will decide what is necessary or not. They can also ask the commission to advice on the terms of reference but it is voluntary. In the past, it was obligatory but now it is voluntary. After that, the report is composed including alternatives then the government comes back to the commission to find out if the report is of good quality or not. After that, the competent authority decides as to whether to issue the permit and then the developers can start to build their wind farm or solar panel. The government has to justify why they granted the permit and they use decisions from the EIA to justify their decision. Sometimes it is not clear whether one alternative is more

environmentally friendly than the other. Sometimes it is just up to the authority to choose. Scoping is mandatory in some EIAs but not all. Advises are given by working groups consisting of a chairperson and 3-5 experts e.g. Experts on biodiversity, expert on sound emission from windmills and expert on landscape impacts and they compose the advice.

What are the ideal criteria for approving/advising the set- up of a renewable energy technology at a particular site during impact assessments?

It depends on the context within which you are defining criteria. In the north- east of the Netherlands, there is an area which the government says is suitable for setting up large scale wind farms and in that area, you can look for locations for large scale wind farm projects. The criteria are dependent on the type of renewable energy. For instance, for wind farms, if they are situated close to people's homes they emit a lot of noise and also, the height of the wind turbines create shadows and so if they are close to people's homes it will be a problem. Hence there are rules as to how much of shadows that are allowed per house in a year. If the amount is likely to be exceeded, they will do something about the wind turbine for instance when the sun is up, they will slow down the turbine for a couple of minutes so that there will be reduced shadows. There is another allocated area for turbines where they are looking as to how to put the wind turbines in several alternative arrangements to get as far away from the large density of houses. The impact of alternatives of projects on biodiversity, landscape, bird and bat mortality are all compared in the EIA report. In the Netherlands it is valued more if you have a calm view. If the height and speed is not uniform, it is valued less and seen to have more impact on the landscape.

In the Netherlands, we have a general principle to try to protect nature that is threatened or which is very special and nature which is present in large volumes. For instance, if something is extinct or near extinct, we protect it. If not, we do not bother. That is the general rule of thumb. For example, for wind turbine parks, the locations are not really an issue in EIA. What is really an issue is the casualty of birds and bats which will collide with these turbines. Why? Because these birds and bats are considered to be important and are not enough. As a result, some of the projects will have a lot of criteria In the Netherlands, we regulate everything and so for special species, we ask ourselves what is the number of these species? How big of a population of this

species do we want to keep in the Netherlands? After thinking on this, we set up a threshold and below that threshold an extra casualty is not okay. It is easier to get a permit for projects that will not cause harm to already threatened species that to get a permit on things that are not threatened.

Do you only work on wind farms or you have done work on solar panels?

Almost none. Solar panels are usually very small projects in the Netherlands and we don't do EIA for it.

So, is EIA done for only large projects?

We have in the Netherlands the C and D list. What is says in this list is that if a project is of a certain size for example in square metres or a certain number of wind turbines then you have to draft up an EIA. In a certain threshold of the D list, you have to decide whether an EIA is necessary or not. So, for solar panels, there is no particular criteria for solar panels but there is a criterion for different land use. So, if your solar park will be large enough so that agricultural land use will be changed so that you have a double land use of agriculture and solar panels, then you have to draft up an EIA as well. Only in those cases that you draft up an EIA. You can have SEA's which plans that cover an entire municipality or territorial region and if you look at what we have to do for energy transition for certain regions, the total of what has to be done is so big that we look into it with SEA's. But there are no EIAs left for these solar projects. Another reason is that there are not many big solar panel projects in the Netherlands and there is a huge opposition against them.

Has there been any renewable project that seemed to be in conflict with biodiversity? How does EIA preserve biodiversity in such situations?

All the time. For example, in the national energy plan on wind energy, they decided that since people did not want wind farms in their backyards, one of the best areas for setting up these wind farms were nature protected areas. There are lots of nature protected areas in the Netherlands, hence there is a good chance that a wind farm will either be close by or in a nature protected area. For example, the area of the IJselmeer, a big lake in the Netherlands, it is an

important area for birds. There are areas designated for possible wind farms which are being developed. In this area, there are a lot of bird casualties and so they have to optimalize the layout of the farm, change the height of turbines or build compensation areas so that the birds will go to another area to feed so they will not be close to the wind turbines anymore because they have no reason to be there. Or they change the distance between wind turbines so that the birds can fly through. All this thinking has to be done in the EIA and research alternatives to comply with nature legislation because in these areas there are many populations of birds which are below thresholds because they are almost extinct or very rare. Therefore, even if there are only 10 casualties per year, it is too much and hence not permitted. So, in these areas, the concern of biodiversity in the EIAs is only rare species. The EIAs will of course have to report on the other bird species that fly through but there are no strict rules in parliament which prohibit competent authorities form issuing permits. However, it is up to the discretion of the politicians according to the law. The law gives the decision to government to weigh both biodiversity and renewable energy and decide in a given situation which of the two should be considered more. Researching alternatives is key in EIA for wind farms in the Netherlands. You have to find a way how renewable energy and biodiversity will go together. Usually, it is difficult.

