



**The institutional
opportunities and barriers of
insect conservation in nature
based solutions**

A case study of Park Lingezegen

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1. Introduction

1.1 Project framework

In this project framework the two central concepts of this thesis will be introduced, namely nature based solutions and insect conservation, and their possible connection.

Nature based solutions (NBS)

When humans inhabit geographies, whether they be urban or rural, space related problems tend to arise, which can cause both social issues and nature related issues. The social and natural elements of those problems are often combined or intertwined. A way to approach those multi-faceted problems are Nature Based Solutions (NBS), as they are meant to address both the social and the natural issues within the same solution (Sekulova & Anguelovski, 2017; Somarakis et al., 2019). The European Commission (2015) define NBS as *“living solutions inspired by, continuously supported by and using nature, which are designed to address various societal challenges in a resource-efficient and adaptable manner and to provide simultaneously economic, social, and environmental benefits”*. Maes & Jacobs (2015) put emphasis on the role of NBS in shaping a sustainable economy, stating that NBS are *“any transition to a use of ecosystem services with decreased input of non-renewable natural capital and increased investment in renewable natural processes”*. These definitions however must be seen in the light of a ‘weak sustainability’ discourse, that sees economic growth as compatible with stopping ecological deterioration (Sekulova & Anguelovski, 2017). Other authors maintain that the inclusion of economic growth as an objective of NBS will detract from the other objectives like social justice and environmental quality (Eggermont et al., 2015; Nesshöver et al., 2017).

The definitions of NBS above are broad. The drawback of this is that the concept of NBS is in danger of being too unclear, which becomes a challenge when using it in policy making (Sekulova & Anguelovski, 2017). Misuse of the term will lead to confusion, overlap with other concepts and unintended consequences (Nesshöver et al., 2017). When it comes to NBS there are indeed related concepts. According to the European Commission (2015) NBS builds on and supports the following concepts: ecosystem approach, ecosystem services, ecosystem based adaption/mitigation, and blue and green infrastructure. What sets NBS apart is the focus on problem(s) that need to be solved, rather than general or neutral ideas about ecosystem approaches in policy (Potschin et al. 2016).

The fact that nature based solutions build on ecosystem based approaches, means they can play a role in nature conservation and the protection of biodiversity (Nesshöver et al., 2017; Seddon et al., 2019). Somarakis et al. (2019) determine that the benefits of the ecosystem services potentially provided by NBS include the protection of pollinators for the sake of food security and biodiversity, by providing habitats for species in decline. There are however also possible harmful impacts of NBS on biodiversity, such as the import of exotic species and homogenized landscapes (Somarakis et al., 2019).

When it comes to the governance of NBS, multi-stakeholder forms of governance are stressed by Sekulova & Anguelovski (2017), as they find that *“the use of participatory evaluation schemes with multiple stakeholders combined with reflexive forms governance emerges as a key approach to*

success". The importance of multi-stakeholder governance and reflexivity is also mentioned by Nesshöver et al. (2017), along with being prepared to deal with uncertainty, and the use of transdisciplinary knowledge. There are however also barriers to implementing NBS that are institutional in nature. According to Brink et al. (2016) these include a lack of resources, expertise and instruments, as well as unsupportive legal frameworks involving permits and (missing) property rights. Other barriers are a lack of space, specifically in urban areas, and conflicting interests (Brink et al., 2016).

Insect conservation

Insects are of critical functional importance to terrestrial ecosystems. This is because of their wide variety of ecological roles. These roles include pollination, population regulation and pest control, decomposition, seed dispersal and protection, and provision of food to other organisms, including humans (Stewart, 2007). The most important ecosystem services insects provide for humans, are crop pollination and pest control (Stewart, 2007). Other services also specifically include decomposition, resources for new medicines, and habitat quality indication (Cardoso et al., 2020).

Recently however, some alarming publications have been made, concerning a dramatic decline of insects and insect biodiversity in Western Europe. Hallmann et al. (2017) have observed a decline of over 75% of flying insect biomass in 63 protected areas in Germany in the last 27 years, regardless of habitat type and landscape configuration. They propose agricultural intensification as a plausible cause of this decline, like pesticide and fertilizer usage, year round tillage, and disappearance of field margins, as most protected areas in Germany are surrounded by agricultural land. A study conducted in the Netherlands, Van Strien et al. (2019), observed a decline in butterflies of over 80% in the period 1890-2017, also regardless of habitat. According to Cardoso et al. (2020), humans are the driving cause of this extinction of insects, in the form of *"habitat loss, degradation, and fragmentation, use of polluting and harmful substances, the spread of invasive species, global climate change, direct overexploitation, and co-extinction of species dependent on other species."* Those losses negatively impact the ecosystem services on which humans depend. Despite this, Thomas et al. (2019) call for caution for interpreting the data this way. The extinction of species at such large scales need more robust and global data, and does not integrate local variation.

In order to combat this decline, insects have to be protected. Insect conservation can be a challenge however, because they differ heavily from more popular objects of conservation like vertebrates and plants (Stewart & New, 2007). Not only do many species have a very specialized habitat, their different life stages also often require a wide variety of resources and habitats. Combined with the fact that many species are only able to disperse over short distances, insects are especially vulnerable to habitat fragmentation and isolation (Stewart & New, 2007). Habitat fragmentation is therefore a large theme for insect conservation. In order to overcome habitat fragmentation for insects, Dennis et al. (2007) advocate a landscape based approach rather than a single species approach or a patch area approach. That way a landscape is inventoried for its habitats and resource diversity and dynamics, which will help as many species as possible instead of a single species or just those living in one habitat. A concept that connects to this is that of ecological networks. According to Samways (2007), connectivity between habitats is crucial in preserving biodiversity long term. However, these connections must also be habitats themselves, in order to make a robust network of habitats within a wider landscape that can withstand environmental disturbances and changes. He however also stresses the problem of a lack of emphasis from conservationists on invertebrates like insects. New (2007) thinks the best way to ensure insect are protected is to focus on benefits within wider conservation agendas, and that insects can benefit from the protection of whole bioregions and landscapes. The landscape in the Netherlands is heavily influenced by agriculture, which is also the cause of habitat fragmentation for insects. Tschardt et al. (2007) posit that agricultural landscapes can however be a basis for a high insect diversity and abundance. Ways to combine agriculture with insect conservation include woody field borders, habitats like beetle banks besides

fields, planting multiple crops as opposed to a monoculture, as well as an organic or at least less intensive management of crops and fields. Agriculturalists can also benefit from these measures, because they provide important ecosystem services like pollination and pest control, as those habitats also attract predatory species, keeping possibly damaging species in check (Tscharrntke et al. 2007). The challenge however is that farmers won't exchange productive land for insect habitats unless it is worth it for them in terms of monetary value (Kremen & Chaplin-Kramer, 2007).

The scientific literature covers how best to physically implement solutions to insect conservation issues. However, little has been written about the institutional challenges of integrating insect conservation into landscape management. This is very important however, because this falls within the realm of spatial planning in the Netherlands, where nature conservation is only one of several focus points. In order to form a bridge between insect conservation and spatial planning, nature based solutions may play a role, as NBS can be applied on a landscape scale.

Scientific relevance

As mentioned, insects play a crucial role in terrestrial ecosystems and are therefore of vital importance to the ecosystem services humans make use of. This, in combination with the decline of insect biodiversity, means that insect conservation is an important topic of scientific discussion. Nature based solutions may have the potential to be used to improve insect conservation, but insect conservation specifically as potentially being included in NBS, has not been researched. The only mention is by Somarakis et al. (2019), who include the protection of 'pollinators' as one in an extensive list of ecosystem benefits provided by NBS. It should be noted however, that insects also provide important ecosystem services other than pollination (Stewart, 2007), so this is too narrow a focus. Therefore, there is a gap in scientific knowledge about the role NBS can play in protecting insects. With this research, I want to address this and make a start to fill this gap.

Societal relevance

As mentioned, insects are vital to human society, as they are needed for pollination and pest control amongst other things, which benefits farmers especially (Stewart, 2007). The extinction of insect species at the rates currently being measured could have disastrous results. With this thesis, I want to explore the potential of NBS in conserving insects, as NBS are explicitly meant to solve both environmental and social issues. Therefore, they are ideal in tackling multiple problems at once, ultimately to the good of the whole society. This research can start a discussion about the relation between NBS and insect conservation among nature conservation policy makers in the Netherlands, so that they can include and use NBS more effectively for insect conservation.

1.2 Research objective

Insects in the Netherlands are in heavy decline due to habitat loss and fragmentation. Conventional nature conservation has turned out to be not enough to solve this problem. Instead, the scope must shift to agricultural and urban areas. Nature based solutions could be a way to integrate insect conservation in these landscapes.

The aim of this research is to gain insight into the potential for nature based solutions to be used as a way to combat the decline of insects. This will be done by examining in how far insect conservation as part of NBS already exists, and whether this needs to be expanded upon by NBS in the future. Because this is a Bachelor's thesis, the scope of this research is small; it will focus first of all on a rural environment, as opposed to an urban one, because agricultural areas are a major source of the causes of insect extinction, such as pesticides (Hallmann et al., 2017). Nevertheless, agricultural environments have the potential to play a big role in improving insect biodiversity, for example with the use of wild flower strips (Haaland et al., 2011). Besides this, there is an urban bias in the

literature, which this research can provide some counterbalance to. Second of all, the research will focus on the province of Gelderland in the Netherlands. Gelderland is diverse as there are intensive agricultural areas, urban areas (such as Arnhem-Nijmegen) and nature reserves (such as the Hoge Veluwe). This makes Gelderland quite representative for the Netherlands, however the small scope of the research means that the results will be difficult to generalize. Nonetheless, it could provide a lesson and start a discussion on the importance of insect conservation in planning.

