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Untapping the Full Potential of Solar Farms in the Netherlands: The Barriers, Drivers, and Activities Associated with Establishing Solar Energy Parks in The Netherlands

SINEAD WALSH
S2899191

Rijksuniversiteit Groningen
Campus Fryslân, Wirdumerdijk 34
8911 CE, Leeuwarden, NL.

Email: s.walsh@rug.nl

Abstract:
This qualitative interview-based research investigates the potential barriers, drivers and activities that are associated with solar energy parks, biodiversity and policy in the Netherlands. The energy transition and combating climate change is thought to be some of the greatest challenges that we as a society face. Therefore, the purpose of this research was to discover the possible ways to encourage the development of solar parks in order to stimulate biodiversity. Seven semi-structured interviews took place with a purposeful sample of solar industry stakeholders. Through the use of literature from the fields of Climate Change and Renewable Energy Policy, Biodiversity and Conservation Policy, and Political Science Theory, it was recognised that solar parks can indeed protect and stimulate biodiversity, however, the development of a solar park faces numerous complex challenges. Using ATLAS.ti three cycles of analysis were completed resulting in four barriers, three drivers, and three activities. The key barriers were regulatory, biodiversity, the current system and establishment. Regulation, developers and biodiversity protection were the main drivers of solar park establishment and the protection of biodiversity. Additionally, the primarily associated activities were regulatory, biodiversity protection and possible solutions.

INTRODUCTION

The COVID-19 pandemic symbolises the greatest shock to the global energy system since World War II with the decline in demand this year set to overshadow the effect of the 2008 financial crisis (International Energy Agency, 2020a). However, even though there is an unprecedented decline in demand for almost all major fuels, especially oil, coal and gas, it is renewable energy that is surviving during this never before seen energy nosedive. In drastic contrast to all other fuels, renewables used for electricity generation will increase by almost 5% in 2020[1] (International Energy Agency, 2020b). The increase in demand for renewables occurs at the cost of mainly coal and gas, even though those two sources still represent nearly 60% of the global electricity supply (Rapier, 2020).

Fossil Fuels are finite sources of energy making them intrinsically unsustainable. Thus, providing a sustainable source of energy is thought to be one of the biggest challenges that we as a society face (Bardi, 2013). It is essential that we transition to using renewable sources of energy not only to increase our future energy security but to reduce our reliance on unsustainable fossil fuel-based energy (Niet, 2018). Due to COVID-19, many governments are putting *"packages"* in place for companies to aid them through the current pandemic. However, these packages are going to mould the energy sector for many years to come with noteworthy consequences for energy security and transitions to clean energy (International Energy Agency, 2020b).

There has been an increasing drive for solar parks worldwide as a reaction to energy decarbonisation (Randle-Boggis et al., 2020), in The Netherlands the focus is primarily on the

[1] The actual 2020 numbers have yet to be published.

South, East, and North of the country. The focus is on these areas because they are the least densely populated, accordingly the provinces of Groningen, Friesland, Drenthe, Limburg, and Zeeland constitute approximately 15% of the Dutch population and almost half of existing and planned solar parks (Mayer, van der Gaast, Bachner, & Spijker, 2020). This land-use change is important to investigate as net emissions are a consequence of land use in The Netherlands (PLB Netherlands Environmental Assessment Agency, 2020). It is a land-use management issue because consequently, these solar parks are likely to have a potential impact on biodiversity (Esteves, 2016), and our transition to sustainable energy. Due to the interconnectedness of our world, biodiversity and ecosystem functioning can have major effects on spatial and temporal developments, and their impact on real-world ecosystem functioning has been greatly undervalued in prior research (Duffy, 2009; Hurni, et al., 2015; Schotman et al., 2021).

There is a common misconception about solar energy parks that they disrupt wildlife and reduce the biodiversity of the area in which they are established. However, the opposite is true (Montag, Parker, & Clarkson, 2016; Peschel, Peschel, Marchand, & Hauke, 2019). More often than not, the biodiversity level remains the same or increases after the installation of a solar park (van der Haas, 2019). In fact, the 25-year lifespan of completed sites has the potential for long-term biodiversity benefits due to its security, and minimal disturbance from machinery and/or humans (RSPB, 2014). A recent German study showed that there are positive effects on biodiversity and soil quality when the spaces between panels are of a certain size (Peschel et al., 2019). Another UK-based study discovered that total plant diversity[2], was notably higher within the solar parks versus the control plots with the difference being highly significant at the 0.0001 level (Montag et al., 2016).

[2] i.e. the total broadleaf plants plus grasses

A field of solar panels is considered to be an obvious and controversial object, as they are a modern human-made structure that tends to clash with the natural beauty of an area (Bevk & Golobič, 2020). Many studies have discovered that among the most common concerns of non-expert locals are aesthetics, impact on the landscape, and the unknown benefits of embracing this way of energy production (Bevk & Golobič, 2020; van Veelen & Haggett, 2016; Delicado, Figueiredo, & Silva, 2016; Wolsink, 2018; van der Horst, 2007; Batel & Devine-Wright, 2015). This societal rejection creates a barrier to solar park development, i.e. the energy transition, which in turn, becomes a barrier to managing and stimulating biodiversity within this contextual land use. Thus, there is a need to establish more formal management techniques and refocus policy to include and acknowledge societal concerns when establishing solar parks in order to genuinely maximise the benefits for the environment.

The ground-based solar park land-use change transpired at an exponential rate which plausibly has greater potential than any other land-use change to administer natural capital and ecosystem benefits (Randle-Boggis et al., 2020; Blaydes, Potts, Whyatt & Armstrong, 2021; Schotman et al., 2021). However, due to the COVID-19 pandemic, *"many planned investments to switch from fossil fuel heating to renewable or electric solutions are likely to be postponed or cancelled in the absence of strong policies"* (International Energy Agency, 2020c: 4). This may be due to the political challenges that companies face, not only at a local level but also at a municipal or provincial level as the policies differ per area (Pollema, 2018). If solar parks are developed responsibly then they can provide stable use of land, protection, and shelter to improve biodiversity (Sinha, Hoffman, Sakers, & Althouse, 2018). This, in turn, may aid the

improvement of the relationship that developers have with the local residents, and with the municipal or provincial government. This has the potential of making investors more willing to invest since there is less resistance from the community (Fromherz, 2013).

A multifaceted strategy that integrates nature and the economy needs to be used to halt biodiversity loss and work towards the renewable energy transition (van Zeijts et al., 2017). Additionally, there is a need for stronger and more transparent policies in the area of renewable energy (International Energy Agency, 2020c), and biodiversity and nature conservation (van Zeijts et al., 2017). Alongside the use of stronger policies, the management of the parks post-construction is crucial to this multifaceted strategy because solar farms with more focused management practices can result in increased levels of biodiversity (Taylor, Conway, Gabb, & Gillespie, 2019; Schotman et al., 2021). Therefore, if it is possible to combine the transition to sustainable energy with the goal of halting biodiversity through post-construction land-management practices in other European countries with similar climates, such as the United Kingdom (Taylor et al., 2019) and Germany (Viertl et al., 2015; Peschel et al., 2019), it should be possible to do so in The Netherlands as well.

The aim of this paper is to identify the barriers, drivers, and activities in the establishment and operation of solar parks in relation to biodiversity and policy. Thus, posing the research question; *"What are the drivers, barriers, and activities associated with the establishment and operation of solar energy parks in relation to biodiversity and policy in the Netherlands?"*

The remainder of this paper is structured as follows: first, the theoretical background is set, which outlines the policy frameworks regarding climate change and renewable energy policy, biodiversity and nature conservation policy, and political science theory. The following section outlines the methods which were used to investigate the above-mentioned research question. This includes the Research Design, Research Context, Data Collection Methods, and Data Analysis Methods. After that, the Findings are presented, and the results are subdivided into Barriers, Drivers, and Activities. Finally, the Discussion Section outlines the Conclusions and Implications, including the Barriers, Drivers, and Activities, followed by the Limitations and Future Research.

THEORY

The theory section of this report will be divided into three sections as it is necessary to research literature in three different fields in order to answer the research question. The three sections are, (1) Climate Change and Renewable Energy Policy, (2) Biodiversity and Nature Conservation Related Policy, and (3) Political Science Theory. This is because the intersection of climate change and renewable energy policy with biodiversity and nature conservation policy is fundamental to this research. The integration of which is fundamental to tackling climate change (van Zeijts et al., 2017; Randle-Boggis et al., 2020). Additionally, the political science theory will aid in the creation of a conceptual model with respect to the three aforementioned areas.

Companies need to comply with policies and the extent to which they do so often depends on the financial cost and/or gain to come from a given action. These actions will be viewed through the lens of the rational choice theory approach to policy[3]. In order to easier comply with the EU level

[3] This will be discussed further in the *"Political Science Theory"* section below.

policies, developers can implement their own forward-thinking policies on an organisational level resulting in them being proactive rather than reactive in the market. It is in the best interests of businesses to warrant the continued functioning of ecosystems to provide both business and societal value (World Business Council for Sustainable Development, 2011). It is suggested that insufficient economic incentives and investments for safeguarding effective compliance and the enforcement of legal instruments at the national or European level may lead to ineffective and inefficient policies that simply do not work (Ambalam, 2014). Businesses should work more closely with policymakers on the design and implementation of biodiversity conservation and ecosystem-related policy, which would notably boost the likelihood of bringing successful policies to the table (World Business Council for Sustainable Development, 2011). The United Nations stated that *"[they] recognise that social and economic development depends on the sustainable management of our planet's natural resources",* (United Nations, 2015: 9).

Policy Framework

Climate Change and Renewable Energy Policy

Jackson (2011) stated that due to the subsequent trajectory of renewable energy policy it is evident that we will see more, and larger renewable energy projects planned and completed in the next decade (Jackson, 2011). This holds true today, with the solar renewable energy sector alone having an annual turnover of 1.96 billion Euros, with more than 10 million solar systems installed in Europe (European Commission, 2020a). However, the growth in the renewable energy sector will put further pressure on both land and water (van Zeijts et al., 2017). In the Netherlands, the Climate Act[4] (Ministry of Economic Affairs, 2020) protects land and water, and provides a framework for the establishment of a national policy on greenhouse gas emission

[4] Enacted May 2019

depletion to 49% by 2030, and 95% by 2050, in comparison to the 1990 level. The Climate Act was then superseded by the National Climate Agreement[5] which detailed how the 2030 target should be achieved (PBL, 2020).

The National Climate Agreement is an adaptive agreement based on five key pillars. The five key pillars are, (1) Built Environment, (2) Mobility, (3) Industry, (4) Agriculture and Land Use, and (5) Electricity (Dutch Ministry of Economic Affairs and Climate Policy (DMEACP), 2019). The primary goal of the agreement was to achieve a 49% reduction in greenhouse gas emissions by 2030 in comparison to the 1990 level (DMEACP, 2019). However, a secondary goal of the National Climate Agreement is to increase the European target from 49% to 55% by 2030. This is because it is expected that an increase in the European target can change the national and international policy context (Tompkins & Amundsen, 2008; Stavins et al., 2014; DMEACP, 2019).