For the protected areas, what about the plants?

Not really given much consideration because if you measure the square metres, it is a very small landscape hence the impact is minimal. Generally, wind turbines are not built in exactly those areas, they are built in wetlands mostly. There are exceptions but not so much for wind farms. In the Netherlands, the plants are also protected if they are rare and/protected. Thorough research is done when it has to do with coal fired plants because they release nitrogen which could lead to rare plants losing their diversity. The rule of thumb is that, such plants do not get enough nutrients and so if a lot of nitrogen is released, the diversity of plants could be lost. It could lead to other plants in the same habitat becoming more dominant and put pressure on the rare species. Also for large rivers, there are special plants between the dykes. Therefore, if you want to excavate sand from the dykes, you have to look carefully if there are no rare plants.

Any suggestions as to how current EIA practices could be improved so as to create an equal balance of RE installations and biodiversity

At the moment, nobody knows how the Netherlands will reach their biodiversity goals. If they decide to do it with wind farms, then the impact on biodiversity will be high and the biodiversity goals will not be complementary with renewable energy. However, there might be some ways out of this conflict. First of all, you have to strengthen nature because if biodiversity is strong and resilient then impacts of renewable energy will not be relatively so big. For example, put more wind farms in the North Sea then the pressure will not be big on the main land of the Netherlands. Of course, there are a lot of nature protected areas in the North Sea and so it is not as easy as it sounds. Nuclear fusion and carbon capture technologies are also not fully developed and so it needs to be looked into. In the Netherlands, EIA procedure is reviewed, everything is researched hence there is a good balance of the procedure therefore, if you want to take biodiversity values into account, sometimes you have to, sometimes you don't have to, it depends on the legislation.

But if you want to preserve the present nature values and ensure that they have a long-term viability, then your only option is to strengthen nature. Then in practice, you have to do something about other nature pressurizing factors like fishing, like agriculture, like air pollution. If you take away these pressures from nature they can flourish more and then effects of renewable energy will be less of a problem. For example, in the North Sea, if we stop fishing there will be much more food for mammals in the North Sea like seals and birds who live there. Populations will also grow.

If you think that renewable energy and climate change is bigger than everything else, that is also defendable because climate problems are more on the global scale and biodiversity in the Netherlands is on a regional scale and the wind farm is only local.

A3 ARNOUD DE VRIES

What does the federation do?

We are an NGO. We have no individual members, organisations are members of our organization; an umbrella organisation. For example, Natuur Monumente, a huge nature protection organization is a part of their organization. We influence politicians and politics so that they can take the right measures for the environment and nature protection together with a lot of their members. We speak for our members if they agree. We react together with members on for example plans for windmill locations and give their comments on such plans.

In your own opinion how complementary do you think that biodiversity and climate change (renewable energy) goals are in practice? Or is one being given more attention over the other?

Renewable energy goals are given more attention than biodiversity. There is more economical interest; the economics are more focused on renewable energy but they forget that biodiversity is very important. In the sense that we are so reliable on biodiversity; we get enough crops from the land, biodiversity cleans our water, cleans our air so at times politicians forget. It feels like we renewable energy is more ahead, however in recent times biodiversity seems to be getting more attention.

Do you think that renewable energy is affecting biodiversity negatively?

Yes, renewable energy affects biodiversity negatively and it can be avoided. A good example is on the roof of van hall, there is a kind of bird "*vistief"* found along the coast. It is very difficult for these birds to find breeding grounds along the country side so what they do is that they go to flat roofs, which is a good habitat for them to breed. But these flat roofs we also need for solar power, so on the roof van hall, they put solar panels on the roof where "*vistief"* is located. We have to be aware that we can use the flat roofs for solar panels, but not everywhere. Example in areas where a lot of birds breed we must not put solar panels there. This is also the same for solar panels on agricultural land, if you put a lot of solar panels on agricultural land, it is very bad for birds who breed because they like to breed in open space therefore breeding is hampered.

How inclusive do you think that EIAs are of biodiversity?