1.3 Research question

The main research question is:

What are the institutional opportunities and barriers of insect conservation in nature based solutions in Gelderland?

To figure this out, four sub questions are formulated, which are related to different aspects of NSB:

- What are the opportunities and barriers of insect conservation measures for the actors of NBS in Gelderland?
- What are the opportunities and barriers of insect conservation measures in the rules related to NBS in Gelderland?
- What are the opportunities and barriers of insect conservation measures in the discourses surrounding NBS in Gelderland?
- What are the opportunities and barriers of insect conservation measures in the resources surrounding NBS in Gelderland?

The role of rules is important for NBS in Gelderland, because they provide the framework, or the rules of the game, that planners work with. The role of actors is also an important aspect of NBS, because it largely determines who or what benefits the most. Thirdly, the role of discourses surrounding NBS in Gelderland is relevant, because it will tell us where the focus might be in planning the NBS. Finally, the resources surrounding NBS are important, because they determine the physical possibilities of planning NBS. The sub questions are based on the dimensions of the Policy Arrangement Approach (Van Tatenhove et al., 2000), expanded upon in the following chapter.

2. Theory

2.1 Theoretical framework

In order to analyze the institutional aspects of nature conservation in nature based solutions in Gelderland, I consider NBS as a policy arrangement, and use the Policy Arrangement Approach (PAA) (Van Tatenhove et al., 2000) to determine the policy arrangement's substance and organization, as a policy arrangement is defined as the way in which a certain policy domain, for instance nature based solutions, is shaped in terms of organization and substance (Van Tatenhove et al., 2000; Wiering & Arts, 2006). The PAA can be used as a conceptual and analytical framework to *"do justice to policy dynamics caused by both strategic and structural factors"* (Arts et al., 2006). The PAA is an analytical tool to describe and characterize policy arrangements, as well as to interpret their relative stability or change (Leroy & Arts, 2006). With Nature based solutions being a part of environmental policy (European Commission, 2015), the PAA can be used to analyze the contents and organization of NBS and elements of it from an institutional perspective, which will give a broad overview of NBS and elements of it within environmental policy. In this research, it will be used to look specifically at and give an overview of insect conservation within the policy arrangement of NBS.

What sets the PAA apart from other methods is its particular emphasis on four factors: *"(1) the institutional embeddedness of multi-actor policy processes; (2) the manifestation of structural developments, such as globalisation, in concrete policy practices; (3) the role of different faces of power in policy-making; and (4) the importance of both substance and organisation, as well as of change and continuity in policy practices"* (Arts & van Tatenhove 2004). The PAA does build upon policy network models, but in contrast to those models, the PAA pays more attention to the institutional contexts in which the policy actors have to work, the substance of policy making, and the power relations between the actors that are involved in the policy field (Wiering & Arts, 2006). It also builds upon the concepts of institutionalization and modernization. By institutionalization is meant that day to day policy processes as well as the interaction between the actors involved in those processes gradually develop into relatively stable constructs in the form of institutionalized patterns, labeled as policy arrangements (Lieverink, 2006). At the same time, the shape of policy arrangements is not just influenced by strategic behavior resulting in institutionalization, but also subject to modernization, as they reflect long term contextual, societal and political trends as well (Arts & Leroy, 2006). The concept of policy arrangements therefore connects micro-level, day to day interactions with macro-level social and political change (Arts & Van Tatenhove, 2004). This draws heavily on the concept of the duality of agency and structure put forward by Giddens (1984). So in other words, policy arrangements are shaped by both individual actor agency, as well as the structure of the social and political context. This duality also means that actors on the one hand are shaped by their structural context, but at the same time also create and maintain structures as a result of their interactions. In this light, policy arrangements change as a result of policy innovations and political modernization (Hehn, 2016). Furthermore, policy arrangements have almost by definition a multi-level character, as they cannot be coupled to a specific policy level due to processes of internationalization and the dynamic nature of policy arrangements as a result of the constantly ongoing institutionalization and modernization (Arts et al., 2006).

The major defining characteristic of the PAA is its focus on four analytical dimensions (Liefferink, 2006):

1. The actors and their coalitions involved in the specific policy domain.
2. The resources actors have at their disposal and how they are divided between the actors, leading to differences in power and influence.
3. The rules of the game, referring to both the formal procedures of decision making and implementation, as well as informal routines of interaction.
4. The discourses, which refers to the views and narratives of the actors involved.

These dimensions belong to the two aspects, 'substance' and 'organization.' The organization aspect consists of the dimensions 'actors and coalitions', 'rules of the game' and 'resources'. The substance aspect consists of the dimension 'discourses.' (Van Tatenhove et al., 2000). Figure 1 shows the operationalization used by Van Tatenhove et al. (2000).

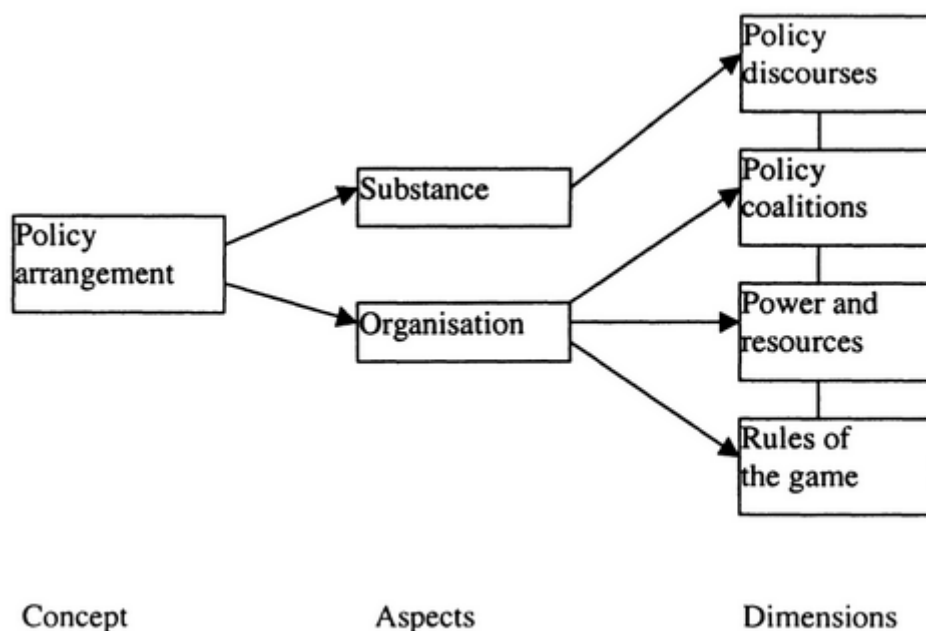


Figure 1: Operationalization of the concept of policy arrangements. (Van Tatenhove et al., 2000).

These four dimensions are inextricably interwoven, meaning that a change in one dimension will result in a change in the other dimensions (Liefferink, 2006). To symbolize this, a tetrahedron is used (figure 2).

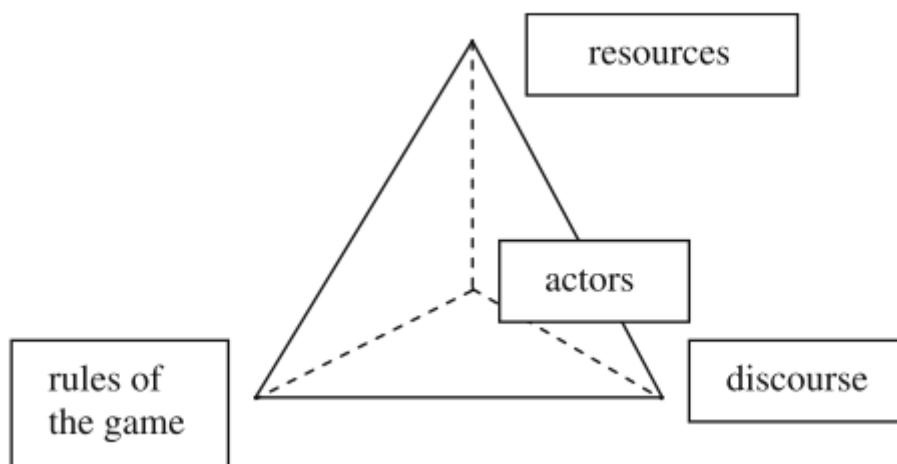


Figure 2: Tetrahedron symbolizing the connections between the dimensions of a policy arrangement. (Lieverink, 2006).

The tetrahedron shows how for example the appearance of a new actor will result in a shift, as it may also change or add to the prevalent discourse or lead to a change in the distribution of resources. This change can start at any of the dimensions and can have ramifications to the policy arrangement as a whole. Therefore, when analyzing a policy arrangement, all four dimensions and their interaction should be taken into account (Lieverink, 2006). I will elaborate on each of the four dimensions.