According to The Climate and Energy Outlook (2020)[6], if the 49% reduction target is to be achieved by 2030, the annual reduction rate will need to be double what it is at present. Between 2010 and 2019, the average annual emission reduction was equivalent to approximately 3 Megatonnes (Mt) of CO_2. In the next decade, this will need to reach 6 Mt of CO_2 annually to meet the 2030 target (PLB, 2020).

[5] June 2019

[6] The Climate Energy Outlook is a joint publication by PBL Netherlands Environmental Assessment Agency, TNO Energy Transition, Statistics Netherlands (CBS), the Netherlands Enterprise Agency (RVO) and the Netherlands Institute for Public Health and the Environment (RIVM).

On 20th December 2019, the Dutch Supreme Court, the highest court in the Netherlands, upheld the prior conclusions in the Urgenda Climate Case[7] (Cox, 2016). This case stated that the Dutch Government has a responsibility and obligation to acutely and substantially reduce emissions in line with human rights obligations making it the first successful climate change action established under tort law[8] (Cox, 2016). It was also the first time that a court had stated the bare minimum emissions' reduction goal for a developed country (de Graaf & Jans, 2015). With the current trajectory, it is uncertain that the Netherlands will reach the Urgenda target, even if there had been a bigger second COVID-19 wave of infections accompanied by further lockdowns causing a decrease in emissions as was the case during the first wave (PLB, 2020).

The EU's 2020 Climate and Energy Package[9] is a set of laws passed to safeguard the EU into meeting its climate and energy targets for 2020. The 2020 package contained three key targets to achieve by 2020, (1) 20% to cut greenhouse gas emissions compared to the 1990 level, (2) 20% of the EU's energy supplied by renewables, and (3) 20% improved energy efficiency (European Commission, 2019a). The EU was on track in meeting its 20% energy efficiency goal (European Environment Agency, 2020), and its 20% emissions reduction goal for 2020 with greenhouse gas

[7] To quote from the Urgenda Foundation website; "*The Urgenda Climate Case against the Dutch Government was the first in the world in which citizens established that their government has a legal duty to prevent dangerous climate change. On 24 June 2015, the District Court of The Hague ruled the government must cut its greenhouse gas emissions by at least 25% by the end of 2020 (compared to 1990 levels). The ruling required the government to immediately take more effective action on climate change."* (Urgenda Foundation, 2020)

[8] In common and civil law, tort is any occurrence of harmful behaviour such as a physical attack on a person (Markesinis, 2021), or, in this instance, it is the negligence of the Dutch government to take care of its citizens by protecting them from climate change through the reduction of emissions.

[9] The EU also has Climate and Energy Packages set up for both 2030 and 2050. The key targets for 2030 include; (1) 40% cut to greenhouse gas emissions from the 1990 level, (2) a minimum of 32% market share for renewable energy and, (3) a minimum of 32.5% improved energy efficiency (European Commission, 2019a). The 2050 Package is a long-term strategy whereby the EU plans to be climate-neutral, an economy with net-zero greenhouse gas emissions, by 2050. This target is at the core of the European Green Deal and embedded within the EU's pledge to Global Climate Action under the Paris Agreement (European Commission, 2019a).

emissions reduced by 24% between 1990 and 2019, while, at the same time, the economy grew by 60% (European Commission, 2019a). Furthermore, approximately 38% of the EU's energy came from renewable sources in 2020 (Vetter, 2021).

These policies are not always having the desired effect on renewable energy or solar park development[10]. There is a disconnect between the policies put in place on an EU or national level and those that are enforced on the ground. Regardless of the overall effectiveness in terms of achieving the set goals, it is the policy context of the EU that is driving the development of solar parks and the protection of biodiversity on national levels (Vatn, 2005; Stavins et al., 2014).

Biodiversity and Nature Conservation Policy

"In developing climate change law we must not forget the need to protect and enhance biodiversity ... instead we should seek win-win sustainable development solutions that reduce [greenhouse gases] while protecting and enhancing biodiversity" (Hodas, 2008: 399). The planet is losing biodiversity like never before due to unsustainable human activities (European Commission, 2020b). The climate crisis that we face and biodiversity loss are interdependent crises and they constantly aggravate each other (European Commission, 2020b). This is why it is exemplary that nature restorations are already planned to be a core element in the EU's COVID-19 recovery plan through providing immediate business and investment opportunities to restore the EU's economy (European Commission, 2020c). The economic and social costs of inactions would be monumental as biodiversity loss and ecosystem collapse are some of the most prevalent threats to human life in the next decade (European Commission, 2020c).

[10] For example, Article 17 of the Kyoto Protocol for Climate Change (1997) established carbon markets in an agreement that was fundamentally flawed and essentially *"set back the solution process by decades"* (Rosen, 2015: 40), thus showing the consequences of misguided policies.

The largest nature conservation initiative in Europe is called Natura-2000[11] (Dutch Ministry of Agriculture, Nature and Food Quality (DMANFQ), 2005). The Habitats Directive[12] (1992) and the Birds Directive (1979) also are fundamental to the EU's biodiversity policy (European Commission, 2010). The EU has the aim of establishing protected areas for at least 30% of land and sea in Europe (European Commission, 2020b). This also relates to the Nitrogen Action Plan[13] approved by the Dutch Council of State in 2019 which aims to have 40%, 50%, and 74% of the nitrogen sensitive Natura-2000 areas to be at less than the critical deposition value in 2025, 2030 and 2035 respectively (Wedzerai, 2021), which is obligatory under the Habitats Directive (1992) and the Birds Directive (1979).

It is the Nature Conservation Act 2017, that protects natural areas, wild plants and animals in the Netherlands (DMANFQ, 2017). However, there is currently little or no policy in place for the conservation of biodiversity when establishing a solar park. PBL (2017) has stated that it is not possible to stop biodiversity loss through nature regulations alone. Thus, expanding the range of policy strategies is necessary for nature conservation and development. This will potentially stimulate discretionary efforts that move outside the range of regulation, and lead to the formation of new coalitions between government authorities, businesses and citizens (van Zeijts

[11] Upon completion, it is intended to be a systematic pan-European nature network. This network aims to cover 18% of EU land and 8% of EU marine territory (European Commission, 2008).

[12] A directive is a legally binding act of the European Union that outlines a set of objectives that each member state achieves, however, the member states are allowed to choose *how* to achieve the objectives (European Commission, 2019b).

[13] The Nitrogen Action Plan is what sparked the protests by farmers over the past 18 months (Pira, 2019), as the government wants to halve the livestock population in the country to deal with The Nitrogen Crisis (Schaart, 2019).

et al., 2017). The participation of non-governmental and non-business actors is fundamental to the success of these policies.

Communicating and clarifying nature's relevance for a sustainable future of economic sectors is considered to be one of the key challenges in creating policy, thus, embedding nature considerations in other policy areas is crucial to combat biodiversity loss and more general pressures on nature (PBL, 2017). Embedding this type of policy is more likely to succeed when the fundamental values and distinctive challenges and motivations of each industry or sector are both understood and acknowledged (van Zeijts et al., 2017). This should comprise all relevant stakeholders, including locals and non-state actors. Over the next century, climate change is anticipated to be one of the biggest drivers of biodiversity loss (Heller & Zavaleta, 2009). However, many authors view the installation of solar parks to be an opportunity for enhancing our biodiversity (Viertl et al., 2015; Peschel et al., 2019; Taylor et al., 2019, Schotman, et al., 2021).

Political Science Theory

Political theory is being reviewed to highlight the importance of non-governmental and non-business actors in the protection of the environment and the creation of policy. Prior research has established regulation to be a key determinant of organisations acting in an environmentally friendly way (Irwin & Hooper, 1992; Green, McMeekin, & Irwin, 1994). Industry certainty can be increased through regulation and standards, however, if these are misinformed they can have an unintended impact on the market (Stern, 2008).

When it comes to environmental policy, market-based instruments tend to be more effective than command-and-control regulations (Hockenstein, Stavins, & Whitehead, 1997; Stavins, 2003). This is because command-and-control regulations have the tendency to stunt the evolution of mechanisms or technologies which may have had a greater effect, and market-based incentives could feed into the motivations for organisations to act environmentally friendly (Stavins, 2003). There are numerous policy instruments available to promote the protection of the environment and the establishment of solar energy parks. For example, tradable permits, charge systems, market friction reductions, and information instruments (Jaffe, Newell, & Stavins, 2001; Stavins, 2003; Tews, Busch, & Jörgens, 2003; Jordan, Wurzel, & Zito, 2005; Vatn, 2005; Bailey, 2007).

Throughout this research, policy is being viewed through the lens of Rational Choice Theory because organisations are seen as rational economic actors (Zsolnai, 2018), and economic actors are described as being self-interested when acting under external constraints (Vatn, 2005). In short, Rational Choice Theory is *"built around the idea that all action is fundamentally rational in character and that people calculate the likely costs and benefits of any action before deciding what to do"* (Scott, 2000: 1). It is an effort to merge the benefits of theory-guided research with the well-built experimental custom of sociology (Coleman & Fararo, 1992). The surfacing of rational models has been seen as the foundation upon which the decision regarding which government mechanisms to use has been built, and the contributions of such models to the creation, implementation, and evaluation of policy have been significant (Neimun, & Stambough, 1998).

It is known that national climate policy can be shaped by international climate policy (Tompkins & Amundsen, 2008), and the success of international policies can be affected by national policy and political structure (Stavins et al., 2014). Additionally, a crucial factor that is frequently disregarded is how priorities change because of public discourse, *"it involves a change in public understanding of responsible behaviour"* (Stern, 2008: 24). Public discourse has been focused on climate change and related themes for a number of years now, and the policy instruments used to deal with it impact public behaviour and preferences (Vatn, 2005). Thus, it can be concluded that if market-based mechanisms are implemented, such as the establishment of institutional arrangements which take the *"multidimensionality of values characterising environmental choices"* (Vatn, 2005: 215) into account, the environmental policy would be significantly more successful (Neimun, & Stambough, 1998; Jaffe, et al., 2001; Stavins, 2001; Vatn, 2005).

METHODS

Research Design

To date, there has been very little research done on the interactions of biodiversity and policy on the establishment and operation of solar energy parks (Taylor et al., 2019). Thus, to fulfil this research, qualitative methods were used in the form of semi-structured interviews with various stakeholders of the Dutch solar energy industry. This interview style was chosen because it is the most appropriate for this type of exploratory research (Bell, Bryman, & Harley, 2018). The purpose of this exploratory research was to discover the possible ways to encourage the development of solar parks in order to stimulate biodiversity and to outline the themes for further, more in-depth and specific research into the ways in which solar energy companies can help in the battle to halt biodiversity loss. Due to the lack of research and literature completed in this area, a grounded

research approach was used to find out the drivers, barriers, and activities associated with the establishment and operation of solar energy parks in relation to biodiversity and policy.