If it is for big plans, then they need to make EIAs. But in practice, it is not working that well all the time. For example, a wind mill park (Nij Hiddum Houw) which is in the news in the past few weeks, it is open for people to speak out about what they think about the plan. But we already gave out a reaction before. There are some big gaps in the EIA of this plan. They can decide to put it (the EIA) aside if they want, then you can decide to go to a judge to change but then that is not easy. For example, there are a lot of protests from people concerning wind parks who don't want a big wind mill beside their house and so it leads to situating of these wind mills in areas where many people do not live. These areas are also interesting for nature. For example, the IJselmeer lake is very important for birds and it is also protected by Naturs 2000 but in practice, you see that a lot of wind parks are situated in the IJselmeer lake. Also, a big plan from this province (Friesland) is situated in the lake and it is difficult to get a good attention on the nature aspect of this pla. Because what they do not consider is all the different parks together have more influence; cumulative aspect and a lot of times they don't take into account these cumulative aspects so they look to only one park and conclude that it is not harmful for the birds. They don't care about the nature area, they give the excuse that it is just one lake. You have to really investigate all the parks together and other plans that are built in that area to know what influences on the bird population.

Why is there emphasis being placed on bird population?

The wind mills along the shore lines, there is a lot of migration of birds and the wind mills tend to collide with these birds and in turn increase bird mortality. Especially wind mill parks that are situated along the shoreline of the IJseel lake, there are a lot of birds that use it as a migratory route. Specific bird species are being endangered, hence if the mortality is too high then these species will disappear. There are some species in the IJseel lake are endangered and as such quite protected. Not all birds have the same protection and wind mills do not "discriminate" against any bird species. Of course, the wind mills in the IJseel lake try to avoid killing of birds. I heard a few days ago that these wind mills want to have a specific radar and when they see these birds coming they can stop the wind mills. But the time between the radar detection and the time they

need to stop the wind mill is too close and so they can't really act that fast. This problem has to be worked out, but that can be a solution.

In your opinion, to what extent do you think that policy makers consider biodiversity when it comes to renewable energy projects?

Unfortunately, most of the politicians, they do not give a high priority to biodiversity. Instead they try to downplay the importance of biodiversity e.g. bird species.

Can you give me an example of a recent advocacy that the NGO did on behalf of biodiversity against a renewable energy project?

Yes, we did that with the wind park in the IJseel lake which is now in planning; Nij Hiddum Houw which is a small plan. But they have a big plan centred in between the dykes in Friesland and the north of Holland and they are planning a huge windmill park about 350MW. So, we went to the judge to fight in court and did a second opinion on the influence of the windmill on birds but I do not think that we will be able to stop it.

What effect do offshore windmills have on marine life?

When they are building, they have to drill to erect poles and fish can be harmed by the shocks. Also "*brauwvis*" can be harmed during the construction process. But they now have a solution where they put bubble screen in the water so that they can stop the noise from travelling far. On the other hand, the water life can have a positive influence if you make small rocky islands in the water, it creates new habitats.

How influential are the NGO'S and the public opinion in EIAs that are related to renewable energy?

EIAs do not consider public opinion.

Do you find it problematic that it does not happen this way?

EIAs have to focus on facts which are the real effects and not on opinions of groups. Well they have to listen of course to the, they get all the letters but they should filter out the opinions and use them in the EIA. They use the input we give them.

Would you say that NGO's like yours are influential in EIA decisions?

EIA is a report and politicians can choose otherwise. It's a huge pile of information, and politicians can choose to say that they will cite a windmill in a particular location even if it goes against biodiversity. Politicians can also go against EIA reports even if it defies the regulation set by the EU. If there is no organization that will protest against it, then they can do that. EIA is a good instrument but it is not that strong

What are the benefits of tradeoffs between renewable energy and biodiversity?

It brings about innovations. This is because then they would have to think about other solutions. For example, the bubble screens were developed due to increasing protests about how the fish were being harmed. I believe that if you take biodiversity more into account it could lead to more innovation. Also, because the solar panel fields, they sometimes try to put these fields nearby nature areas and due to protests from local residents, they tend to develop these areas by incorporating more of biodiversity.

What would you suggest as measures to improve the relationship between biodiversity and renewable energy?

What you see about windmill parks is that it is pushed away by a lot of people, about 40% of windmill projects are stopped because its nearby the houses of people and so they get a lot of noise and it is mainly because the people living nearby have to endure all the negative impacts and they are not compensated in anyway. What we try to do is that the people around get more financial benefits out of it. When people get more profits out of wind parks, it generates more positive attitudes. Now there is a big difference, the developers get all the money and the local people do not get anything out of it. If that will be changed, the parks will be more welcomed. In Friesland we have an example of a village wind mill and this wind mill gives a lot of financial benefits for the local community and they can develop community centres, swimming pools etc.