Actors

The actor dimension in the Policy Arrangement Approach focuses on the individuals and organizations involved in (part of) a specific policy domain, as well as on their interaction, their cooperation and their conflict. The actor dimension is a good place to start analyzing a policy arrangement, because it is the most tangible way to get to an overview of the policy arrangement, because it is through the actors that the other analytical dimensions, the rules, discourses and resources, are able to materialize (Lieverink, 2006). First the relevant actors should be identified and their influence in the policy process. In doing this, it is useful to group the actors with similar roles or positions in the arrangement together. A common distinction of actor positions in a policy arrangement is given in figure 3, consisting of state, market, expert system and interests (civil society):

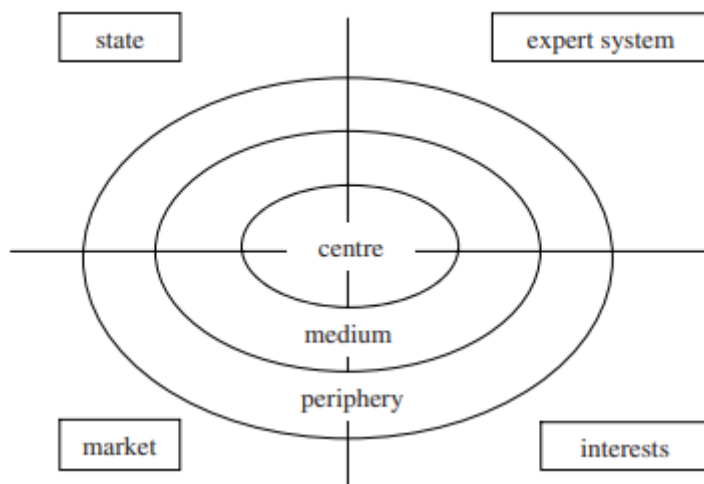


Figure 3: Map of actors according to their relative position in a policy arrangement. (Lieverink, 2006).

State actors refer to the actors that represent governmental bodies, like national, provincial or municipal governments and government agencies. The market actors have a commercial stake in the policy domain like land owners and commercial farmers. The expert system actors are those that the other actors can draw expert knowledge from about the aspects of the policy arrangement. The interests are the remaining actors with a stake in the policy arrangement that is not commercial or governmental in nature. These actors are also classified as civil society, which is the term that I will henceforth refer to for this group of actors. This thesis will maintain this grouping of actors in its analysis.

Another important aspect of the actor dimension is to identify coalitions of actors. Actors who share policy goals and views will band together in coalitions, and they will interact and possibly come into conflict with other actor coalitions. Coalitions are defined by Arts & Van Tatenhove (2004) as *“a number of players who share resources and/or interpretations of a policy discourse, in the context of the rules of the game”*. This definition neatly underlines the interconnectedness with the other dimensions. You can therefore characterize actor coalitions by the resources and discourses they represent, and the rules govern how they interact. Coalitions also allow actors to gain access to certain resources and political arenas they otherwise would not have access to (Hehn, 2016).

Rules

Another dimension of the Policy Arrangement Approach is the rules of the game, which consists of regulations, legislation and procedures, both formal and informal, that are relevant in a specific policy domain (Veenman et al, 2009). Rules are defined as *“the mutually agreed formal procedures and informal routines of interaction within institutions.”* (Lieverink, 2006). In this definition, the rules form the maneuvering room for actors, in the form of access to political arenas and participation in decision making and implementation processes (Veenman et al, 2009). Rules define the way the game should be played and dictate *“which norms are legitimate, how issues may be raised; agendas set; interests articulated; policies formulated; decisions made; and measures implemented, e.g. by which procedures, by which allocation of tasks, and by which division of competencies between actors and organisations.”* (Arts & Van Tatenhove, 2004). The rules also generate meaningful and justified circumstances as well as define which actors may be involved and which may not (Arts & Van Tatenhove, 2004).

The relationship between the rules and the actors is clear in the form of providing the playing field for the actors. The relationship between rules and discourses can be found in the discourses underlying the rules of interaction between the actors, for example what should be the share of responsibility between the state actors, market actors and civil society actors (Lieverink, 2006). The relationship between rules and resources is more ambiguous. Rules can be used strategically, and can therefore be legal resources, however they are not exclusively controlled by certain actors, and are normally part of the mutual knowledge of the actors (Lieverink, 2006).

Discourses

The third dimension of the Policy Arrangement approach is that of the discourses. Discourses can be understood as a set of ideas, concepts, buzzwords and narratives that, combined, give meaning to real world phenomena, and are also produced, reproduced and transformed through a set of practices (Hajer, 1995). On the basis of that, policy discourses can be defined as *“dominant interpretative schemes, ranging from formal policy concepts to popular story lines, by which meaning is given to a policy domain.”* (Arts & Van Tatenhove, 2004). Liefferink (2006) notes that discourses in

policy arrangements are relevant at two different levels. The first level concerns the general ideas of how society is organized, especially about the relationship between the state actors, market actors and civil society actors. These discourses rise above the level of specific policy domains, but they can still have an impact through the actors involved. The second level refers to ideas about the policy issues at stake; what is the problem and what are the causes and solutions? Coalitions of actors often form around these discourses at both levels, however Liefferink (2006) also shows that considerable incongruences between the two levels can exist, potentially leading an actor to be driven by conflicting ideas. This can result in paralyzing the policy arrangement and suffocating new developments.

Wiering & Arts (2006) discern three layers of discourses. First of all there are the discourses that are ontological in nature, which give a specific perspective about reality and frame problems a specific way. Questions related to this are: how do we see reality? How do we define problems? Ontological discourses generally deal with the world views of actors. Secondly there are the normative discourses. These deal primarily with ideas, goals and visions. In other words: how things should be, which values are at stake. Normative discourses generally deal with the ideals of actors. The final layer is the strategic discourses. These discourses are concerned with how those ideals and visions can be achieved. For policy arrangement actors, this discourse is about the route from what is seen as real to what is seen as desirable and important, in order to go from a problem to a solution. This surfaces in the form of policy programmes of actors.

Resources

The fourth and final dimension of the Policy Arrangement Approach is that of the resources. The concept of resources refers to the assets that actors have access to, which they can use in order to exercise power over other actors, for example authority, money and knowledge (Veenman et al., 2009). In general, resources are not equally distributed among actors within a policy arrangement, leading to situations where not all actors have the same capability to achieve their goals. The concept of power is inextricably linked to resources, as according to Arts & Van Tatenhove (2004) on the one hand power refers to the ability of actors to mobilize resources to achieve their desired outcomes, and on the other hand it refers to the asymmetrical distribution of resources, revealing itself in dominance of certain actors over other actors in achieving their desired outcomes. Actors around a given policy arrangement are often to various degrees dependent on each other for resources, as they are driven into each other's arms because they share control over important resources (Liefferink, 2006). Therefore, actor coalitions around certain resources can form. As mentioned in the rules section, rules can also be used strategically, for example in the form of legal resources.

The Policy Arrangement Approach will be used in this thesis, as it will give a broad overview of the institutional aspects of the application of a spatial planning concept like nature based solutions. Those institutional aspects can then be related to insect conservation, leading to the discovery of the institutional opportunities and barriers for insect conservation in nature based solutions.

2.2 Conceptual model

The conceptual model shows a non-causal relationship between NBS and insect conservation, that is influenced by opportunities and barriers. The opportunities and barriers consist of the dimensions of the PAA: actors, rules, discourses and resources, that are also used in the sub questions of the research question. This thesis aims to find and explain those opportunities and barriers by examining the relationship between NBS and insect conservation by using the aforementioned policy arrangement approach.

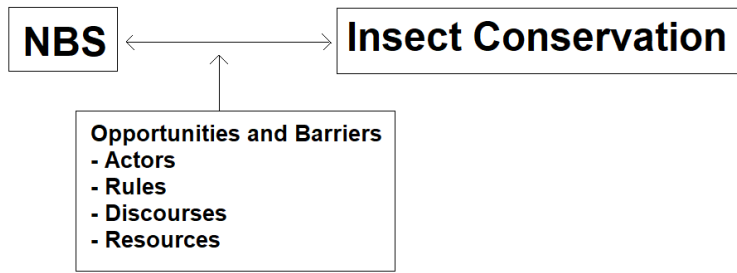


Figure 4: Conceptual Model.

3. Methodology

3.1 Research strategy

The data in this research will be collected and analyzed as qualitative. The reason for this is that the research question calls for a holistic method, because the concepts of NBS and insect conservation are broad and hard to quantify. In order to study these concepts, we cannot select some quantifiable elements and subsequently infer things about the whole concept. A qualitative method is suited for a holistic approach (Vennix, 2016). In addition, it is useful for my research question to study the natural setting of the research object, while at the same time being close to it. This allows me to track down the motives and mechanisms of the various actors in the real world. Finally, the reflective nature of qualitative research (Vennix, 2016) will help the internal validity, because the theoretical framework can be adjusted during data collection and analysis whenever it is necessary.

Because I do not want to isolate the concepts of NBS and insect conservation from their natural and social context, I will apply them to a real world case by performing a case study. This will allow for more in-depth research, however, as a consequence, we must be careful when generalizing the results. The case for this thesis is a landscape park that I classified as a nature based solution on the basis of the definition by the European Commission (2015), see 1.1. The park is located in Gelderland, the Netherlands called Park Lingezege (for the description of the case study, see chapter 4).