In total, seven interviews took place with, (1) Wageningen University & Research (WUR), (2) GrunnegerPower, (3) Solarfields - Asset Manager, (4) Solarfields - Policy Expert, (5) Holland Solar, (6) TNO, and (7) Eelerwoude.

These organisations were selected because they represent a diverse and unique cross-section of the solar energy industry in The Netherlands. The specific reasons for the selection of each stakeholder can be seen in *Appendix 1*. An overview of all the participants and their areas of expertise can be seen in *Table 1* below.

Table 1: Overview of Interviewees

Interview Number	*Organisation*	*Interviewee Background*	*Duration of Interview*
One	**Wageningen University and Research (WUR)**	Landscape ecologist. Researcher for 40 years on nature conservation. Currently an ecologist at WUR. Researching the effects of solar parks on biodiversity since 2017.	33 min, 8 sec
Two	**Grunneger Power**	Employee at Grunneger Power. Developer for solar plants on land with the aim of developing them in a more natural way. Intending to make ground-mounted solar parks rich in biodiversity.	46 min, 4 sec
Three	**Solarfields**	Asset Manager at Solarfields, meaning they maintain/manage the grounds of solar parks developed by Solarfields but also ones developed by external parties. Current focus is on improving biodiversity in their ground-mounted solar parks.	48 min, 50 sec
Four	**Solarfields**	Project Manager responsible for having a clear overview on relevant policy developments and engagements by politicians. Expert in the area of policy and politics.	63 min, 20 sec
Five	**Holland Solar**	Policy and Public Affairs Officer at the Solar Industry Association. Within Holland Solar they are responsible for anything that has to do with large-scale ground-mounted solar, as well as rooftops. At the moment, they work a lot on strategies related to biodiversity.	76 min, 26 sec
Six	**TNO**	Researcher and Programme Manager at TNO. Expert on advanced solar parks, dealing with the full complexity of the park ranging from the business case to integrating societal values. Chair of National Consortium Solar in Landscape, *Zon in Landschap.* Through this they initiate networks and collaboration on the topics of aesthetics, biodiversity, Agri-PV, grid integration and more.	62 min, 55 sec
Seven	**Eelerwoude**	Landscape Designer at Eelerwoude, working at lot in rural areas helping solar companies to develop solar parks, aiding them with the requesting of the permit and matching farmers with developers. Writes policies for municipalities, working with them on the development and application of such. Practical researcher regarding effects of solar parks on the soil underneath the panels. Also operates a biodynamic farm.	66 min, 1 sec

Additionally, there is a collaboration between TNO, WUR, Eelerwoude, Holland Solar and NL Green Label in which they are developing a certification for solar parks with added ecological value. Their ongoing research will result in a national *"Solar EcoCertified"* label (TNO, 2021). This research is in addition to the SolarEcoPlus[14] project where researchers assess identical features in new solar parks that are being built with new unconventional set-ups (TNO, 2021). Thus, it can be understood that much of the research on solar parks and biodiversity is yet to come, showing that exploratory research is the most suitable option.

Research Context

Data Collection Methods

Primary data was collected for this research through online[15] semi-structured interviews with the abovementioned stakeholders from the Dutch solar energy market. This interview style was chosen because it can aid in guiding the interviewer through the interview while still allowing them to be prepared in advance for the interview (Bell et al., 2018). Additionally, it allows the interviewee the freedom to articulate their views and/or opinions autonomously (Bell et al., 2018). By utilising probing techniques, it was possible to gather additional data and ask additional questions when the interviewee did not sufficiently answer the question (Bell et al., 2018). A purposeful sampling method was used because there was specific knowledge or criteria that the interviewee needed to have so that various perspectives could be established. Each interview lasted 30 to 70 minutes and the participants were asked questions related to their

[14] SolarEcoPlus is a collaboration of LC Energy, TNO, Wageningen University & Research, Eelerwoude and SolarCentury where they carry out research into the effect of solar parks on soil quality and biodiversity in six Dutch solar energy parks. The Netherlands Enterprise Agency (RVO) is subsidising the project with €3.6 million. The primary goal of the project is to specify both the economic and ecological return through the novel double-acting panels for sand, peat and clay, the most typical soil types present in The Netherlands (TNO, 2020)

[15] The interviews were conducted and recorded using Google Meets, thus both the researcher and participant received a copy of the recording. It was not possible to undertake in-person face-to-face interviews due to the nationwide COVID-19 lockdown and restrictions.

knowledge on the interaction of biodiversity and policy on the establishment and operation of solar energy parks.

Table 2: Sample Interview Guide

***Solar Energy Industry Stakeholders**: Wageningen University and Research [Research-Based Stakeholder]*

Theme	***Questions***	***Possible Probes***
Solar Parks	*When it comes to the establishment and operation of solar energy parks, what do you believe are the main challenges that companies should look out for?*	Political? Social? Financial? Environmental?
	Is there a way that these challenges can be eased?	e.g., tax breaks; collaboration between companies, ecologists, and the govt.; more guidelines for companies
Biodiversity	*Are you aware of the impact that solar parks have on Biodiversity in an area? (or is it known/discussed in the industry?)*	Have you ever tried to measure this impact? Or tried to find out the impact?
	What motivates you (or companies in general) to go beyond the bare minimum of what is expected of you as a company? i.e., how can one stimulate discretionary/voluntary efforts that move outside the range of regulations.	In terms of acting in an environmentally friendly way? e.g., protecting and improving biodiversity even though no regulations tell you to do this
	What land-management practices do you use (or could you use) to encourage/improve biodiversity and ecosystems?	e.g., cutting the grass and taking it away afterwards has been proven to encourage the presence of biodiversity in solar parks.
	Is there any (or do you know of any) company-level policy in place to protect biodiversity or encourage the protection of such?	If yes, which companies? Or what is the policy? If no, why do you [Holland Solar] not aid companies in the development of this?
Policy	*Are you aware of the new EU Taxonomy Regulations?* It established a framework for the EU by setting out six overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable.	The Taxonomy Regulation est. six environmental objectives; 1. Climate Adaptation 2. Climate Mitigation 3. The sust. use and Protection of Water and Marine Resources 4. The Transition to a Circular Economy 5. Pollution Prevention and Control The Protection and Restoration of Biodiversity and Ecosystems
	Do you know what implications this may have for/on biodiversity and ecosystems?	If no, what do you believe the implications could be?
	What factors do you believe encourgae or prevent researchers and/or companies from complying with biodiversity and ecosystem realted policies?	Is it classic cost/benefit or are there other factors involved? E.g., image, CSR, impact assessment, GRI, etc.
	Is there a way in which researchers/consultancy companies can work closely with policy makers on the design and implementation of policies (in order to make them more successful)?	e.g., a platform or something like this Would you be willing to actively take part in such a discussion?
Theory of change	*To what extent does policy and/or regulatory changes encourage you as a company (or companies in general) to change the way you/they operate?*	

The main themes along which participants were asked questions remained the same, but the questions varied depending on the participant because different participants have different bodies of knowledge. The four themes along which they were interviewed were (1) Solar Parks, (2) Biodiversity, (3) Policy, and (4) Theory of Change. Above, in *Table 2*, you can see a sample interview guide that was used for interview one, however, each of the Interview Guides can be

seen in *Appendix 2 - 6.* These specific questions were chosen based on the literature and theory that was gathered previously, plus the information necessary to answer the research question[16].

Data Analysis Methods

During the initial interview coding stage, the transcribed interviews were analysed using ATLAS.ti Software. ATLAS.ti is employed to aid in the qualitative analysis of large bodies of video, audio, visual and textual data. During the use of the tool, the texts of the transcribed interviews were analysed and explained using note-taking and coding proceedings. To define the codes during the data collection stage, and the codes from the interview transcripts, a conventional content analysis approach was applied. Meaning the codes are derived directly from the text data when using this approach (Hsieh & Shannon, 2005). A conventional content analysis approach was used because this was exploratory research (Hsieh & Shannon, 2005).

There were three coding cycles for the transcripts. The nature of the first cycle was exploratory as it was done to define common themes running throughout the interviews (Saldaña, 2021), which identified 38 initial codes that can be seen in *Appendix 7.*

Cycle two continued to explore the common themes to build a theoretical framework (Saldaña, 2021). During this cycle, the initial codes were split into their various challenges/barriers, motivations/drivers and activities which resulted in a new total of 72 codes. The 72 codes related

[16] For example, Solarfields was asked questions regarding the current market and the barriers which are present for companies when establishing solar energy parks, the ecologist from WUR was ask questions about the ecological impact of solar parks on biodiversity along with general do's and don'ts regarding land-management practices, and TNO was asked about research in the area regarding what current mechanisms are being used to halt biodiversity loss and what forums are in place for stakeholders to discuss such.

to Challenges/Barriers (30 Codes), Motivations/Drivers (18 Codes), and Activities (24 Codes) can be seen in *Appendix 8, Appendix 9, and Appendix 10* respectively.

The nature of the third cycle was more explanatory as the data was re-analysed to determine if any insights occur into the untapped potential of solar energy parks in The Netherlands (Saldaña, 2021). Cycle three regrouped the codes from cycle two into their appropriate themes resulting in a final number of 10 codes in total. The 30 Barriers identified were merged to create 4 overarching themes, see *Table 3 below*.

Table 3: Challenges/Barriers and Resulting Themes

Challenges/Barriers – Round 3 Codes

Codes Merged	***Resulting Themes***
Governance Issues: Policy *Policy: Challenges & Barriers* *EU Taxonomy Regulations: Challenges* *Gedragscode Challenges* *Impact of Solar on Policy in NL* *SDE+ Subsidy Challenges* *Governance Issues: Permits* *Permits Challenges & Barriers* *General Issues: Governance Challenges* *Governance Issues*	Regulatory Barriers
Biodiversity Protection *General Issues: Ecological Challenges* *Governance Issues: Ecological Challenges* *Land-Management Practices Challenges* *Climate Change Challenges*	Biodiversity Protection Barriers
Current System: Challenges *General Issues: Grid Challenges* *General Issues: Renewable Energy Related Challenges* *General Issues* *Research Being Done: Challenges* *Collaboration: Challenges*	Current System Barriers
Challenges/Barriers in Establishment *General Issues: Business Related Challenges* *General Issues: Social Challenges* *Farmers: Challenges* *Public Perception* *Issues with developers* *Energy Co-Op Challenges/Barriers* *Motivations of Developers Challenges* *Key Industry Organisations Challenges*	Challenges in Establishment

The Drivers from the second cycle were amalgamated to create 3 different overarching themes. The initial codes and resulting themes can be seen in *Table 4* below.