This windmill is treated well because the community sees it as theirs, therefore involve the local people more in the planning process. Finally, set up a fund for nature protection which could be used to do things like buy new nature areas, raise the water level for birds who breed along the shoreline.

A4 HARM JAN BOUWERS

What are the Spatial considerations that go into the wind park?

National government has made an agreement with the provincial governments on the number of megawatts that should be erected by 2020. For the province of Friesland, its 530.5MW of wind turbine power should have been erected by then. We have not reached that goal yet, no province has reached that goal yet. We are trying to fulfill that goal by making a pretty huge MW wind park in the IJsseel lake called Wind Park Friesland it will have approximately 300MW and will be situated in the IJseel lake near the shore. The 2nd park is the one of which I am project leader and that is the park Nij Hiddum Houw and it will approximately be 40MW and will be located at the head of the *"Afluitsdijk".* Normally, the local government will give the planning consent known as "*bestemmingsplan".* The local government normally makes plans for regions in the municipality and those plans demarcate agricultural, residential, industrial areas and it is called "*bestemmingsplan"*. If someone wants to build something, you apply for a permit, if your application is inside a "*bestemmingsplan"*, you most likely get a permit.

For this wind farm, the local government did not want to make a *bestemmingsplan,* they did not want to make a plan that will give consent to the wind farm and so the area where the wind farm will be located is designated as a rural agricultural area and no wind farm is allowed there. However, the agreement with the national government needs to be fulfilled there is a law that allows the province to overrule the authority of the municipality, saying that if you don't want to do the *bestemmingsplan,* we will do it for you. It is called the *"imposixplan*". And that is what is happening here.

Another national law says that since the wind turbines are needed for sustainable energy badly, the way that the law goes has been changed. Normally you plan, it is open for comments from the public through adverts in the local newspaper (citizens, and any other organization that thinks they have a say) to the government organization responsible for making the plan. The government organization in charge replies to it and if the people are not satisfied, then they can go to the regional court first and then national court. However, since the province made the plan, the only way to go is the national court directly hence. So we make the *bestemmingsplan*

ourselves and we are obliged to apply to this law therefore, the procedure is made as short as possible and possibilities to go to court are limited to one time. That's basically the spatial, legal procedure.

When you say that plans are made open to the general public to comment on it do you mean the citizens?

Yes, the citizens and any other interested and concerned parties. This is standard procedure. Every plan that you make, if it goes beyond a region it is published by advertisement in the newspapers. Given period within which people can comment on the plans, suggest changes etc. and everybody can do that. Example; for the plan Nij Hiddum Houw, we have comments from even Australia even. And we have to see to every plan. In this case, wind farms are not the most popular in the area, so what you see is that people make standard forms for people to sign petitions against it and there are also comments. I think in this particular case we had 240 comments. Some small, some standard and some very long. Some from the citizens, some from environmental organizations, all kinds of things. Most of the comments were against the park.

What was the most outstanding reason for people disliking the wind turbines?

Because mainly people do not want wind turbines near their homes and these wind turbines are going to be higher than usual (>200m). The area concerned is an old cultural area and where the landscape is considered rather flat, mostly very agricultural, very small, old villages and farms. They are against the wind turbines coming and they are against the fact that there are lights on it because it is higher than 150m and they do not think that these high wind turbines fit in their landscape. The reason for these wind turbines being situated there comes as a result of a very large procedure which started in 2012 where the province first made a provincial plan as to where they we believe that wind turbines should be allowed. The provincial plan is the main plan and the municipality makes a "*bestemmings*" plan which should copy the provincial plan. People were so much against the provincial plan that the municipality decided not to make a "*bestemmings"* plan and so decided to do something else. Municipality in collaboration with a group of people who were against the wind turbines and those who were in support of it identified areas; the region where people did not really mind having wind turbines situated and sent it to the province.

In the end the provincial government in 2013, province insisted that they wanted as little amount of turbines as possible and so they wanted it situated in the IJsseel lake and the rest at the head of the *Afluitsdijk* where this wind park is being situated. The "*bestemmings"* plan for this particular wind park was started at the beginning of 2016 by the province. So it is a long history and has a very long history of people being against or sometimes being in favour of it. It is a very sore political topic especially in our province because Frisians love their flat, open country. So it is a very difficult subject here.

How did you lay to rest the fears of the environmental NGOs with regards to biodiversity?