To further ensure the validity and credibility of the research, triangulation will be applied to the data collection of the case study. The following types of data collection will take place: observation, in-depth interviewing, and content analysis of policy/planning documents.

Operationalization

In order to examine the concepts of NBS and insect conservation within the context of Park Lingezege, the dimensions of actors, rules, discourses and resources are used, taken from the Policy Arrangement Approach. Those are further divided into indicators in order to capture them more accurately. As mentioned previously, because of the reflective nature of this type of research, the

indicators in the operationalization table below are subject to revision during data collection and analysis.

Each of the dimensions from the PAA has been operationalized in order to uncover their substance and organization. For each dimension a number of indicators has been used. For the actor dimension, the indicators are: which actors are involved, what are their tasks/goals, what are their interests, which coalitions have been formed, and finally which conflicts have occurred? The actor dimension has been worked out in chapter 5.1. For the rules dimension the indicators are: what laws are the actors subject to, what formal policies are laid out, and which procedures guide interaction between actors? The rules dimension has been worked out in chapter 5.2. For the discourse dimension, the indicators are: what do actors see as the problem, which ideals do the actors have, which goals do the actors have, and what do the actors see as the solution? The discourse dimension has been worked out in chapter 5.3. Finally, for the resources dimension, the indicators are: which resource types are relevant, which actors have access to them and how much, and what are the power relations between the actors? The resources dimension has been worked out in chapter 5.4. There is an overview of the operationalization in the table below.

Dimension	Indicators
Actors	Which actors are involved?
	What are their tasks/roles?
	What are their interests?
	What are the coalitions?
	What are the conflicts?
Rules	What laws are actors subject to?
	What formal policies are laid out?
	Which procedures guide interaction?
Discourses	What do actors see as the problem?
	Which ideals do the actors have?
	Which goals do the actors have?
	What do actors see as the solution?
Resources	Which resource types are relevant?
	Which actors have access to them?
	What are the power relations?

Figure 5: Operationalization table

3.2 Research material

The following research objects are studied in this thesis:

- The lay-out and physical attributes of Park Lingezege through observation.
- Policy and planning documents through content analysis
- Actors, which are individuals or organizations, through in-depth interviews.

Observations

The observation took place over the course of three days. Two days were spent cycling and walking through all the sub areas of the park and taking notes with pen and paper both descriptively and reflectively, which can be found in appendix I. Special attention was made to insects and possible signs of their conservation. The third day was spent in a food forest, on an invitation of the interviewee I spoke with regarding the food forests in Park Lingezege (see interviews). Here took

notes about a conversation with a number of volunteers from the food forest, which can be found in appendix II.

Content Analysis

As part of the content analysis I have analyzed a number of planning and policy documents for the occurrence of insects and insect conservation. These documents include:

- Intergemeentelijke Structuurvisie Park Lingezegen, which outlines the policies of the municipalities of Overbetuwe and Lingewaard regarding Park Lingezegen.
- The elucidation of the zoning regulations of Park Lingezegen
- The Environmental Impact Assessment for Park Lingezegen
- Bestuursvereenkomst 2008, the agreement between the different governments to create Park Lingezegen.
- Gemeenschappelijke Regeling Park Lingezegen, the formation of the management of Park Lingezegen as a separate entity.
- Masterplan 2010, a planning document for Park Lingezegen as a whole.
- Doorontwerp De Woerdt en Ecologische zone, a planning document for sub area De Woerdt and the ecological zone.
- Doorontwerp De Linten, a planning document for sub areas Landbouwland and De Buitens.
- Ontwerp basisuitrusting De Park, a planning document for sub area De Park.
- Doorontwerp Het Watterrijk, a planning document for sub area Watterrijk.
- Definitief ontwerp De Poel, a planning document for a pocket park in Park Lingezegen called De Poel.

Interviews

In order to gain a better insight into the policy arrangement of Park Lingezegen and insect conservation in general, I have interviewed seven respondents:

- An expert on ecology and insect conservation (Appendix IV).
- The research leader of soil, explosives and archeology in Park Lingezegen (Appendix V).
- The director of Park Lingezegen from 2008 to 2019 (Appendix VI).
- The farmer of a food forest in sub area De Park (Appendix VII).
- The farmer of the natuurakkers in sub area De Woerdt (Appendix VIII).
- A landscape architect for Park Lingezegen (Appendix IX).
- A representative of the municipality of Overbetuwe, who is in the board of Park Lingezegen (Appendix X).

I have chosen these seven respondents to gain a variety of viewpoints, from both the management side of the park (park director, research leader, representative Overbetuwe) as well as the users of the park (farmers). The interview with the expert on ecology I used as orientation to learn more about insect conservation. The landscape architect offers another unique perspective on Park Lingezegen.

I have recorded and transcribed every interview, which can be found in the appendixes. I have codified and analyzed these transcripts using Atlas.ti. I used the PAA dimensions as the starting point for codifying. Every time the respondent touches on a subject that relates to one of the four dimensions, I coded it accordingly. After that I specified the code on its contents. Examples:

- Actor: province as animator
- Rules: bestemmingsplan long process
- Discourse: anti-environmentalism
- Resources: finances no issue

Aside from the PAA dimensions, I used the code Insect Conservation for matters pertaining to that subject.

At the time of writing this thesis, the Covid-19 pandemic has made its mark on society in the Netherlands. This influenced the execution of these interviews, as I could not meet the interviewees in person. I have used Skype, Zoom and telephone connection to conduct these interviews. The result is that transcription of the interviews was difficult at times, and some words have been left out in the transcripts, marked with [?], however this has had no effect on the analysis of the interviews.

4. Case study

4.1 Geographical situation

Park Lingezegen consists of a strip of land in a north-south orientation between the rivers Nederrijn in the north and Waal in the south, with the smaller river Linge running in an east-west direction through the park. There is a system of broad drainage canals that drain into the Linge from the agricultural area around it. These canals are called zegen, and are found all across the park, which is why the name Lingezegen was chosen. To the north Park Lingezegen borders the southern neighborhoods of the city of Arnhem, whereas in the south it borders the northern neighborhoods of the city of Nijmegen. The territory of the Park itself however is located within two more rural municipalities, Overbetuwe and Lingewaard. Park Lingezegen straddles the towns of Elst (center-west on the map) and Bommel (center-east on the map) in these municipalities. The park also borders some large infrastructure, namely the A325 highway in a north-south direction, the A15 highway in an east-west direction, the passenger railway between Arnhem and Nijmegen running north-south, and the cargo railway called Betuweroute running east-west. The bicycle high way RijnWaalpad between Arnhem and Nijmegen runs directly through the park. The soil of Park Lingezegen consists of flat, fertile clay grounds, with some slightly higher sand ridges (personal communication).

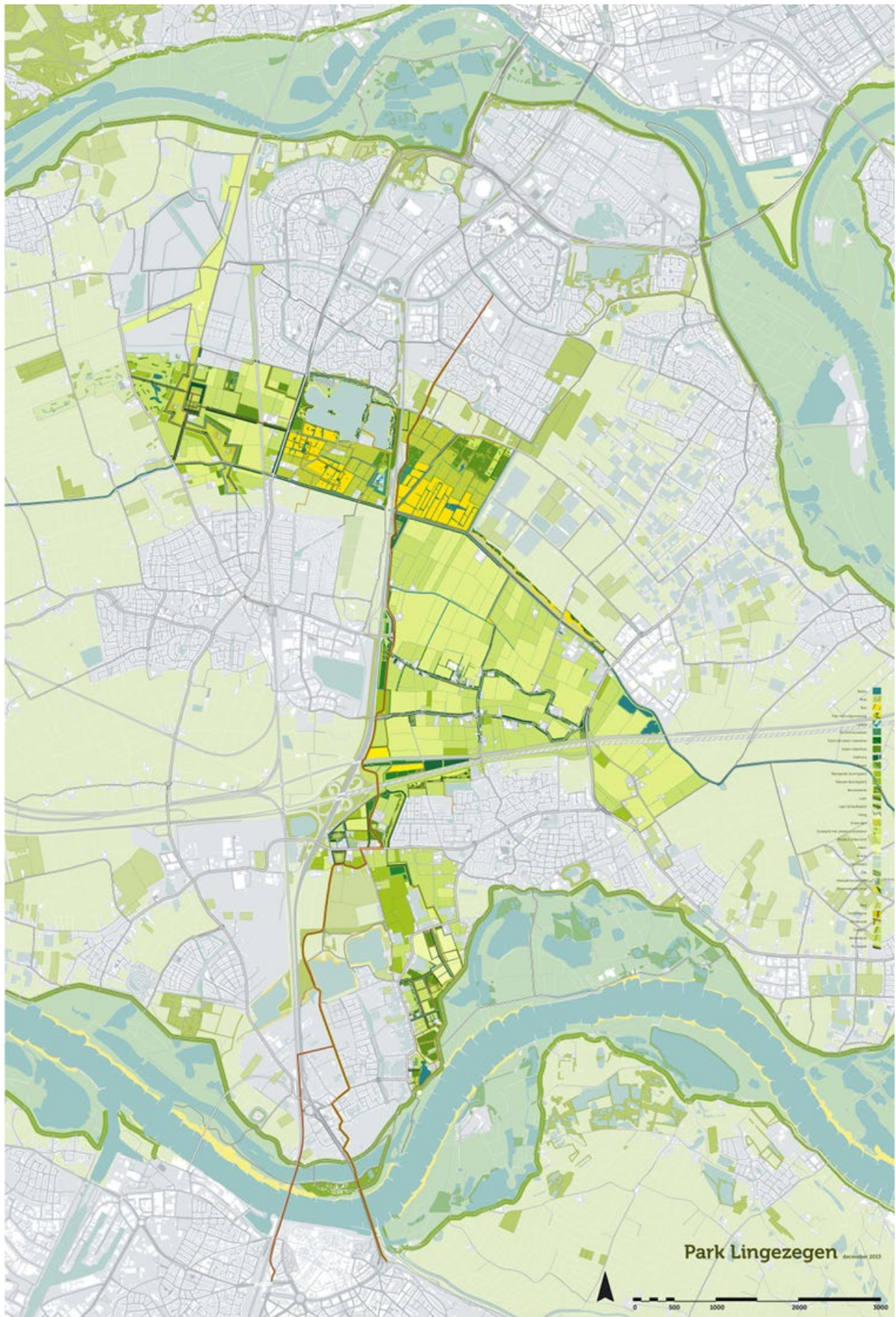


Figure 6: Map of Park Lingezen, source: Archief Park Lingezen.