Table 4: Motivations/Drivers and Resulting Themes

Motivations/Drivers – Round 3 Codes	
Codes Merged	***Resulting Themes***
Policy Motivations/Drivers *Impact of Solar on Policy in NL* *EU Taxonomy Regulations Motivations/Drivers* *SDE+ Subsidy: Motivations/Drivers*	Regulatory Drivers
Collaborations Drivers *Energy Co-Op Drivers* *Motivations of Co-Ops: Positive Motivations/Drivers* *Motivations of Developers: Positive Motivations/Drivers* *Image of Solar Companies* *Current System: Motivaitons/Drivers* *Farmers Motivations/Drivers* *Permits: Drivers*	Developer Drivers
Biodiversity Protection: Motivations/Drivers *Climate Change: Motivations/Drivers* *Reasons for Steps* *Future of the Solar Industry: Motivations/Drivers* *Research being done: Motivations/Drivers*	Biodiversity Protection Drivers

Finally, the Activities codes were then compounded to create 3 overarching themes that can be seen in *Table 5* below.

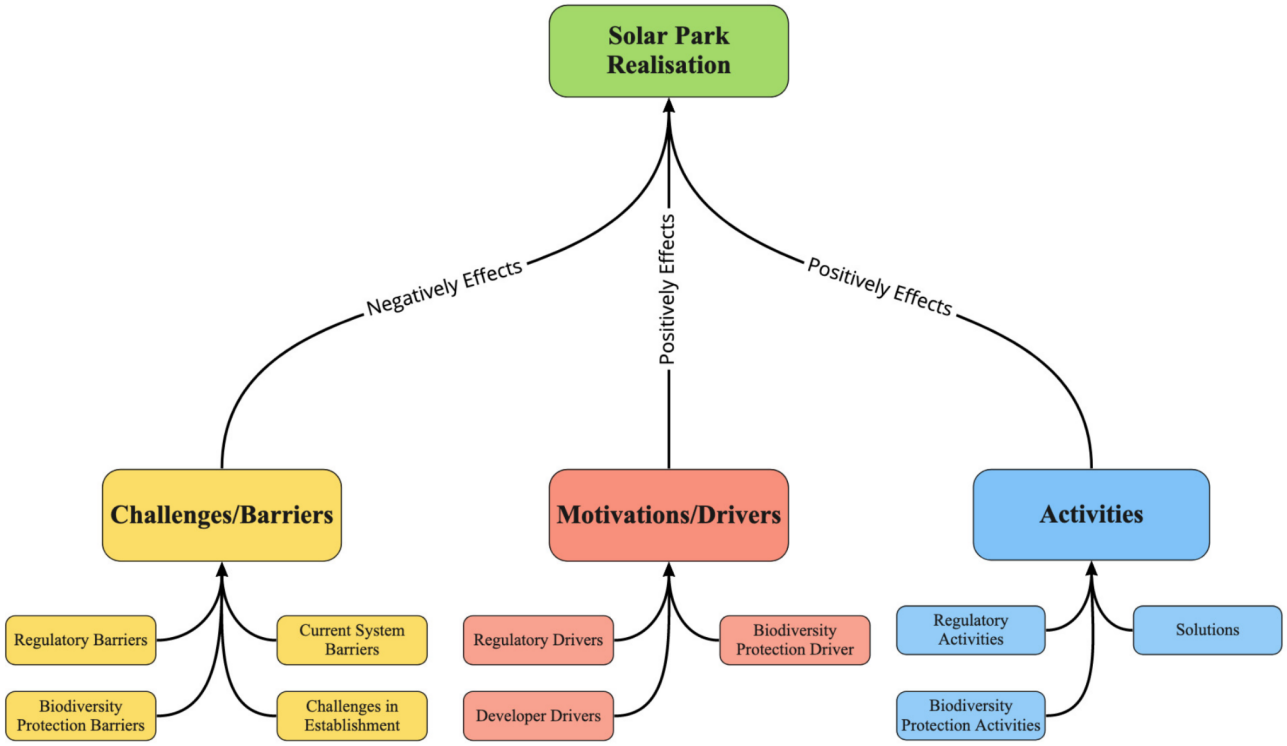
Table 5: Activities and Resulting Themes

Activities – Round 3 Codes	
Codes Merged	***Resulting Themes***
Policy Activities *SDE+ Subsidy: Activities* *EU Taxonomy Regulations: Activities* *Gedragscode [Holland Solar]: Activities* *Impact of Solar on Policy in NL: Activities* *Permit Activities* *Motivations of Developers: Activities* *Current System: Activities* *Proactive Engagement* *Where to Establish Solar Parks*	Regulatory Activities
Biodiversity Protection: Activities *Climate Change: Activities* *Collaboration: Activities* *Research being done: Activities* *Land Management Practices: Activities* *Result of Taking Steps*	Biodiversity Protection Activities
Solutions *Future of the Solar Industry: Activities* *Steps to Take* *Ways to Change* *Key Industry Organisations: Activities* *Industry Association: Activities* *Energy Co-Op: Activities* *Farmers: Activities*	Solutions

For the duration of each cycle, descriptive codes were used to produce insights about the research while keeping in mind the opinions of respondents. Additionally, some codes were determined through the observation of patterns in interviewees' responses across all interviews. Triangulation of data was used to verify much of the information provided by interviewees. Further online research of both scholarly and grey literature produced results that were in line with the information provided by the interviewees. Thus, their statements were labelled as truthful as no inconsistencies could be found.

Given the data analysis, the overall conceptual model that was developed can be seen in *Figure, 1* below. A more specific conceptual model can be seen in *Figure 2,* of the findings section.

Figure 1: Overall Conceptual Model



FINDINGS

The interview data has been analysed, the results of which will be presented in this section as a general overview before delving into deeper detail along each of the emergent themes. The aim of the findings is to provide an overview of the barriers, drivers, and activities that are faced when establishing and operating a solar park in relation to biodiversity and policy.

Results

The data analysis proved fruitful as it resulted in a number of barriers, drivers, and activities that are present in the establishment and operation of solar energy parks in relation to biodiversity and policy. These factors can be broken down into a variety of categories.

Barriers

The barriers faced in relation to biodiversity and policy when it comes to establishing and operating a solar park are, (1) Regulatory, (2) Establishment, (3) Biodiversity Protection, and (4) The Current System. Two quotes related to each of the barriers can be seen in *Table 6* below.

Table 6: Challenges/Barriers and Quotes

Barriers	***Quote***	***Participant Number & Organisation***
Regulatory Barriers	I think municipalities are free to come up with their own plans. I've heard some. Yeah, during the election time, they had some plans of making an official law or just you have to protect the land, you're building your solar plant on, but now elections are over I haven't heard anything about it.	3: Solarfields
	The problem at the moment is that there is a lack of policies for solar parks. And there is a lot of confusion and a lot of conflict between ministries. I know of the projects, where the Ministry of Agriculture and the Ministry of Economic matters and Climate both have to agree with the project. And one ministry agrees and the other doesn't agree. And they are in conflict and some communities or provinces have a completely different policy, according to solar parks, and biodiversity and agricultural land use than other [provinces].	1: Wageningen University & Research
Biodiversity Protection Barriers	Only maintenance as cheap as possible, and then you don't have benefits for biodiversity	1: Wageningen University & Research
	The current framework is only aimed at protecting protected species, rather than promoting non-protected species. ... Every endangered species or biodiversity aspect needs its own management idea.	4: Solarfields
Current System Barriers	we are also trying to push for a bit better involvement of the private sector within those conversations that are happening because you don't want certain ideas about how a park should be developed to get into law if that is not actually making sense on the ground.	5: Holland Solar
	So, an East-West orientation per panel produces 10% less electricity annually than a South oriented panel ... you can better balance the grid connection with an East-West field, because you'd have less of a peak in the middle of the day, and you spread it a bit more out over the day.	6: TNO
Challenges in Establishment	there are some companies in region who kind of well, took over all the agricultural lands and put solar parks in there without any consulting the people live around there, and not even taking into account that there's maybe nature that you have to take into account.	2: Grunneger Power
	So political will and perhaps also, the community doesn't always like new spatial developments. But I think that's something that's relevant for whether it's a housing area or commercial area being developed, every spatial development being done in something, what was green, like, small farm area, there's always resistance.	4: Solarfields

The challenges that developers face go much deeper than biodiversity or climate change-related themes. They face a multitude of barriers related to the establishment of solar parks and the current system. As the interviewee from Eelerwoude put it, asking someone how they want a solar park in their area, *"it's like asking them how they want to have a car crash"* (7).

The regulatory barriers in the solar industry appear to stem from the fragmented governance of the industry, thus are present at every level. On a national level, there is an overall lack of policy as much of the policies are decentralised *"to a provincial or municipal level, so it can be really hard to get stuff done"* (4). Each municipality can make their own decisions when it comes to the policies they want to establish, however, *"municipalities simply don't have the capacity and the knowledge to set up these rules in such a way that they are always in line with what the sector can deliver"* (5). The Dutch government has decentralised many different policy fields at the same time, and therefore they have overburdened municipal governments in general because they do not have the resources to spend time looking into all these policies and figuring out what works (5).

When establishing a solar park, developers face many challenges (Musango, Amigun, & Brent, 2011). According to the ecologist from WUR, *"a big challenge is to find a way to integrate solar parks in the present landscape ... apply[ing] solar parks only when they are not in conflict with food production ... or recreation or nature conservation."* (1). According to both Solarfields and Grunneger Power, financing is an additional barrier. This is partly due to the fact that the SDE+ Subsidy *"is being decreased year in year out based on the falling prices of PV globally ... there's no supplement for societal values in this SDE+ subsidy ... they do not include extra spendings*

for aesthetics ... they just consider that this should come out of the business case of the solar park" (6).

Furthermore, when it comes to the protection of biodiversity, the matter becomes even more complex. According to the policy expert from Solarfields, the lack of protection for biodiversity comes from the political context of the country; *"that's a bigger problem because ... the climate needs a long and stable policy environment ... we need stability to do major investments needed for the future, but the political timeframe is always four years, at most ... the political term is ... too short ... to protect the future climate"* (4). There is no subsidy or financial compensation for increasing the biodiversity of the land that you already have (3). Additionally, the physical location of solar parks is also a barrier, as each project differs in what they should do to protect biodiversity depending on the soil, landscape, ecological values, and surrounding community. As participant four stated, *"because ecological values are so locally bound, we can have a solar park in a municipality ... and also have a project in the same municipality but five miles downwind, and [there] could be a whole different landscape or ecological value"*. Furthermore, solar park developers do not have the knowledge, *"they don't have an idea of how to stimulate biodiversity and how to produce biodiversity ... it's possible but they are not doing so continuously, because most developers are not ecologists ... some people are only seeing dollar money"* (1).