The environmental federation were one of the people to put in comments about NHH. We have looked at that and we have considered it and you must know that if such a big plan is being made, it is required by law in the Netherlands to have an EIA. The EIA conducted on this plan showed that the impact on biodiversity is very little. There are not a lot of birds that rest in that area. The major impact will be felt by migratory birds from northern Europe who rest here and go further. But the EIA which is done by specific bureau that has knowledge of that in the end said that the impact will be felt not by the park itself but by the building of the park and the disturbance is more towards birds in the meadow and not so much as the water birds. Birds which are of a major concern to biodiversity, according to the EIA the impact on migratory birds will be little, however the concern was more for the birds in the meadow, and the effect was considered to be a rather small one and would not impact the population. I know that the EIA looked at a huge list of birds and especially the threatened species. Permits are also given by the municipality based on environmental ecology laws (EU and Dutch) to ensure that the environment is protected.

What tradeoffs were considered between the park and the environment?

What was considered in the environmental assessment is that there are smaller turbines (10) already existing in the area, owned by the people who want to build a new one, there are 6 other turbines also around the area. The EIA takes into that the 16 existing turbines in the area will be demolished to give way for 9 new ones (bigger) instead of 16. The process is that we want turbines in an area, and we know that we need to 36MW extra of RE power in Friesland. The

existing wind mills provided about 5MW of power and will be demolished to make way for about42/41MW of wind power. What we first did, we had 3 scenarios; were; 18 turbines which were not very tall or very big, thus producing lesser mw, or 11 turbines or 9 large ones. The bureau assessed the environmental impact of all 3 scenarios were in the EIA and the impact of the 9 turbines was found to be the lowest. The opinion of the people around the area were sought and they decided to go for 9 because they said 9 gives lesser noise than 18 turbines. The EIA assessed the impact specifically t of the 9 turbines and had concluded that there is little impact on birds and bats relative to their population. This assessment was also subject to comments, and so last year in November, we published the EIA report together with the "*bestemmingsplan"*. Drop shadows, noise emission are all considered in the EIA and so based on that they draw up the spatial plan. Both the spatial plan and EIA are made available for comments. There is also the commission in the Netherlands, NCEA, they assessed our report, gave some comments, we made some additions to it in the form of better explanations. They agreed that it was a good plan and sufficient to make a good decision enough to make a spatial plan. So that gives us a good decision that we need to make a spatial plan.

What do you think can be done that creates a win-win situation for both biodiversity and the environment?

There is a lot of division for and against wind farms, hence it makes it difficult for us as a government to choose. I think we did our best as a government to weigh all arguments and it is true that every decision you make impacts your environment and some of those effects are negative and some positive. But on the whole, I think that the effects of the environment as a whole of making sure that sustainable energy is more necessary than maybe a local effect on the environment. Ecology was not a huge problem in this project, but the effects on the people seem to be a problem and they still are. We do our best to weigh the impacts of plan against the negative effects of CO2 emissions on the environment, and make this evident in our replies to the people who send in complaints.

A5 PAUL WESTERBEEK

Do you have any experience with environmental impact assessment?

Yeah, not making them but reading them and judging whether or not they are done correctly. So, I have worked with the national government and now with the provincial board. And in both those jobs I have had to analyse and evaluate environmental impact assessment. first of all, wind farm on the North Sea, offshore and saltwater and here with the provincial board for wind farm and other large initiatives both in water and on land.

What do you look out for in an environmental assessment to allow it or request for more work to be done?

First of all, you scan whether or not all the species that have recorded the endangered species. The EIA is only done with regard to their Habitats Directive from the European Commission and that means it in the Netherlands we have specific species goals species goals within each Natura 2000 sites and depending on the site whether or not it's in the South of no North different species are appointed to have a goal within that site. So, if for instance wind farm Friesland is planned within the boundaries of Natura 2000 sites IJselmeer, then I know the specific species goals for the IJselmeer and I check if all the species are within the EIA. If all the species are in there you go deeper into the details and then you check whether or not all the information that you need to write a permit is within the EIA. If it’s not then definitely a knowledge gap then, and the initiator should still do more research on that topic. And of course, within the EIA it's very important to accumulate with all the other initiatives within that Natura 2000 site but also and if there's external influence like for instance you can create a wind farm outside of a Natura 2000 site but still have an impact on the specific species goals within a site. So, you have to be sure that in accumulating all the effects of all the initiative and you really have a complete set of all the initiatives that are going on there at that very moment, because if you're missing out on one then the application could possibly be denied.

We are the competent authority, we write the permit and an applicant who disagrees can go to the high court and object the permit. In the high Court usually, the competent authority and

initiator on one side and then on the other side is a person object so if I can think of certain knowledge gaps within the EIA then the person objecting to the EIA and the permit can also make the same derivation during the appeal.