4.2 History

Habitation and agriculture from prehistory up to the middle ages in the region was based on the higher sand ridges, because the lower lying lands were marshy and very prone to flooding. This river landscape still shapes the way the current inhabitants use the land: the settlements and growing of grain and fruit happens on the higher and dryer areas, whereas the wet, low lying areas are used as grasslands. During the second world war, the area was heavily fought over, leading to a large amount of potential explosives still in the ground. From the second half of the 20th century onward, with advances in water management, industrialization and urbanization takes hold of the region with little regard for soil type and hydrology. The territory of Park Lingezegen itself has preserved many traditional landscape features, but it is bordered by modern neighborhoods and large infrastructure (Park Lingezegen, n.d.)

The first ideas for Park Lingezegen arise in the 1990s. As Arnhem and Nijmegen were expanding, the idea of a green zone in between the two cities developed. Only in 2008 was this idea substantiated as a landscape park in a masterplan, which laid the basis for land acquisition, zoning regulations and design. In the same year the management arrangement was made, where the province of Gelderland, municipalities of Arnhem, Overbetuwe and Lingewaard, the water board Rivierenland and the now defunct city region Arnhem-Nijmegen intended cooperate to achieve the goals of the masterplan. After this an Environmental Impact Assessment was made, and an intermunicipal Structuurvisie detailing the policies of Park Lingezegen. In 2010 the management board of Park Lingezegen was set up on the basis of the Wet Gemeenschappelijke Regelingen (Law for Communal Arrangements), with allowed the participating parties to cooperate under a single organization ensuring the realization and management of the park. Since then the zoning regulations in the municipalities of Overbetuwe and Lingewaard have been adapted to accommodate Park Lingezegen. At the time of writing this thesis in 2020, the park has finished the realization phase, and has ensured the continued management for the next 40 years (Park Lingezegen, n.d.).

4.3 Goals

The goals of Park Lingezegen are laid out in the Structuurvisie (Gemeente Overbetuwe, gemeente Lingewaard, 2011) as follows:

- Preservation of the green and rural landscape with no room for urbanization. Increase the quality of the landscape by accentuating the different landscape elements and strengthening the coherence of the landscape.
- Create a north-south ecological connection between the flood plains of the rivers Nederrijn and Waal, and an east-west connection along the river Linge, by the creation of both dry (woodlands) and wet (reed lands) nature, while protecting the existing natural values.
- Give more space to water by creating water storage and wet nature, making the area safer from flooding and more resilient against climate change.
- Preserve cultural heritage and archeological remains in the landscape.
- Create a coherent network of recreational opportunities with connections to the cities, and stimulate initiatives that positively contribute to the quality of the landscape and recreation.
- Stimulate agriculture where it contributes to the other aims of the park.
- Create a safer traffic environment by restricting car usage, and create higher quality bicycle network.

4.4 Sub-areas

Park Lingezegen has five sub areas with different qualities and focusses (Park Lingezegen, n.d.)

De Park

This area in the northwest is the most recreation oriented sub area. There is space for large events, an information center with restaurant, a 'circuit' around meadows aimed at recreationists like cyclists and skaters. The landscape has a mosaic structure, with meadows, small woodlands, lanes and the river Linge running through it. Notable are the five food forests at located at the eastern edge of the area.

Waterrijk

The central theme of this area in the northeast is water. A large part is dedicated to nature, about a third of which are wetlands, a third woodland, and a third natural grasslands (personal communication). The wetlands also act as extra water storage. There is however room for recreation, with a recreational beach and cycling paths running through the area.

Landbouwland

The central theme of this sub area in the center is agriculture. This is where the local inhabitants have the opportunity to profit from the new accessibility of the area in the form of farm shops or bed and breakfasts, while providing recreation and education for example in Park Bredelaar, in the middle of the fields.

De Buitens

Landbouwland transitions seamlessly into De Buitens to the south of it. This area too is agricultural, but it is the only sub area with room for new development of buildings, as long as it adds to the quality of the landscape. The new inhabitants are in that case expected to invest in the park for example by creating a foot path or orchard.

De Woerdt

This is the southernmost sub area, which is a transitional area between the city and countryside. The activities in this area are varied, with nature, recreation and agriculture all having a place. Notable are the recreational area of Landgoed Doornik, within which there are the 'natuurakkers', a working with nature concept for agriculture, combining food production with sustainable practices and biodiversity.

5. Results

5.1 Actors

The first dimension of the policy arrangement of Park Lingezegen that will be discussed are the actors, because the actor perspective is the most tangible, and leads to the other dimensions (Lieverink, 2006). The actors involved in Park Lingezegen are grouped into the different societal positions from Liefferink (2006), namely state actors, market actors, civil society actors and expert system actors. Firstly, the state actors are those that are part of the letter of intent signed in 2006 that outlines agreements about the rights and commitments of the parties involved, the organization, finances and planning of Park Lingezegen. These include primarily governmental actors, and can be found under subsection *State*. These actors together formed a board ('bestuur') with representatives of the state actors (an overview of the organization of Park Lingezegen can be found in subsection 5.2 *Rules > Procedures*) that deals with the daily management of Park Lingezegen. Under the market actors can be found the mainstream farmers who owned most of the land before the foundation of Park Lingezegen, whereas under civil society can be found the experimental farmers who have gotten room in Park Lingezegen to approach agriculture in non-mainstream ways. Finally, under Expert system, can be found the landscape architects, which are experts hired by Park Lingezegen to design a coherent whole. Finally, the coalitions and conflicts between the different actors are examined.

State

Province of Gelderland:

The province of Gelderland was the initiator of the project. Their initial aim was to create a network that connects the major nature reserves of Gelderland to each other, called the ecologische hoofdstructuur, which was also a national policy at this point, based on the concept of ecological networks (Samways, 2007). The area of Park Lingezegen is situated between two major rivers flowing east-west, Nederrijn and Waal, with Park Lingezegen being an opportunity to connect these two rivers in a north-south direction using ecological stepping stones (Gemeente Lingewaard & Gemeente Overbetuwe, 2011). Another objective for the province was limiting the urbanization of the Arnhem-Nijmegen region, keeping the area in between the two cities relatively green and rural, in order to maintain a high quality living environment for its inhabitants. To ensure this, Gelderland heavily backed the project financially, with 7,5 million euros initially (Park Lingezegen, 2008). However, when a subsidy program for rural areas in the Netherlands, which Park Lingezegen relied on, was cut by the national government, leaving the organization of Park Lingezegen with a hole in the budget of around 10 million euros, Gelderland covered the hole in the budget, as they deemed it very important for the project to continue (personal communication, park director). During the process of the formation of Park Lingezegen, Gelderland played the role of mediator and binding force, to bring other actors together. They had a representative in the board of Park Lingezegen, but once they saw their initial goals met and ensured the continuation of the park, they withdrew from direct involvement in the management board of Park Lingezegen, and reverted to an advisory role.

Municipalities of Overbetuwe and Lingewaard:

The municipalities of Overbetuwe (Elst) and Lingewaard (Bemmel) are relatively rural municipalities in between the cities of Arnhem and Nijmegen. Park Lingezegen is situated on their territory. Like the province of Gelderland, they too had an interest in limiting urbanization in order to protect the relatively rural nature of the landscape, while at the same time creating a higher quality for living, working and recreation in the region. They each have a member in the management board of Park Lingezegen representing their municipality. They also have a specific responsibility in protecting the interests of the inhabitants of Park Lingezegen, which are mostly farmers.

Municipalities of Arnhem and Nijmegen:

The municipalities of Arnhem and Nijmegen are urban municipalities, not far apart from each other. Even though Park Lingezegen is not on their territory, they are directly bordered by it. Especially recently built neighborhoods in both cities are close to the park. Like Overbetuwe and Lingewaard, both Arnhem and Nijmegen have a representative in the board of Park Lingezegen. These cities saw opportunities in Park Lingezegen for their inhabitants to benefit from recreational possibilities and green areas.