One of the major barriers in the current system is the national electrical grid[17]. All the energy goes into the grid and is spread out across the country, *"this means there are certain areas ...*

[17] This grid is centralised meaning that if someone buys their electricity from a green company, that doesn't necessarily mean that they are getting their energy directly from that company.

don't have enough cables, for example, or ... they don't have enough capacity to get more energy" (3). It is a design and construction problem. The barriers faced by industry stakeholders are vast and extremely complex as it involves social, cultural, financial, ecological, geographical, and political factors, to name but a few.

Drivers

The main drivers of the establishment and operation of solar energy parks in relation to biodiversity and policy are associated with, (1) Regulatory Drivers, (2) Developer Drivers, and (3) Biodiversity Protection Drivers. In *Table 7* below two interviewee quotes related to each driver can be seen.

Table 7: Motivations/Drivers and Quotes

Drivers	*Quote*	*Participant Number*
Regulatory Drivers	there is a document called *Gedragscode* from Holland solar, it says a maximum of 70% of the fields should be covered by solar panels. And 30% space for other functions is enough to make something from it. I have the experience that most developers are using this rule of fist and working according to this agreement, but I've also seen solar parks that have very much higher coverage of solar panels, it's in that case, they're not working according to the *Gedragscode* code.	1: Wageningen University & Research
	there is a new law, that means also the greater solar parks need participation of the people who live around it.	2: Grunneger Power
Developer Drivers	it just shows of course what's happening in a public or at a national level is important.	3: Solarfields
	It's kind of logical because Groningen has historically been our gas supplying province, but they also carried the negative sides like the earthquakes. So people feel unsafe, and there's a growing sentiment there. Okay, we have to stop using our gas. So we have to do something else and then solar is one of the ways we can do it.	4: Solarfields
Biodiversity Protection Drivers	since a few years, we communicate that solar parks should not be realised within nature reserves. And as far as I know, they don't do that in the Netherlands. And we also communicated when you realise solar parks in intensively used agricultural fields. There are almost no losses for biodiversity because there is no biodiversity left.	1: Wageningen University & Research
	with a regular agricultural field, it's almost dead so the solar park on it, then it will increase a lot.	7: Eelerwoude

It appears that the main driver of the development of solar parks in relation to biodiversity and policy is regulation itself. According to participant six, solar parks in The Netherlands have a lot of potential when it comes to helping to improve biodiversity, especially when the park is established on a previously agricultural field because *"agricultural land has notoriously low*

biodiversity" (6). This was confirmed by the ecologist from WUR who stated, *"when the existing situation is that you have agriculture fields ... you can improve the biodiversity within the solar park"* (1), which can be seen as a driver of solar park establishment.

Furthermore, as the policy expert from Solarfields stated, *"there's been a big impact"* (4) of solar on policy in the Netherlands. The municipalities in the north of the Netherlands *"are much more progressive in their policies"* (4), and Groningen is leading the way in this policy field. Provinces tend to learn from each other because once one starts implementing ecological policy it *"spreads like fire"* (7) to the others[18].

Developers are motivated by various factors, for some, such as Grunneger Power they *"want more biodiversity, [they] want more equal money for the people who live around it, [they] want better impassing [integration] in the landscape"* (2). Solarfields appears to be much on the same page as this stating *"it's very important that we actually take into account biodiversity, not just because we have to or because the market is developing this way but because we actually believe as a company that we have to improve what we can improve"* (3). However, others are only motivated by money (1, 7). Additionally, taking care of biodiversity can be seen as a way to *"stand out from the competition"* (4). Solarfields thinks that *"there are more developers aiming to be stand out on ecological knowledge or values"* (4) as having this knowledge can be seen as a competitive advantage.

[18] The wave of new policies originating in the North is *"somewhere near Rotterdam at the moment"* (4) and is continuing its way South.

One major driver of biodiversity protection when it comes to establishing solar parks in the current system is the allocation of permits. This was confirmed by multiple participants, such as participant six who stated that, *"if there's a project developer doing much more for biodiversity, it can help them to get permits"* (6) and participant seven who stated, *"when they're at risk of not getting permits, they do everything"* (7). Additionally, the government is a big driver present in the current system, as interviewee four put it, *"Energy is tightly regulated. Energy is a right, a human right, ... so the government is everywhere in our energy markets ... whether it's funding our subsidy scheme, or creating demands for ecological values, or ... the protection of endangered species, or permitting procedures, [or] how you should engage with the community. They can demand all that ... they have a really tight rope. And a lot of pull strings to pull. If they want to adjust some part of our industry, pull one string, and everyone has to follow."*. The national government appears to have all the power, yet, the governance is dealt with on a municipal level.

There are many drivers for the development of solar parks. However, public opinion and the fact that Groningen was previously a gas supplying province[19], appear to be key drivers. As interviewee three said, *"we're part of society, which means we also change with the actuality of each day ... Sometimes we try to be proactive and want to work from our own core beliefs ... for example with biodiversity, but it [public discourse] can speed up the process ... if the whole country and public discourse is focused on the lack of biodiversity and the changing of the ground or landscape because of solar plants"* things may change faster. The image of companies affects their overall value (Smith, Smith, & Wang, 2010), "*every company is sensitive to public*

[19] Thus have taken the brunt of the negative effects related to fracking and extraction of fossil fuels.

interest … there are a lot of companies that only change because there is public pressure" (3). Public pressure can drive sustainable developments.

The public likes to be included in the policymaking process[20] (7). Now, there is a new policy from Gemeente Groningen that one must have 50% local support and participation before anything is done (2), developers must inform the locals that they will be developing a solar park near them, they must engage with and gather input from the locals (4). Residents like to be heard and feel as if their opinion matters (7). They want to be included in the development process, which can increase acceptance among both locals and farmers (4, 6, 7).

Activities

The primary activities that resulted from the analysis are, (1) Regulatory, (2) Biodiversity Protection, and (3) Solutions. Each of the activities, along with two quotes from participants can be seen in *Table 8* below.

Table 8: Activities and Quotes

Activities	*Quote*	*Participant Number*
Regulatory Activities	So, Groningen has already said that there has to be a think a metre and a half. Between the top of the panel if you have a south facing, and the next panel, or three metres, or at least there has to be a minimum distance now. So, there's enough sunlight and rain falling on the ground beneath.	2: Grunneger Power
	Maybe when solar developers can get cheaper money by complying with these rules. Cheaper than the money they get now, which is also quite cheap because of the solar panels, it is a green investment in the Netherlands, I think. So, it's a tax-free investment. Well, when they can get even more or cheaper money, maybe that helps them make better parks. Then you need to translate the policy in such a way that they understand it and they can use it. That they really see like "okay, that gives me one percentage less interest so that I can have this much more money to spend on the development"	7: Eelerwoude
Biodiversity Protection Activities	It's in provinces that have a clear policy, in favour of the environment, like Groningen you can get a licence to produce by listening to the, to the wishes of the Society, of the government,	1: Wageningen University & Research
	we have this list of European protected species of flora and fauna. If one of those species is believed or perceived to be present at your location, then you need to mitigate hindering them or whatever. Because obviously, they are protected. So, you can't go in and just build your stuff with your bulldozers or cranes	4: Solarfields
Solutions	public may create some pressure on you but you can also create some pressure on your suppliers or the rest of the supply chain to be green.	3: Solarfields
	you need to understand the whole regulatory context or just the whole context of the country, whether it's regulatory or cultural or political, to be able to be successful.	5: Holland Solar

[20] It is the direct or indirect local residents who are affected by the establishment of a solar park, and logically, they are usually the ones who protest about the park, especially if they weren't consulted in the process.

The highest number of factors were in relation to regulatory activities. The number of solar parks in The Netherlands has increased exponentially in the past decade (Londo, Matton, Usmani, van Klaveren, Tigchelaar, & Brunsting, 2020). As participant four stated, "*every part of government has been mandated to create their share in making the Netherlands a sustainable country .. one of the ways to achieve it is by using solar energy parks ... we need to develop our own policy framework or regulatory frameworks for it".* It is present at every level of governance *"whether it be national, provincial, or municipality level, all levels of government are busy with developing a framework"* (4). However, it is important to have a *"good biodiversity policy [that is] being recognised and to be independently confirmed ... [which is] helpful for your market volume ... but it will possibly squeeze your business case"* (6).

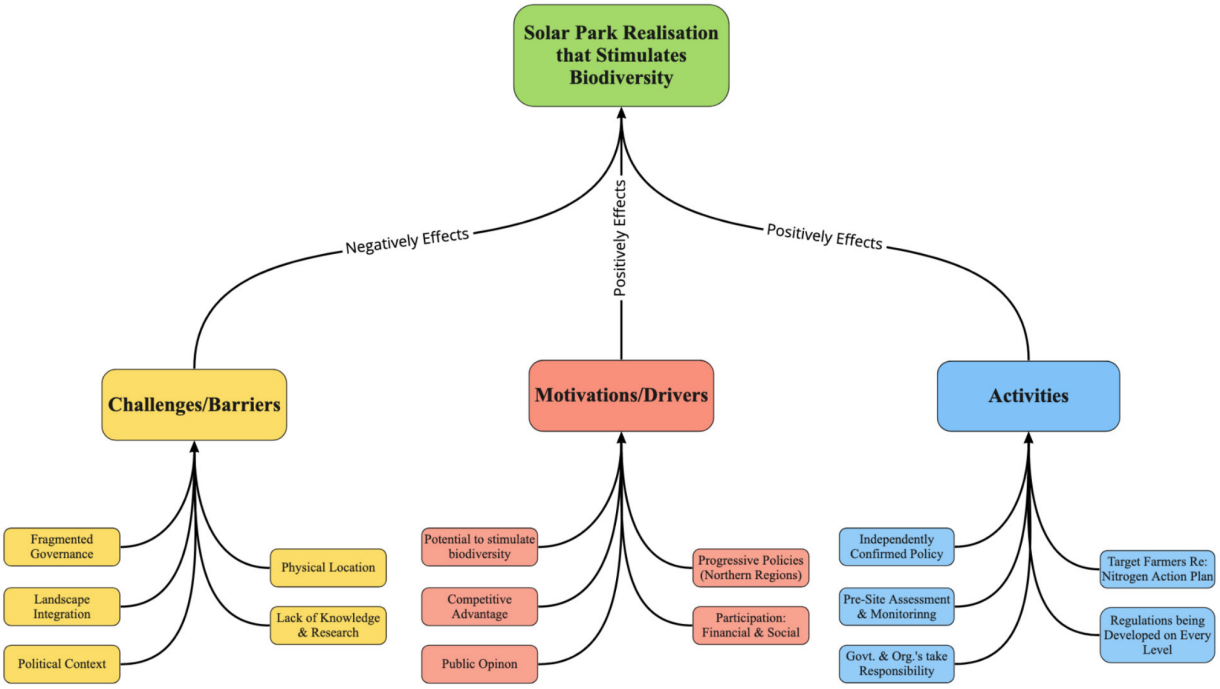
Biodiversity can be protected and stimulated in several ways such as assessing the sight prior to any developments (Schotman, et al., 2021). Eelerwoude recommends putting a specific type of fence around the site making it easier for small animals to pass through, and avoid putting a fence in a wetland area so that the marine life can still move about freely (7). The most commonly mentioned land-management practice mentioned by multiple interviewees was to cut the grass and then remove it afterwards, this stops the soil from becoming too fertile which is important to allow other types of flora to grow (1, 2, 3, 4, 6, 7). Additionally, "*gradients are very important in biodiversity ... every ecologist is looking for where you can find gradients ... [the] height of grass, [the] humidity of the soil, height of the soil, all these kinds of things they create*

possibilities for different types of insects and vertebrates and vegetation to grow ... this is what creates diversity" (6).