Then once you start writing a permit and you find out there's still some knowledge gaps that you missed first hand within these big initiatives for wind farms so you have very intensive contact with the initiator with other authorities with, with NGOs, with just about anyone who is involved in that particular initiative and if halfway in the process you find out that for some species it would be good to have an extra research project done on that. For example it's not 3 or 6 months, the whole procedure takes many years then there's always time to do that part of the research wait for the report and take that with you in writing a permit. We as a province check the EIA and if you haven't filled in all the knowledge gaps, don't worry you can do it in process too.

So the role of the province is to check EIAs and decide whether to issue a permit or not?

That's correct. We have certain expertise within the province but the real detailed expertise we don't have within our province so you need ecological advisors for that. The real research is by the people who are the real experts so if they tell you the reports that should form the basis of the EIA and if the EIA quotes those reports then you know those independent researches has made the entirety of the EIA. So, we as a competent authority we can base our permits on independent research. Of course, funded by the initiator and you could say that's not independent anymore but the integrity of the ecological advisor is also at stake so if for some reason, the community, the Dutch people, or the European people find out that a certain ecological advisor doesn't have the integrity that they thought that they will never get another assignment so they will stop making money therefore they have to keep their integrity.

To what extent do you think that biodiversity is considered by renewable energy projects?

To a very broad extent it is considered because we have the Nature Conservation Act, European Commission has the Habitats and Bird Directive and those two directives they flow into national legislation which is a nature conservation act. And an initiative on a plan or project that large can never be created without the nature conservation permit. So, you really have to have the nature

conservation permit that we as a provinces in the Netherlands write. Without that you can never complete your wind farm for example. So, species are definitely considered, of course in details the legislator who make the nature conservation act who came up with the actual is in text that means they know a lot but they don't know all the details when they write the law. That's why every once in a while, the law is updated and the nature conservation act keeps getting better. And that has to do with accumulating the effect of multiple initiatives that happen within a certain area at the same time. When one competent authority doesn't know what the other competent authority does or actually is writing a permit for at that very moment, then that means when it comes to accumulating the effects things can go wrong .For instance if you can add all the effects together up to a certain threshold and you know that when you reach the threshold, that's the point where a significant negative effects on some species start to occur then you can just add all the little effects of two different threshold. But if you were very close to the threshold and one competent authority is permit in one thing that goes over the threshold in the other one does the same thing at the same time and you don't have any communication about that. We see that that happens in the Netherlands so how to solve the problem, I don't have the solution. I think it's a consequence of the decentralisation of this particular piece of legislation. It used to belong to the national government and of course they have certain boundaries as well you can see that if there is a large wind farm very close to the German border and the effects go across the German border then Netherlands would not look any further than that border. Now the provincial government for Friesland will not look any further than the provincial borders. So it’s a displacement of the problem, first it was the national problem now it's a provincial problem. But the scale is a little smaller now. When the Dutch national government was still responsible then they would take over 12 provinces of Netherlands into account they knew exactly what was going on there. Now only Friesland knows what's going on in Friesland but not what's going on in another province. So, the scale has become a little smaller but that also means that the effect of certain miscommunications can be larger. That's very hard to solve but you won't be able to solve it with an EIA. You can only solve that with National legislation.

By how much do you think that EIA plays a role in bridging the gap between biodiversity and renewable energy?

I think that renewable energies definitely treated with an upper hand above biodiversity and I think the reason is that if we choose to give by biodiversity the upper hand and don't work on renewable energy, the biodiversity will decrease anyway because the renewable energy is the way to go. If we keep on burning coal and other fossil fuels then eventually there will be no place in this world for biodiversity. If we first focus on renewable energy and we take out all the fossil fuels out of the equation then eventually that will go at the cost of a certain amount of biodiversity but eventually the parts biodiversity that remains will be able to flourish. And without first focusing on renewable energy that is just a utopia, that's not possible. And that is why renewable energy and biodiversity for the general public who don't really know the details, they see two green thoughts; renewable energy is green, durable and is good for the environment, biodiversity same thing is also green is about animals about forest, nature renewable energy is about nature too, to conserve nature. But going into detail to create the right circumstances to be able to eventually have a wind farm or solar farm in place that will go with the cost of areas of land and there are species on that part of the land and some of it are agriculture land. For the Netherlands after the Second World War we decided never again will we have hunger within west of Europe so that's why right now the Netherlands is the second largest after the US exporter of food, of meat of potatoes if there's anything that we can grow. Flowers. I think when comes to products, is the number one thing that we export. It takes a lot of land to be able to grow all these flowers and that means that giving up part of that welfare for the Netherlands as a country and for the Dutch people as a people, you cannot discuss that. To give up land where we grow things now to be able to build a wind farm, it takes a lot of land area to build a wind farm or to build a solar farm even more. And to give up agricultural; land for that purpose is not done. This is not the time to do that may be in 10 - 20 years' time when we see that the world is only going down even more than we see at the moment; when polar bears are extinct, when the rhinos are extinct, when the elephants are extinct maybe finally then we decide well maybe we should give up some agricultural land to finally create a renewable energy source that we so desperately need but right now the majority of the people they have no clue what's going on. That's at least my personal opinion.