Waterschap Rivierenland:

Park Lingezegen is situated within the confines of the water board (waterschap) Rivierenland. They were influenced by plans for the creation of wet nature in Waterrijk and along the banks of the river Linge. They saw Park Lingezegen as an opportunity to improve the water safety in this flood prone region, and therefore joined the organization at an early stage, by contributing a representative to the management board of Park Lingezegen. They succeeded in combining this new wet nature with more storage capacity for water, by reserving at least 28 hectares for water storage (Park Lingezegen, 2010). Similarly to the province of Gelderland, once they saw their goals met, they took a step back from the board of Park Lingezegen, and continued in an advisory role.

Dienst Landelijk Gebied:

The Dienst Landelijk Gebied (Office for Rural Areas) was a national governmental institution that aimed to improve and support spatial planning in rural areas in the Netherlands. They provided half of the 68 million euro budget (Park Lingezegen, 2008) in order to establish the goals of the Ecologische Hoofdstructuur (Ecological Network), a nationwide policy to improve connections between nature reserves. This service went defunct during the course of the project, due to the advent of the 2008 financial crisis, in combination with an anti-nature discourse at the national government level, as the service fell under the responsibility of State Secretary Henk Bleker of the CDA (Christian Democrats) who dismantled the service as part of large scale budget cuts (personal communication, park director). This left the park with a large deficit of 10 million euros, which was filled in by the province of Gelderland.

Staats Bosbeheer:

Staats Bosbeheer (National Forest Management) is involved in Park Lingezegen in an advisory role to the management board of the park. Initially they were meant to manage all the new nature preservation areas and the stepping stones of the Ecologische Hoofdstructuur in Park Lingezegen using the budget allocated by the Dienst Landelijk Gebied, but due to the abolishment of that service and the accompanying change in financial situation, a different arrangement had to be made (personal communication, representative Overbetuwe). Now they only manage the nature preserve in Waterrijk. The areas that were left out are now managed by the municipalities of Overbetuwe and Lingewaard, not by Park Lingezegen itself, as it was never meant to be responsible for land management (personal communication, representative Overbetuwe).

Market

Mainstream Farmers:

Mainstream farmers made up by far the largest group of land owners in the area before Park Lingezegen was planned. The extra room for nature and recreation mostly came at their expense, as some of them had to move their activities (personal communication, representative Overbetuwe). Therefore, they were initially very opposed to the formation of Park Lingezegen, and were organized in interest groups, in particular De Ploegschaar. This was coalition of individual market actors. Their concerns were that the increase of the ground water table to create wet nature would interfere with their agricultural activities. They also felt that the area was beautiful the way it was and that there was no need to change it (personal communication, representative Overbetuwe). By keeping the

dialogue between the mainstream farmers and other actors going, often by efforts of the rural municipalities, relations later on improved, and the mainstream farmers became more involved in Park Lingezege, coming to regard it as opening up new opportunities (personal communication, representative Overbetuwe). Especially the sub area Landbouwland provides farmers with new opportunities, like opening up to the public by selling their produce locally and educate the public about agriculture, or opening up to forms of recreation and catering.

Civil society

Experimental Farmers:

Some of the farmers currently in Park Lingezege don't adhere to the mainstream principles of agriculture in the Netherlands, with a focus on productivity. I have called these experimental farmers here. These are often local inhabitants from non-agricultural backgrounds, interested in protecting the traditional landscape and biodiversity, educating the largely urban population of the region about food production and biodiversity, and finding out and showing the possibilities of non-mainstream agriculture in order to contribute to a sustainability transition in agriculture (personal communication, food forest Santackergaard & Natuurakkers Doornik). Their ideas for initiatives were quickly adopted by the management of Park Lingezege because they saw it fit very well with the aims of Park Lingezege (personal communication, park director). However, it was still hard at times for these farmers to implement their vision because of the inflexibility of previously made plans by landscape architects. For example they had to extensively lobby to save a row of trees from being cut down, and in another instance a vote had to be held by the board members about a cycling path that would have cut right through a field instead of going around it. These issues were resolved in the farmers' favor and in the end they are happy with the result (personal communication, food forest Santackergaard & Natuurakkers Doornik). Their ideas took the form of several food forests in De Park and De Woerdt, and 'natuurakkers' in De Woerdt, which combine food production with a greater consideration for nature and biodiversity, including insects. These initiatives became a key element of Park Lingezege. The food forests can provide a wide variety of habitats to insect species, as there are multiple layers of foliage, various kinds of flowering plants, open spaces for digging species, bee stables for domesticated bees, insect hotels for wild bee and ponds for (semi)aquatic species (observations). The Natuurakkers provide habitats for insects as well, as the field margins are broad and overgrown with a variety of bushes and trees, while no pesticides are used. The food forests are also monitored for their biodiversity; the food forests provide a good habitat for wild bee species and butterflies (Werkgroep Monitorrapport, 2019).

Expert system

Landscape Architects:

Multiple landscape architects worked on the various sub areas of Park Lingezege, and the park as a whole. Their task was to incorporate all the aims of Park Lingezege into their plans, which is broadly speaking, accentuating the features of the traditional landscape while providing more room for both nature and recreation. As mentioned above, once a plan was made, they could be inflexible in adapting it to initiatives from civil society, as they and landscape architects often had different principles and priorities. For example, where there are food forests now in sub area De Park, initially there were traditional orchards planned, because they belong to the traditional landscape of the region. It turned out to be difficult to implement the food forests without straying away from the initial aims of preserving the traditional landscape. However, eventually a compromise was reached wherein the side of the food forests facing the pathways and cycling paths were established to be more orchard like than the away facing side, which everyone was happy with in the end (personal communication, food forest Santackergaard, landscape architect De Park).

Coalitions and conflicts between actors

The various actors have diverse relationships with the other actors. The major coalition of Park Lingezegen was the management board, which consisted entirely of state actors, namely the province, the four municipalities, and the water board, however the province and the water board later left the board when their aims were met, continuing on in advisory roles. This coalition is based on shared discourses and the aims that follow those (see chapter 5.3 discourses). Another coalition is that of the actors of the board with the civil society actors. This is a resource coalition, as it exists because the civil society actors lack resources to achieve their desired aims which the board can provide in, while the civil society actors fit into the ideals of the board on how Park Lingezegen should look like. Finally, there was a coalition of market actors, particularly traditional farmers. This was also a resource coalition, as individually they did not have the resources to prevent the state actors from altering the status quo which was their desire to maintain, indicating a power imbalance (see chapter 5.4 resources).

More generally, the province of Gelderland acted as the animator for interaction between the different actors, ensuring that the park materialized, but leaving the exact details open for the other actors. As mentioned, in the beginning, the mainstream farmers clashed with the board of the park, consisting of the province, the four municipalities, and the water board. The mainstream farmers saw the encroachment on agricultural land and creation of a wetter environment as them being put on the sideline, with no say in the matter. This also caused disagreement at times between the rural municipalities and the urban municipalities, as the concerns of the mainstream farmers were felt stronger in the rural municipalities. However, cooperation between the municipalities has always been a major consideration for the management of Park Lingezegen, and consensus was always a priority (personal communication, representative Overbetuwe). Meanwhile, the rural municipalities made efforts to keep the farmers involved in the process in order to create more support, and managed to get them on board eventually, by showing that Park Lingezegen provided opportunities for them (personal communication, representative Overbetuwe).

Furthermore, there was sometimes disagreement in direction between the experimental farmers and landscape architects, who weren't always willing or able to adapt their plans to initiatives from experimental farmers, about where the priorities of the planning of the park lay: freedom to experiment with biological farming or sticking to the traditional landscape. These disagreements were often solved by compromises eventually by continuing to talk and cooperate, with the board of the park as mediators. When no agreement could be made, the management of Park Lingezegen could be asked to vote on the matter, however mutual relations always remained largely positive (personal communication, Natuurakkers Doornik). Overall, the relations between governmental actors were smooth and cooperative, and the actors from the market and civil society were sufficiently involved for them to be happy with the outcome, although some would have liked to have seen a bigger focus on participation from the beginning (personal communication, park director, representative Overbetuwe).

Opportunities and barriers

Bottom-up initiatives from civil society like the food forests are vital for the conservation and biodiversity of insects in agricultural areas, because it manages to bring together nature and food production, with insects providing benefits to both. Nature based solutions like Park Lingezegen can help give those initiatives a boost, especially if there is a coalition between the state actors and the civil society actors, providing resources for initiatives.

However, this blending of functions remains hard because of institutionalized ways of thinking among planners, who still apply plans top-down and are inflexible in changing them to suit bottom-up initiatives that can help insect conservation, and mainstream farmers, who see the creation of new nature and the protection of insects as harmful to their activities. This causes the problem that

the positive effects for insects from bottom-up initiatives could be hampered by this resistance. At the same time, Park Lingezegen shows that cooperation between actors and the perseverance therein, can get every actor on board and work towards multiple aims within the confines of the same nature based solution, when the governmental actors take on the role of enabling bottom-up initiatives and mediating between civil society and the other actors while also having the power to make final decisions.

5.2 Rules

The next dimension of the policy arrangement of Park Lingezegen are the rules of the game. These can be divided into three sub dimensions, based on the operationalization table from chapter 3.1. First of all *law*, which in the case of Park Lingezegen refers to the formal boundaries within which actors can adjust the landscape, set by the national, provincial or municipal government. Furthermore, there is *policy*, which refers to what the those same governmental layers want to achieve and what their priorities are. The final dimension is *procedure*, which refers to how the interaction between actors are guided.