When it comes to solutions, according to participant five, from Holland Solar, the industry representative, you can define them at three levels. On a governmental level, governments need to take responsibility for the challenge that we are facing. They need to be honest and open with the public on the issue, *"to own up to the situation that we're in ... to say, "Look, I don't like the solar park either but ... we're not going to meet the [long-term] climate goals ... you can fight that all you want, but that is the situation"* (5). On an organisational level, companies have a responsibility to *"develop their projects with care for local people living around them, for biodiversity and ... landscape issues"* (5). This is because the consequences of not developing responsibly are far heavier than the effort required for developing the right way, by considering the wishes of local populations, biodiversity, and landscape (7). They need to make sure that money is not everything in the situation because it can have knock-on effects for the rest of the industry (1). The third level is industry, the renewable energy sector is the only sector that is actually paying local people living around projects[21]. Politicians and locals tend to forget that companies are adding other types of value, such as financial, social, and environmental, next to the renewable energy that is also being developed (5).

[21] There is a component of financial participation, where local people are financially profiting from the installation that is being built, which is not the case with any other development (2, 5).

Figure 2: Specific Conceptual Model



The conceptual model in *Figure 2* was developed to portray the main findings. Furthermore, it can be seen from the results prior, that the drivers, barriers and activities have some common factors. However, the main data element that stands out is the fact that the establishment and operation of solar energy parks in relation to biodiversity is a significantly more complex task than it would initially seem.

DISCUSSION

In this final section, the findings from the previous section will be discussed regarding the underlying theory of this research. Conclusions and Implications will be given based on each of the factors, barriers, drivers, and activities. Following this, the limitations of this research will be discussed and finally, there will be recommended future avenues to research identified.

Conclusions and Implications

The purpose of this research was to investigate the untapped potential of solar parks in The Netherlands, to provide information for developers about the drivers, barriers, and activities regarding the establishment and operation of solar parks in relation to biodiversity and policy. Seven industry stakeholders were interviewed to give insight into this question.

In general, the analysis showed that there is a national-level policy gap regarding solar parks and biodiversity which desperately needs to be filled if The Netherlands want to meet their long-term climate goals. It is evident that this gap has stemmed from the recent increase in the number of solar parks which has caused fragmented governance of the industry due to decentralisation and lack of coordination.

Barriers

Per the results section, the barriers that developers face when establishing a solar park are complex and multifaceted, much like any sustainability problem. This was very evident from each of the interviews, especially the regulatory, biodiversity, and establishment barriers. However, the challenges that developers face go much deeper than establishment or biodiversity-related themes. Not only do residents not want their landscape to change, but the politicians who possess the power to do something about the energy transition, are worried about the votes they may lose from allowing the development of solar parks in their jurisdiction. In theory, many politicians and their constituents are in favour of renewable energy, but in reality, their constituents don't want solar parks in their backyard (Devine-Wright, 2014), thus there is low political support. This is one of the cornerstones of the underlying governance issues that are foundational to challenges developers face when establishing solar parks.

Furthermore, the effect of decentralised policy is proportionally worse *"for the smaller municipalities that ... bear a proportionately much larger burden of ... renewable energy projects coming in because they're simply less inhabited"* (5). If there are no residents who form an energy co-op, such as Grunneger Power, it can be much more difficult for the needs and wants of locals to be heard. There is less cooperation between relevant parties thus miscommunication is more likely which may result in protests from local inhabitants if they have not been adequately informed. Establishing a solar park is not an easy task and takes nine months to one year to get only the permit. Prior to that, there is discourse for some number of months with locals and after that developers still need to apply for SDE+ Subsidy. As participant seven stated, *"more than half of the projects that are started don't get finished"* which can happen for a multitude of reasons such as permit issues or protests from local inhabitants.

Drivers

The primary drivers related to regulation, developers, and biodiversity protection. Many of the regulatory drivers stem from the monumental increase in the number of solar parks in The Netherlands over the past decade[22]. One example of this is the *Gedragscode* from Holland Solar, which is a policy framework that contains solid principles for solar parks *"like community engagement should be addressed in ABC way ... ecological values can be addressed in ABC way"* (4).

[22] The effect these drivers have had on the national regulatory framework can be seen in many developing markets. When a market emerges and the margin becomes large enough, a policy or regulatory framework is being created (4).

The developer drivers present themselves in many forms such as improved public image, competitive advantage, priority from municipalities and current public discourse. Loss of biodiversity is a global issue and it is essential for companies to be part of the solution (Vatn, 2005). Every market is moving toward sustainability and if solar park developers want to stay relevant, they need to move with the market trends. Saving money is always a motivation for companies and managing a solar park in a biodiversity-friendly way is *"a cheaper method of management"* (1). Additionally, due to the Nitrogen Action Programme enacted in 2019 to reduce nitrogen levels in Natura-2000 areas[23], thus farmers are being encouraged to reduce their livestock numbers (RIVM, n.d.). Farming is a labour-intensive profession and is one in which a sufficient pension is not guaranteed, consequently farmers can turn to developers, such as companies and energy co-ops. Farmers can transform one of their fields into a solar park meaning that they are guaranteed an income regardless of what circumstances may occur, thus providing them with financial stability while reducing their livestock. This has the potential to stimulate substantial synergies between stakeholders.

Activities

The activities that resulted from the analysis were in relation to regulation, biodiversity protection and possible solutions. As with any industry, there are numerous activities taking place at any one time. Some organisations prefer to be proactive rather than reactive in the market and one way this can be achieved is through partaking in the regulatory discussion. Most Dutch developers are represented in these discussions by either Holland Solar[24], or Energie

[23] Which is mandated under the Birds Directive and Habitats Directive

[24] The Solar Industry Association

Samen[25]. This conversation takes place on a much higher level than most developers operate, and due to the fragmented governance of the industry, not all of the policies translate into practice efficiently. The creation of regional working groups would aid in bringing the discussion down to a more local and accessible level. These market-based policy instruments would aid in knowledge dissemination and the development of more efficient and effective policies.

For the future of the solar industry, it is important not to think in terms of solar parks as an element in the landscape, but one should design new landscapes, including solar parks (1). Integration is a factor that is of concern to locals and there is an abundance of opportunities to develop multi-functional solar parks which over time will become energy landscapes (1). It is possible to create new energy landscapes and integrate the solar parks into them by taking previously agricultural land, where farmers have been *"growing crops in a desert"* (7) and changing it into renewable energy landscapes in which biodiversity can flourish for 25 years.

Much of the biodiversity protection activities in relation to solar parks and policy has a connection to research according to the interviewees. Considering the recency of the solar market boom, there is very little research done on the effects that solar parks have on biodiversity. However, it is understood amongst stakeholders that the way in which the land is managed is fundamental to stimulating biodiversity (Schotman et al., 2021).

The management phase of a solar park in The Netherlands is 25 years and it is the longest phase in the lifetime of a solar park. Ergo, it is crucial that there is a management plan in place which developers must adhere to and, most importantly, they are held accountable for attaining what is

[25] Represents the interests of Energy Co-Ops

expected. Any company, no matter how good they are, can fail simply from bad management practices, the same goes for solar parks and the creation of biodiversity. Using green land-management practices can make or break the biodiversity levels in that area (Schotman et al., 2021). The mismanagement from one solar park can echo throughout the country painting a negative image of the entire renewable energy industry (7). For solar park developers, it is evident from the findings that they need to constantly and actively engage with the local community, to include them in the design and construction from the very beginning.

Limitations and Future Research

For all participants, English was their second or third language which, at times limited the participant in expressing themself in the way they wanted. Thus, it is key that researchers manage the potential methodological complications regarding this language divide (Squires, 2010). Additionally, given that all the interviews took place online there was a drawback due to the slow internet connection experienced by some participants. Furthermore, it is not as easy to read body language via video as it is in person. As stated by Kendall (2008) when referring to online interviews, *"researchers need to carefully consider their limitations and proceed with caution"* (Kendall, 2008: 148). Considering the relative youth of the solar industry in The Netherlands, there is limited literature available as many studies are currently taking place or will start soon.

Finally, the most conspicuous limitation was time. Given the short timeframe, it was not possible to interview everyone that was planned, namely, NL Green Label and the Dutch Special Envoy Climate. However, there are limitations to every sample and it's important for all types of researchers to grasp them (Smith & Quelch, 1993). Nevertheless, *"there is no magic number of*

interviews" (Reay, 2014: 2), but researchers must collect an adequate amount of high-quality data.

Additionally, given that qualitative methods were used, there is an issue regarding the transferability of findings, but in the future, mixed methods can be used to deal with this drawback (Kelle, 2006). It would be of value to undertake sequential quantitative-qualitative research to create a more comprehensive interview guide. Through this, the quantitative research can be used to influence the selection of cases and themes for the subsequent qualitative research (Kelle, 2006). A key area to look at would be the determinants of solar park acceptance among local residents in The Netherlands, this has been done in other countries, such as the UK (Roddis et al.,, 2020), furthermore, it would be interesting to see if the results are generalisable to the Dutch population. Aside from research focused on social factors, further policy research is needed on the intersection of policy evaluation and the implementation of such in policymaking (Haug et al., 2010), as both biodiversity and solar park-related policy will need to be part of a productive irritative process.

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APPENDIX

Appendix 1: Reasons for Stakeholder Selection

Wageningen University and Research

The first interview was with an ecologist from WUR as they recently undertook the largest-ever Dutch research on solar parks and their effects on agriculture, soil, biodiversity and landscape (Schotman, van der Zee, Hazeu, Bloem, Sluijsmans, & Vittek, 2021). They provided knowledge on the intersection of ecology and solar power which was fundamental to this research.

Grunneger Power

Grunneger Power is an energy cooperative based in Groningen. In the Netherlands, energy cooperatives were created to encourage the creation of renewable energy. They are an organisation that is not connected with any private developer and are run for citizens, by citizens. There are 484 cooperatives in The Netherlands and Grunneger Power is the one in Groningen (Grunneger Power, 2020).