By how much do you think environmental impact assessment are capable of bridging the gap between biodiversity and renewable energy?

I think its part of solution but it's not the solution. But at least it's part of the solution because one of the first step of the EIA is to pinpoint the exact initiative. For instance, a wind farm how many windmills will you create; is it 10 or 100? What will be the size of that thing? What will be the diameter of the eventual rotor? How high will it be up? Where exactly will you place these windmills?? In what lines will you set the wind mills? Will they be more south or will that be east or west? All those factors will eventually lead to a certain amount of birds that will fly into those rotors and will eventually die at the cost of renewable energy and in that EIA, the first thing you do is to make sure that the details of the plan that you eventually will need to calculate the effect, will be chosen such that the effects are small as possible and in that the EIA will be able to bridge the supposed gap between renewable energy and biodiversity. Because in that choice of the actual details, is the weighing of those two. There are two major pillars and the pillars are biodiversity and renewable energy. And if we'll go for renewable energy completely for a full 100% biodiversity is gone. If you go for biodiversity there's no room for renewable energy so the challenge is to take those both factors and get to somewhere of like a golden middle. Where you consider the renewable energy and the biodiversity and get to the factors, the details of your plan of your windfarm of that will consider both sides. Meaning you want to have the most megawatts within your uniform but also biodiversity you want to have the least facts on the present species and on the nature conservation areas so in that way EIAs will definitely be part of the solution to bridge the gap between those two big pillars. But in itself EIA will not be the solution

What informs the decisions that you make when you're caught in trade-offs between biodiversity and renewable energy?

Depends on goals that we have within the nature conservation areas like the Netherlands have had a thing for numbers, which goes way back. So, the goals for instance for the IJsselmeer we have a certain amount of species and we know exactly how many birds of that species we want to have at the minimum within that area. So, for instance a duck species we want to have at least

10,000 birds every year within the area. If there are exactly 10000 there and you build a wind farm within that nature conservation area, a certain amount of ducks will be flying into the rotors of the wind farms so the 10,000 will go down and that's not allowed. So therefore, you need to consider moving the entire wind farm or maybe to another place where ducks don't occur, that means that you won't have any effect on those ducks anymore. If for instance you have 12000 ducks but the goal is 10000 then you calculate how many ducks a year will be flying into your wind farm and how many will die. Of course you have to do research on that population so that you know also what the natural mortality, the survival rate so how many of the little fledgling ducks will eventually will eventually reach adulthood and if you calculate that and you'll see that the amount of new ducks that are being born and growing into adulthood would be the same as the amount of ducks that will fly into your wind farm then there's no problem. Up until how many years that wind farm will be there, probably 30 years you will always have the goal of 10000. But if you see that the population of the ducks will eventually go down and reached at 10000 and go on to plummet under the 10000, then you have a problem then you have to a mitigating measure to make sure the effect of your wind farm won't be as large as your initial project would have had those effect. So instead of the planned for instance 100 windmills you can also calculate that with 100 windmills you would have an effect that will be too large for those 10000 but with 80 windmills that effect will be more or less level and there will be no problem. So those are the measures that you could implement; less windmills have the rotor go up so that the birds fly under the rotor and will not be chopped down or space the windmills further apart so that the birds will actually fly in between the windmills. The research is very good at giving insights in what actually works and what measures don't work it off so often the ecological advisors of the initiator, the researchers will give the vision on what to do or what not to do and together the initiator and ecological advisor will come to us, the province to say this is the calculation that we did and this is what we eventually calculated as the effect and we believe this will do for the next 30 years. Then we have to decide whether or not they did their research correctly.

What are the possibilities advantages of these trade-offs?