Law

When it comes to insect conservation, there are several relevant laws from the national government and the European Union. At the time of the formation of Park Lingezegen, the *Natuurbeschermingswet* (Nature Protection Law) was in effect which incorporated the European Natura 2000 legislation and the birds and habitats directives. This law forbids the disturbance of the habitat of plants and animals in designated areas called Natura 2000 sites. Park Lingezegen does not include any Natura 2000 sites, but it does border those sites in the north and south, those sites being the flood plains of the rivers Nederrijn and Waal, so actions taken in Park Lingezegen may affect those areas. Furthermore, the *Flora- en Faunawet* (Flora and Fauna Law) was at that moment in effect, which ensured the protection of plant and animal species, especially endangered 'red list' species. Modifications to the environment must not negatively influence these species. Compensation is necessary if that is unavoidable. In this light, an Environmental Impact Assessment (EIA) must always be made before the execution of a spatial planning project, as has been done for Park Lingezegen, in order to ensure the protection of nature. In an EIA several scenario's or 'alternatives' are investigated on their impact to the environment, based on parameters, for example how many hectares of wet nature is created, the amount of recreational facilities, etc. After that an advice is made using the preferential alternative that minimizes the environmental impact while maximizing the goals of the project. In the EIA of Park Lingezegen, the preferential alternative that Park Lingezegen adhered to was positive for the state of recreation, nature and water aspects of the park, and possibly negative for the state agriculture in the park (Provincie Gelderland, 2009). The only mention of insects in the EIA is in relation to their capacity to become nuisance animals to local residents, especially mosquitoes. It has been deemed that there is no risk of insects forming a nuisance because of Park Lingezegen (Provincie Gelderland, 2009). Additionally, a test for conforming to the *Flora- en Faunawet* has been done, showing which protected animals occur within the confines of the park. At that time, in total 43 insect species were specifically protected in the *Flora- en Faunawet* (Compendium voor de Leefomgeving, n.d.), however none of these were found in Park Lingezegen in this test. It should be mentioned that a total of 227 insect species are on Dutch red lists (EIS-Nederland, n.d.), which does not include every order of insect that occurs in the Netherlands. These red lists don't offer outright protection however as they are not part of the *Flora- en Faunawet*, nor part of the European habitats directive, and no monitoring test for these species has been done for Park Lingezegen.

Another relevant law is the *Bestemmingsplan* (Zoning Plan), which consists of zoning laws set by the municipal council. In order to implement the proposed changes to the environment for Park

Lingezege, the Bestemmingsplan of the municipalities of Overbetuwe and Lingewaard had to be altered. The process of changing the Bestemmingsplan was a big undertaking and a long and complicated process, because of the large size of the park (1700 hectares) and also because of the process of garnering support from local property owners (personal communication, representative Overbetuwe). An example is the event terrain in sub area De Park, which was initially meant to accommodate 50.000 visitors at once. This plan was canceled by the Raad van State (Council of State), the highest judicial body for cases between government bodies and civilians, on the basis of complaints by local residents. After this, participatory platforms were set up for the local residents in order to garner support for a new plan, which limited capacity to 20.000 and has been implemented (personal communication, representative Overbetuwe). Also, because multiple municipalities are part of the management of Park Lingezege, knowledge and legal expertise is always available from at least one of them, which eases the process of making and changing the Bestemmingsplan as well (personal communication, representative Overbetuwe). It must be noted that for non-state actors such as the mainstream farmers and the experimental farmers this process is harder to influence because of a lack of knowledge and power, however the management board of Park Lingezege has played a role in helping their causes along (personal communication, Natuurakkers Doornik).

Furthermore, the process of land acquisition was long and complicated, even though it was successful (personal communication, park director), as no expropriation has taken place in Park Lingezege. As local farmers were initially very opposed to the park, it was difficult to acquire the necessary land, as governments in the Netherlands are obliged to conform to market prices. However, expropriation was seen as a useful big stick to ensure cooperation as well as the judicial power of the Bestemmingsplan (personal communication, park director).

Policy

The policy for Park Lingezege is laid out in the Intergemeentelijke Structuurvisie (Inter-municipal Structural Vision), where the aims for the park as well as the sub areas are defined, and forms the guidebook for further plans and initiatives. It builds upon the outcome of the preferential alternative from the EIA. The main aims include preserving and strengthening the traditional rural and green landscape, creating ecological links between nature preserves and strengthening ecological values in general, give more space to water in order to store a potential surplus and to increase the quality of the wet nature in the area, preserving cultural heritage, and creating a green recreational network across the park with connections to urban areas (Gemeente Lingewaard & Gemeente Overbetuwe, 2011). Relevant for insect conservation is the models used to accomplish the ecological links: model IJsvogelvlinder (white admiral) creates ecological stepping stones of dry nature, particularly woodlands, and model Rietzanger (sedge warbler) creates ecological stepping stones of wet nature, particularly reed lands. This will benefit many insects that might otherwise be cut off from reaching other nature preserves by infrastructure or monocultural agriculture. The Structuurvisie does not mention insects as a subject to be protected or promoted, however model IJsvogelvlinder is named after a species of butterfly that is on the Dutch red list for butterflies, indicating that at least some insects are considered key species in the ecological network of Park Lingezege.

Procedure

The formation of the management of Park Lingezege is possible because of the Wet Gemeenschappelijke Regelingen (Law for Communal Arrangements), which allows governmental bodies to cooperate across municipal and provincial boundaries. This also allows for the management board of Park Lingezege to be a public body by law, and a juridical person. This construction makes it possible for the province, four municipalities and water board to make joint decisions about the intermunicipal territory of Park Lingezege, conforming to the tasks laid out in the Gemeenschappelijke Regeling (Communal Arrangement). The formation of such a construction is

a good sign of the intent to cooperate regionally, which benefits the whole region instead of single municipalities, and allows for the implementation of region wide networks like the Ecologische Hoofdstructuur (Ecological Network), which in turn can potentially benefit insect conservation.

The park management has a hands off approach to managing the land. They mean to ensure the goals of Park Lingezegen are met and set boundaries for what is possible, but also give room to initiatives from civil society and market actors to pursue activities in line with the aims of the park (personal communication, park director, representative Overbetuwe). The reason for this is that the state actors wanted to promote participation of the local residents in order to create a wide support base in the region and a sentiment of 'togetherness' when it comes to tackling sustainability issues, including biodiversity (personal communication, representative Overbetuwe). Very good examples of this are the food forests and natuurakkers, whose managers have been able to strike deals with Park Lingezegen fairly easily to lease the land owned by governmental bodies in order to make their own touch on Park Lingezegen. The decision to keep government interference low, has been regarded as a success, and the future aim is to continue with and expand on this development, as it has led to wider support in the region (personal communication, park director, representative Overbetuwe). This sentiment is also exemplified by the province of Gelderland and the water board Rivierenland stepping out of the management board of Park Lingezegen recently, because they saw their initial goals met, and want to allow the local residents to develop Park Lingezegen further. They still provide an advisory function in case the board needs their expertise.

Opportunities and barriers

The ability for governmental bodies to enter a Gemeenschappelijke Regeling (Communal Arrangement) aids cooperation within a region by ensuring that decisions are made jointly and ensuring shared responsibility, and aids the implementation of nature based solutions that are situated across municipal borders. For Park Lingezegen this has led to an intermunicipal policy which can provide common goals and a bigger context for nature conservation, making it easier to create ecological networks that benefit insects like Model IJsvogelvlinder. Furthermore, the willingness to hand off control of land to civil society actors has made more habitats for insects outside of the designated nature areas.

There are however some barriers concerning NBS using this format, as both land acquisition and Bestemmingsplan (Zoning Plans) procedures are long, expensive and complicated processes that require smooth cooperation and expert knowledge, and the political and financial circumstances can change during this time, which happened in the case of Park Lingezegen when the financial crisis of 2008 hit and the Dienst Landelijk Gebied (Office for Rural Areas), a major source of subsidy, was abolished. An NBS like Park Lingezegen is not easily or quickly implemented because of this, as it has taken Park Lingezegen from 2008 when the Masterplan was made to 2020 to implement it completely, with land acquisition starting before that.

5.3 Discourses

There are several discourses surrounding Park Lingezegen coming from various actors that come with their own worldview and problem definitions. I have grouped these according to what the focus or most important aim is for Park Lingezegen, because these aims stem ultimately from what is seen as the most important problems. These include recreation, landscape protection, nature conservation, water safety, mainstream agriculture and experimental agriculture. Finally, also the relationships between the different discourses are elaborated upon.

Recreation

The biggest discourse around recreation is that of regionalism; this means that Park Lingezegeen is part of a larger region, Arnhem-Nijmegen, which belongs to all its inhabitants. The problem that is discerned for this discourse is that the region is too closed off right now. Instead, everyone should be able to make use of all the facilities in the region, including green and rural areas. With so many people living here, a central green area would be ideal for recreation relatively close to the home of these urban citizens. Therefore, the area must be opened up, and Park Lingezegeen provides the opportunity for this. This discourse is prevalent among the municipalities, especially Arnhem and Nijmegen, as they look after the interest of their own inhabitants. Because of the prominence of the municipalities in the management of Park Lingezegeen, this was a dominant discourse, and recreation received a prominent place in the park (Observations). A common phrase in this discourse is openness; making the area more accessible to recreationists creates a lively environment (personal communication, park director, representative Overbetuwe). Opposed to this is a discourse of localism, propagating the idea that the rural areas are meant for the people who live there, in particular farmers, as recreationists could harm their interests by taking away space for agriculture in favor of recreational facilities. For them, maintaining the status quo was important in the face of changes brought about by Park Lingezegeen. This discourse was less dominant because the board of Park Lingezegeen has made efforts to convince local residents that promoting recreation does not harm their interests, but provides opportunities for them, as they can profit from recreationists and educate them about agriculture (personal communication, representative Overbetuwe).