Solarfields

Solarfields is a Groningen-based solar energy company that was established in 2014 but is already the market leader in ground-based solar parks (Solarfields, 2020). They are leading the way not only in terms of ground-based solar park realisation but also in their land-management practices to aid the increase in biodiversity.

TNO

The Netherlands Organisation for Applied Scientific Research (TNO), is an independent research organisation that focuses on transitioning through various social themes including; *The Circular Economy and the Environment: Directing and Accelerating Sustainability,* and *Energy: Faster Towards Sustainable Energy Supply.*

Holland Solar

Founded in 1983, Holland Solar is an industry association representing the Dutch solar energy sector by ensuring that solar energy becomes the primary energy source in The Netherlands (Holland Solar, n.d).

Eelerwoude

Eelerwoude is a consultancy firm with considerable quantities of regional knowledge which specialises in the balancing of development, layout, and management of rural areas (Eelerwoude, 2020a). They have recently developed a guide for solar companies to help them establish solar parks with greater ecological quality (Eelerwoude, 2020b).

Transcripts can be found here.

Appendix 2: Interview Guide used for Interview One
Wageningen University and Research

***Solar Energy Industry Stakeholders**: Wageningen University and Research [Research-Based Stakeholder]*

Theme	***Questions***	***Possible Probes***
Solar Parks	*When it comes to the establishment and operation of solar energy parks, what do you believe are the main challenges that companies should look out for?*	Political? Social? Financial? Environmental?
	Is there a way that these challenges can be eased?	e.g., tax breaks; collaboration between companies, ecologists, and the govt.; more guidelines for companies
Biodiversity	*Are you aware of the impact that solar parks have on Biodiversity in an area? (or is it known/discussed in the industry?)*	Have you ever tried to measure this impact? Or tried to find out the impact?
	What motivates you (or companies in general) to go beyond the bare minimum of what is expected of you as a company? i.e., how can one stimulate discretionary/voluntary efforts that move outside the range of regulations.	In terms of acting in an environmentally friendly way? e.g., protecting and improving biodiversity even though no regulations tell you to do this
	What land-management practices do you use (or could you use) to encourage/improve biodiversity and ecosystems?	e.g., cutting the grass and taking it away afterwards has been proven to encourage the presence of biodiversity in solar parks.
	Is there any (or do you know of any) company-level policy in place to protect biodiversity or encourage the protection of such?	If yes, which companies? Or what is the policy? If no, why do you [Holland Solar] not aid companies in the development of this?
Policy	*Are you aware of the new EU Taxonomy Regulations?* It established a framework for the EU by setting out six overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable.	The Taxonomy Regulation est. six environmental objectives; 1. Climate Adaptation 2. Climate Mitigation 3. The sust. use and Protection of Water and Marine Resources 4. The Transition to a Circular Economy 5. Pollution Prevention and Control The Protection and Restoration of Biodiversity and Ecosystems
	Do you know what implications this may have for/on biodiversity and ecosystems?	If no, what do you believe the implications could be?
	What factors do you believe encourgae or prevent researchers and/or companies from complying with biodiversity and ecosystem realted policies?	Is it classic cost/benefit or are there other factors involved? E.g., image, CSR, impact assessment, GRI, etc.
	Is there a way in which researchers/consultancy companies can work closely with policy makers on the design and implementation of policies (in order to make them more successful)?	e.g., a platform or something like this Would you be willing to actively take part in such a discussion?
Theory of change	*To what extent does policy and/or regulatory changes encourage you as a company (or companies in general) to change the way you/they operate?*	

Appendix 3: Interview Guide used for Interview Two and Three.
Grunneger Power and Solarfields.

***Solar Energy Industry Stakeholders**: Grunneger Power and Solarfields [Operational Industry Stakeholders]*

Theme	***Questions***	***Possible Probes***
Solar Parks	*When it comes to the establishment and operation of solar energy parks, what are the biggest challenges that you as a company (or companies in general) face?*	Political? Social? Financial? Environmental?
	Is there a way that these challenges can be eased?	e.g., tax breaks; collaboration between companies, ecologists, and the govt.; more guidelines for companies
	What factors determine where you will establish a solar park?	
Biodiversity	*Are you aware of the impact that solar parks have on Biodiversity in an area? (or is it known/discussed in the industry?)*	Have you ever tried to measure this impact? Or tried to find out the impact?
	What motivates you (or companies in general) to go beyond the bare minimum of what is expected of you as a company?	In terms of acting in an environmentally friendly way?
	i.e., how can one stimulate discretionary/voluntary efforts that move outside the range of regulations.	e.g., protecting and improving biodiversity even though no regulations tell you to do this
	What land-management practices do you use (or could you use) to encourage/improve biodiversity and ecosystems?	e.g., cutting the grass and taking it away afterwards has been proven to encourage the presence of biodiversity in solar parks.
	Is there any (or do you know of any) company-level policy in place to protect biodiversity or encourage the protection of such?	If yes, which companies? Or what is the policy? If no, why do you [Holland Solar] not aid companies in the development of this?
Policy	*Are you aware of the new EU Taxonomy Regulations?* It established a framework for the EU by setting out six overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable.	The Taxonomy Regulation est. six environmental objectives; 1. Climate Adaptation 2. Climate Mitigation 3. The sust. use and Protection of Water and Marine Resources 4. The Transition to a Circular Economy 5. Pollution Prevention and Control The Protection and Restoration of Biodiversity and Ecosystems
	Do you know what implications this may have for your business? Or for the solar energy sector in general?	
	What factors would encourage or prevent you from complying with policies?	Is it classic cost/benefit or are there other factors involved? e.g., image, CSR, impact assessment, GRI, etc.
	Is there a way in which solar companies can work closely with policy makers on the design and implementation of policies (in order to make them more successful)? Or what motivates you to go beyond the bare minimum of what is expected of you?	e.g., a platform or something like this Would you be willing to actively take part in such a discussion?
Theory of change	*To what extent does policy and/or regulatory changes encourage you as a company (or companies in general) to change the way you/they operate?* *What factors would encourage companies to change faster?*	

Appendix 4: Interview Guide used for Interview Four and Five.
Solarfields and Holland Solar

***Solar Energy Industry Stakeholders**: Solarfields and Holland Solar [Industry Policy Experts]*

Theme	***Questions***	***Possible Probes***
Solar Parks	*What impact has the increase in the number of solar parks had on the regulatory framework in the Netherlands?* *Do you think that is it possible ot create policies and coinside with one another? i.e. protecting biodiverity and encouraging the establishment of solar parks?* *When it comes to the establishment and operation of solar energy parks, what are the biggest challenges that you as a company (or companies in general) face?* *Is there a way that these challenges can be eased?* *What factors determine where you will establish a solar park?*	Has there been a substantial increase in the number of laws/policies created relating to solar energy parks? Are there already policies such as this?
Biodiversity	*Are you aware of the impact that solar parks have on Biodiversity in an area? (or is it known/discussed in the industry?)* *What motivates you (or companies in general) to go beyond the bare minimum of what is expected of you as a company?* i.e., how can one stimulate discretionary/voluntary efforts that move outside the range of regulations. *What land-management practices do you use (or could you use) to encourage/improve biodiversity and ecosystems?* *Is there any (or do you know of any) company-level policy in place to protect biodiversity or encourage the protection of such?*	Have you ever tried to measure this impact? Or tried to find out the impact? In terms of acting in an environmentally friendly way? e.g., protecting and improving biodiversity even though no regulations tell you to do this e.g., cutting the grass and taking it away afterwards has been proven to encourage the presence of biodiversity in solar parks. If yes, which companies? Or what is the policy? If no, why do you [Holland Solar] not aid companies in the development of this?
Policy	*Are you aware of the new EU Taxonomy Regulations?* It established a framework for the EU by setting out six overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable. *Do you know what implications this may have for your business? Or for the solar energy sector in general?* *What factors would encourage or prevent you from complying with policies?* *Is there a way in which solar companies can work closely with policy makers on the design and implementation of policies (in order to make them more successful)? Or what motivates you to go beyond the bare minimum of what is expected of you?*	The Taxonomy Regulation est. six environmental objectives; 1. Climate Adaptation 2. Climate Mitigation 3. The sust. use and Protection of Water and Marine Resources 4. The Transition to a Circular Economy 5. Pollution Prevention and Control The Protection and Restoration of Biodiversity and Ecosystems Is it classic cost/benefit or are there other factors involved? e.g., image, CSR, impact assessment, GRI, etc. e.g., a platform or something like this Would you be willing to actively take part in such a discussion?
Theory of change	*To what extent does policy and/or regulatory changes encourage you as a company (or companies in general) to change the way you/they operate?* *What factors would encourage companies to change faster?*	

Appendix 5: Interview Guide used for Interview Six

TNO

***Solar Energy Industry Stakeholders**: TNO [Research-Based Industry Stakeholder]*

Theme	***Questions***	***Possible Probes***
Solar Parks	*When it comes to the establishment and operation of solar energy parks, what do you believe are the main challenges that companies should look out for?*	Political? Social? Financial? Environmental?
	Is there a way that these challenges can be eased?	e.g., tax breaks; collaboration between companies, ecologists, and the govt.; more guidelines for companies
	What impact has the increase in the number of solar parks had on the regulatory framework in the Netherlands?	
Biodiversity	*Do you think that is it possible to create policies and coinside with one another? i.e. protecting biodiverity and encouraging the establishment of solar parks?*	Have you ever tried to measure this impact? Or tried to find out the impact?
	Are there any regulations in place that guide companies as to HOW to protect biodiversity and ecosystems when they are operating a solar park? .	
	Are you aware of the impact that solar parks have on Biodiversity in an area? (or is it known/discussed in the industry?)	Do you believe this impact can be lessened? Or turned into a positive impact?
	What motivates you (or companies in general) to go beyond the bare minimum of what is expected of you as a company?	In terms of acting in an environmentally friendly way?
	i.e., how can one stimulate discretionary/voluntary efforts that move outside the range of regulations.	e.g., protecting and improving biodiversity even though no regulations tell you to do this
	What land-management practices could be used to encourage/improve the protection of biodiversity and ecosystems?	
	Can you name five relatively simple things that any solar energy company could do to improve biodiversity?	
	Is there any (or do you know of any) company-level policy in place to protect biodiversity or encourage the protection of such?	
	What land-management practices do you use (or could you use) to encourage/improve biodiversity and ecosystems?	
Policy	*Are you aware of the new EU Taxonomy Regulations?*	The Taxonomy Regulation est. six environmental objectives; 1. Climate Adaptation 2. Climate Mitigation 3. The sust. use and Protection of Water and Marine Resources 4. The Transition to a Circular Economy 5. Pollution Prevention and Control
	It established a framework for the EU by setting out six overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable.	The Protection and Restoration of Biodiversity and Ecosystems
	Do you know what implications this may have for/on biodiversity and ecosystems?	*If no, what do you believe the implications could be?*
	What factors do you believe encourage or prevent researchers and/or companies from complying with biodiversity and ecosystem related policies?	Is it classic cost/benefit or are there other factors involved? e.g., image, CSR, impact assessment, GRI, etc.
	Is there a way in which researchers/consultancy companies can work closely with policy makers on the design and implementation of policies (in order to make them more successful)?	e.g., a platform or something like this Would you be willing to actively take part in such a discussion?
Theory of change	*To what extent does policy and/or regulatory changes encourage you as a company (or companies in general) to change the way you/they operate?*	
	To what extent do you see policy and/or regulatory changes influencing businesses to change?	
	What factors would encourage companies to change faster?	