One advantage is definitely that without implementing those measures you will not get the permit. If you did the calculations correctly and you show the general public that you have implemented all these different measures to make sure that the effect that your initiative has is as low as possible, that will give certain organizations like the bird protection agency and all those NGOs, will give them the idea or that will convince those organizations that you really looked at the effects in a detailed, way did your calculations correctly and made the effects as small as possible. Greenpeace has said that for the offshore wind farms they will never appeal to a permit to create an offshore wind farm they know as Greenpeace as one of the the major green organisations like WWF, a national birds protection agency. They know that creation of offshore wind farms has a certain negative effect on birds but still they will allow it because they know that renewable energy is more important now than keeping those few birds table actually flying to the wind mills. I saw a program on TV lately, one of the spokespersons for Greenpeace document camera and he said that if you look at the amount of birds that will fly into the offshore wind farms each year and you compare that to the amount of birds that is killed by house cats or by a traffic in the Dutch roads, it's only it's less than 8%, so why are we having such problems with creating renewable energy and killing off a few birds when every day will we open the door to let our cats out and every day we get into the car and the birds are killed why do we have such problems with this thing and would not with the other things that have way more effect on this same bird species and I never realised that there's a very good question.

Is it a requirement for public opinion to be taken into consideration in an EIA documents?

Not in the EIA but in the permit, yes. There are different ways to go at it you can publish the document or publish permit that you have written on the basis of the EIA. It is publicly made available for everybody who has a certain interest can appeal to that permit. For instance, you have a wind farm and someone lives right next to them and the value of their house goes down you can appeal, if you have an organization that protect birds and certain bird species are flying to those windmills you can appeal to the permit of that wind farm. If the wind farm you live in a different location from the wind farm then it will not be possible to appeal to the permit. Even though you don't like wind farms, you really have to have an interest at that particular place. So

that way the opinion of the public is integrated into the whole process of licensing a wind farm and that's one way. Another way is to write a sort of concept permit and then you make that concept publicly available and you ask public and you give me 6 weeks you ask them for their opinions so they can write their opinion down send them to the competent authority the competent authority we will look at all the visions and all the opinions and we will incorporate those who we think add something to the permit and that can sometimes mean that they need to skip one of the windmills that is closest to a certain colony of birds or bats . That means you can no longer 25 windmills but only 24 because one of them got dumped. And the process of six weeks of consulting the public helps a lot because that means that you can prevent certain parties from writing an appeal and that means if they do appeal to the permit then you will go to court and that will take a lot of time and if you can prevent that from Happening then eventually the initiator can start building but there'll always be people that will write down their opinion and then eventually seemed to be a pinion this not well enough incorporated within the permit and they will appeal anyway. But that is the democratic process of writing the permits and consulting the public.

Do you think there is a way to improve the current EIA to make them more efficient?

I think the ones that I saw, they do their absolute best to weigh the two aspects; renewable energy and biodiversity. In weighing those two aspects and get to the best possible solution that gives credits to both aspects.

What measures would you suggest to improve the arising conflict that exist between renewable energy and biodiversity?

I think that is going to be hard in the Netherlands. Because it's so densely populated and wherever you plan a certain plant or farm for renewable energy, there will always be people oppose to it so if you go across the border to Germany or France there are enormous areas where you can create gigantic wind farms nobody will appeal to it. But from the European commission since the Netherlands is on the shore and the wind comes from the North Sea this is the best place to place the wind farms and also is the best place to trade. So that's why Rotterdam is the biggest harbour in the entire of Europe. So, there are a lot of things that the Netherlands is the

best place for, that's why so there's so little space to do something new like for instance renewable energy. But we have a certain goal that we need to reach so how to make it easier or better I don't think the Netherlands is the solution. I know Germany builds their offshore part of the North Sea, they completely fill it up with offshore wind farms. If the Netherlands will do that a lot of NGOs that protect birds will appeal to every permit that the Government writes. The German culture considered what the government decides to be good but the Dutch culture criticizes just about anything the Dutch government does.

Why is there emphasis on diminishing bird and bat population?

Birds and bats are two major species, with the two major species groups that fly in the air and wind energy has an effect on anything that flies so that's why birds and bats are under a magnifying glass but also because the birds directive from the European Commission only looks at birds and all the native birds within the boundaries of Europe are under habitat directive so there's a certain level of protection, some species are very strictly protected some not as much, just in the places they breed.

Are there any follow ups done on renewable energy related projects to ensure that they are complying with biodiversity preservation?

With any project that requires an EIA, an ex-post is required so not just the renewable energy related projects, (MER-evaluatie) is required. Usually this takes place a few years after the start of the project or after the start of the operational phase. In this evaluation the assumptions made in the EIA are compared with the actual measured effects to make sure the assumptions were done worst-case and the actual effects are not larger than was assumed in the EIA. If this is true, then that means that the EIA was done correctly. If somehow the assumptions in the EIA were not worst-case and the actual effects were larger, additional mitigating measures (or in some severe cases maybe even compensation) will have to be implemented. As an example: if the actual number of killed birds by a wind farm is higher than the number calculated in the EIA, a possible additional measure could be to stop the turbines during periods of bird migration in order to prevent high numbers of casualties.