Appendix 6: Interview Guide used for Interview Seven.

Eelerwoude

***Solar Energy Industry Stakeholders**: Eelerwoude[Ecological & Operational Industry Stakeholder]*

Theme	***Questions***	***Possible Probes***
Solar Parks	*When it comes to the establishment and operation of solar energy parks, what are the biggest challenges that you as a company (or companies in general) face?* *Is there a way that these challenges can be eased?*	Political? Social? Financial? Environmental? e.g., tax breaks; collaboration between companies, ecologists, and the govt.; more guidelines for companies
Biodiversity	*Are you aware of the impact that solar parks have on Biodiversity in an area? (or is it known/discussed in the industry?)* *What motivates companies to go beyond the bare minimum of what is expected of you as a company?* i.e., how can one stimulate discretionary/voluntary efforts that move outside the range of regulations. *Are there any other design features or ways of managing the land that could help improve or encourage the protection of biodiversity?* *Can you name five relatively simple things that any solar energy company could do to improve biodiversity?* *Is there any (or do you know of any) company-level policy in place to protect biodiversity or encourage the protection of such?*	Do you believe this impact can be lessened? Or turned into a positive impact? In terms of acting in an environmentally friendly way? e.g., protecting and improving biodiversity even though no regulations tell you to do this
Policy	*Are you aware of the new EU Taxonomy Regulations?* It established a framework for the EU by setting out six overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable. *Do you know what implications this may have for/on biodiversity and ecosystems?* *What factors do you believe encourage or prevent researchers and/or companies from complying with biodiversity and ecosystem related policies?* *Is there a way in which researchers/consultancy companies can work closely with policy makers on the design and implementation of policies (in order to make them more successful)?*	The Taxonomy Regulation est. six environmental objectives; 1. Climate Adaptation 2. Climate Mitigation 3. The sust. use and Protection of Water and Marine Resources 4. The Transition to a Circular Economy 5. Pollution Prevention and Control The Protection and Restoration of Biodiversity and Ecosystems *If no, what do you believe the implications could be?* Is it classic cost/benefit or are there other factors involved? e.g., image, CSR, impact assessment, GRI, etc. e.g., a platform or something like this Would you be willing to actively take part in such a discussion?
Theory of Change	*To what extent do you see policy and/or regulatory changes influencing businesses to change?* *What factors would encourage companies to change faster?*	

Appendix 7: Initial 38 Codes

Name			Groups
EU Taxonomy Regulations	52	1	Policy Related Aspects
Governance Issues	100	1	Policy Related Aspects
Impact of Solar on Policy in NL	21	1	Policy Related Aspects
Permits	15	1	Policy Related Aspects
Policy	144	5	Policy Related Aspects
SDE+ Subsidy	31	1	Policy Related Aspects
Biodiversity Protection	91	6	Protecting Biodiversity
Climate Change	29	1	Protecting Biodiversity
Gedragscode [Holland Solar]	45	1	Protecting Biodiversity
Land Management Practices	38	2	Protecting Biodiversity
Reasons for Steps	25	1	Protecting Biodiversity
Result of Taking Steps	12	0	Protecting Biodiversity
Steps NOT to Take	19	1	Protecting Biodiversity
Steps to Take	59	1	Protecting Biodiversity
Current System	9	10	The Current Solar Industry
Energy Co-Op	27	1	The Current Solar Industry
Farmers	27	1	The Current Solar Industry
General Issues	69	2	The Current Solar Industry
Image of Solar Companies	16	1	The Current Solar Industry
Industry Association	6	1	The Current Solar Industry
Isssues with Developers	38	1	The Current Solar Industry
Motivations of Co-Ops	4	1	The Current Solar Industry
Motivations of Developers	44	1	The Current Solar Industry
National Consortium	11	1	The Current Solar Industry
Public Perception	9	0	The Current Solar Industry
Key Industry Organisations	25	2	The Current Solar Industry
Collaboration	41	1	Collaboration
Help from (Local/Provincial/National) G...	3	0	Collaboration
Research being done	23	2	Collaboration
Future of the Solar Industry	37	3	The Future Solar Industry
Possibilities for Future Solar Parks	23	1	The Future Solar Industry
Proactive Engagement	19	1	The Future Solar Industry
Solution	31	1	The Future Solar Industry
Challenges in Establishment	43	0	The Future Solar Industry
Ways to Change	5	0	The Future Solar Industry
Where to Establish Solar Parks	13	0	The Future Solar Industry
Interviewee Background	10	0	
Question	153	0	

Result: 38 of 38 Code(s)

Appendix 8: Cycle Two - 30 Barriers/Challenges

◇	●	Biodiversity Protection: Challenegs/Barriers	41	0	1. Challenges/Ba...
◇	●	Challenges/Barriers in Establishment	43	0	1. Challenges/Ba...
◇	●	Climate Change: Challenges/Barriers	16	0	1. Challenges/Ba...
◇	●	Collaboration: Challenges/Barriers	11	0	1. Challenges/Ba...
◇	●	Current System: Challenges/Barriers	14	0	1. Challenges/Ba...
◇	●	Energy Co-Op: Challenges/Barriers	5	0	1. Challenges/Ba...
◇	●	EU Taxonomy Regulations: Challenges/Barriers	8	0	1. Challenges/Ba...
◇	●	Farmers: Challenges/Barriers	16	0	1. Challenges/Ba...
◇	●	Future of the Solar Industry: Challenges/Barriers	12	0	1. Challenges/Ba...
◇	●	Gedragscode [Holland Solar]: Challenges/Barriers	14	0	1. Challenges/Ba...
◇	●	General Issues	2	0	1. Challenges/Ba...
◇	●	General Issues: Business Related Challenges	13	0	1. Challenges/Ba...
◇	●	General Issues: Ecological Challenges	14	0	1. Challenges/Ba...
◇	●	General Issues: Governance Challenges	7	0	1. Challenges/Ba...
◇	●	General Issues: Renewable Energy Related Challenges	3	0	1. Challenges/Ba...
◇	●	General Issues: Social Challenges	12	0	1. Challenges/Ba...
◇	●	Governance Issues	54	0	1. Challenges/Ba...
◇	●	Governance Issues: Ecological	8	0	1. Challenges/Ba...
◇	●	Governance Issues: Permits	1	0	1. Challenges/Ba...
◇	●	Governance Issues: Policy	40	0	1. Challenges/Ba...
◇	●	Impact of Solar on Policy in NL: Challenges/Barriers	4	0	1. Challenges/Ba...
◇	●	Isssues with Developers	38	0	1. Challenges/Ba...
◇	●	Key Industry Organisations: Challenges/Barriers	4	0	1. Challenges/Ba...
◇	●	Land Management Practices: Challenges/Barriers	5	0	1. Challenges/Ba...
◇	●	Motivations of Developers: Challenges/Barriers	12	0	1. Challenges/Ba...
◇	●	Permits: Challenges/Barriers	1	0	1. Challenges/Ba...
◇	●	Policy: Challenges/Barriers	51	0	1. Challenges/Ba...
◇	●	Public Perception	9	0	1. Challenges/Ba...
◇	●	Research being done: Challenges/Barriers	1	0	1. Challenges/Ba...
◇	●	SDE+ Subsidy: Challenges/Barriers	12	0	1. Challenges/Ba...

Appendix 9: Cycle Two - 18 Drivers/Motivations

Biodiversity Protection: Motivations/Drivers	20	0	2. Motivations/D...
Climate Change: Motivations/Drivers	9	0	2. Motivations/D...
Collaboration: Motivations/Drivers	2	0	2. Motivations/D...
Current System: Motivations/Drivers	1	0	2. Motivations/D...
Energy Co-Op: Motivations/Drivers	4	0	2. Motivations/D...
EU Taxonomy Regulations: Motivations/Drivers	35	0	2. Motivations/D...
Farmers: Motivations/Drivers	11	0	2. Motivations/D...
Future of the Solar Industry: Motivations/Drivers	10	0	2. Motivations/D...
Gedragscode [Holland Solar]: Motivations/Drivers	16	0	2. Motivations/D...
Image of Solar Companies	16	0	2. Motivations/D...
Impact of Solar on Policy in NL: Motivations/Drivers	10	0	2. Motivations/D...
Motivations of Co-Ops: Positive Motivations/Drivers	3	0	2. Motivations/D...
Motivations of Developers: Positive Motivations/Drivers	27	0	2. Motivations/D...
Permits: Motivations/Drivers	4	0	2. Motivations/D...
Policy: Motivations/Drivers	41	0	2. Motivations/D...
Reasons for Steps	25	0	2. Motivations/D...
Research being done: Motivations/Drivers	7	0	2. Motivations/D...
SDE+ Subsidy: Motivations/Drivers	11	0	2. Motivations/D...

Appendix 10: Cycle Two - 24 Activities

Biodiversity Protection: Activities	33	0	3. Activities
Climate Change: Activities	4	0	3. Activities
Collaboration: Activities	22	0	3. Activities
Current System: Activities	2	0	3. Activities
Energy Co-Op: Activities	10	0	3. Activities
EU Taxonomy Regulations: Activities	14	0	3. Activities
Farmers: Activities	2	0	3. Activities
Future of the Solar Industry: Activities	15	0	3. Activities
Gedragscode [Holland Solar]: Activities	16	0	3. Activities
Impact of Solar on Policy in NL: Activities	8	0	3. Activities
Industry Association: Activities	6	0	3. Activities
Key Industry Organisations: Activities	5	0	3. Activities
Land Management Practices: Activities	33	0	3. Activities
Motivations of Developers: Activities	2	0	3. Activities
Permits: Activities	8	0	3. Activities
Policy: Activities	51	0	3. Activities
Proactive Engagement	19	0	3. Activities
Research being done: Activities	8	0	3. Activities
Result of Taking Steps	12	0	3. Activities
SDE+ Subsidy: Activities	13	0	3. Activities
Solution	31	0	3. Activities
Steps to Take	59	0	3. Activities
Ways to Change	5	0	3. Activities
Where to Establish Solar Parks	13	0	3. Activities