Landscape preservation

This discourse around landscape preservation stems from environmentalism. The problem that this discourse sees is that urbanization and modern agriculture are destructive forces, as they have destroyed much of the traditional landscape of the region which was more small scale with many small landscape elements like rows of trees and copses, drainage canals, hedge rows as field borders instead of fencing, flower patches etc. What little is left must therefore be protected or expanded because of the positive effects of those landscape elements on biodiversity, especially insects (personal communication, ecology expert). So for the environmentalism discourse landscape preservation is a tool to accomplish this. To protect the landscape there is a special role for landscape architects, because they have moderate expertise in many things, which makes them able to see connections and to bring different elements together to create aesthetic and lively landscapes that people will want to preserve (personal communication, landscape architect). Also the experimental farmers are generally concerned with landscape preservation owing to their being part of the environmentalism discourse, as their reason for developing experimental farming methods has a lot to do with trying to return to a level of biodiversity there was before biodiversity started to decline due to urbanization and modern agriculture. (personal communication, food forest Santackergaard, Natuurakkers Doornik).

Nature conservation

The discourse around nature conservation also stems from environmentalism, but it sees the development of nature preserves as paramount in order to halt the loss of biodiversity because of modern farming practices and urbanization. Nature conservation was a prevalent goal for the province of Gelderland, because their aim at the time was to create an ecological network across the province, and Park Lingezegeen provided an excellent opportunity to accomplish this in the Arnhem-Nijmegen region. Because Gelderland was the initiator of the project and had few demands other than this despite bearing a large financial load, they were able to make sure their aims were met, which made the environmentalism discourse a dominant one in Park Lingezegeen. The discourse around nature conservation in national politics however was becoming increasingly more anti-environmentalist, leading to the stop of the important subsidy program from Dienst Landelijk Gebied

(Office for Rural Areas) that the park relied on; this has made funding for nature conservation in rural areas more difficult.

When concerning insect conservation specifically, insects have little to no attention in national nature conservation laws, and in the planning documents and the Structuurvisie of Park Lingezegeen there is relatively little focus on insects, which means there may be missed potential. Nevertheless, there is mention of specific insect species on information signs in the park (observations), and the food forests in Park Lingezegeen are monitored for wild bees and butterflies, which shows an interest in the matter from civil society. Additionally, there was a negative discourse around possible infestations of stinging insects like mosquitoes because of the creation of wet nature. The EIA showed these concerns were largely invalid. Overall, the attention to insects within the environmentalism discourse in Park Lingezegeen is unsystematic, limits itself to a small scale like the food forests, and generally focuses on butterflies and wild bees rather than insects as a whole.

Water safety

The area of Park Lingezegeen is situated in between two major rivers, with the river Linge flowing through the park. This area is therefore prone to flooding during high water levels, which could be disastrous in this densely populated area, and cause much economical damage, which is seen as a problem by governmental actors as well as the wider public. Strict water safety with responsibility lying with the government is a very prominent and widely supported discourse in the Netherlands in general, exemplified by the heavy involvement of the water boards in spatial planning, including in that of Park Lingezegeen, as that is seen as the best solution for flood risk. Because of this discourse, water storage and accessible riverbanks is seen as a priority for the water board Rivierenland, which Park Lingezegeen could provide in.

Mainstream agriculture

There is an agrarian discourse among the local farmers that sees the encroachment on mainstream agriculture as undesirable and problematic, because the area is fertile and suited for this kind of agriculture (personal communication, research leader Park Lingezegeen). In this light the implementation of Park Lingezegeen is undesirable, because the area was fine the way it was, and used in the most efficient way. The problem definition here is that there is no problem to be solved. This discourse is also influenced by a national anti-environmentalist discourse among farmers fueled by the many and ever changing environmental rules as well as the animal rights activism discourse painting farmers in a negative light, leading to a reluctance to provide land for nature conservation. In Park Lingezegeen, this discourse was drowned out however by the environmentalism discourse, leading to resistance from local farmers. Later however, the discourse around mainstream agriculture shifted to view Park Lingezegeen as an opportunity to combine agriculture with other functions like recreation, which was possible through the efforts of the board by keeping the farmers involved in the planning, leading them to realize that the park was going to come, but they could fill it in themselves (personal communication, representative Overbetuwe). The buzzword in this change of discourses was 'turning into opportunities.'

Experimental Agriculture

Finally, there is also a sustainability discourse around agriculture that considers the fact that mainstream farming methods are unsustainable as a big problem, and the fact that it is part of the cause for the loss of biodiversity in the country (personal communication, ecology expert). Agriculture therefore needs to shift its focus to working with nature instead of against it. However, the sustainability discourse also believes that it is possible to integrate economy and ecology with each other (Veenman et al., 2009). This discourse is prominent among the civil society actors that have started the food forests and natuurakkers in Park Lingezegeen. These initiatives create

awareness about food production and show it can be a valid alternative to mainstream agriculture in the setting of nature based solutions. Another goal of this discourse is to prove the viability of different farming methods like food forests and natuurakkers, and that way creating a shift within the agrarian community towards more sustainable practices, where nature is the leading force, but can be combined with economic interests, as it is also commercially viable (personal communication, Natuurakkers Doornik).

Relationships between discourses

The two most prevalent discourses, the regionalism discourse leading to a focus on recreation and the environmentalism discourse leading to a focus on landscape preservation and nature conservation, have a complicated relationship, as recreation can have both a negative and positive effect on biodiversity (Van der Duim & Caalders). In Park Lingezege recreation and nature conservation have been combined especially in Waterrijk and De Woerdt where cycling paths and foot paths cross the nature preserves so that nature can provide light recreation, whereas heavy recreation is concentrated in one area of the park, sub area De Park, where there is space for large events, a visitor's center, a playground and petting zoo among other things (observations). Insect conservation seems especially suitable for combining with recreation, as can be seen by the insect hotels at various recreational facilities in the park, like Park Bredelaar (observations). Landscape preservation and nature conservation often go hand in hand too in Park Lingezege, as the preservation of traditional landscape elements like broad field margins and rows of trees and hedges are generally good for biodiversity (personal communication, ecology expert). Water safety too is combined with nature conservation, as the creation of wet nature in Waterrijk also acts as water storage and climate adaptation (personal communication, representative Overbetuwe). The biggest clash of ideals between discourses in Park Lingezege is that of localism and agrarianism in mainstream agriculture versus regionalism and environmentalism among the board (governmental bodies). This is because localism and agrarianism formed the status quo, until regionalism and environmentalism became dominant because of the larger power of the board (see chapter 5.4 resources). The localism has since mostly shifted to regionalism as the local residents have realized the benefits of being part of Park Lingezege (personal communication, research leader Park Lingezege). Also, the success of the food forests and natuurakkers in Park Lingezege are changing the discourse around agriculture as a whole towards more sustainable agricultural practices, and show this transition is possible and beneficial to nature conservation, giving momentum to the environmentalism discourse over the agrarian discourse.

The most important things to stress here are the continued cooperation between actors coming from different discourses, and the blending of functions in order to unite different discourses. The different actors coming from different discourses in Park Lingezege have managed to find ways to come together to achieve different aims with the same solution, which is exactly what nature based solutions are meant to do: solving multiple environmental and social problems using nature.

Opportunities and barriers

Park Lingezege shows that giving room for experimental agriculture provides pioneers the chance to push the view that agriculture and nature conservation can go together, which can create support for more sustainable agricultural practices, which will benefit insect conservation. Moreover, the need for recreation and landscape preservation in relatively urbanized areas can also provide a foundation for the development of nature that is beneficial to insects, as those functions can be intertwined as long as the discourses surrounding these subjects allow for cooperation.

Nevertheless, a negative discourse around nature conservation at the level of national politics can have negative effects on the attitudes of local residents, especially farmers, towards the creation of nature, as well as the financial resources available at the local level, if the NBS relies on national

subsidies. Furthermore, the lack of attention to insects as an object of conservation may lead to missed opportunities for conservation at a small scale, as most of the attention to insects come from experimental farmers, who may for instance focus only on bees, rather than ecological experts who have the knowledge to take into account all insects and the ecosystem as a whole. This lack of attention may stem from a lack of access to nature in modern society, a negative public image propagated by the media and a lack of field work in schools and universities (Cheesman & Key, 2007).

5.4 Resources

Various resources are of importance to the policy arrangement of Park Lingezegen. The relevant resources have been identified as financial resources, social networks, knowledge and legal authority. The degree of access to these resources by the actors are elaborated on. Also the power imbalances resulting from the distribution of these resources are elaborated on.

Financial resources

The main financial contributor was the Dienst Landelijk Gebied (Office for Rural Areas) from the national government, which would contribute half of the 68 million euro budget (personal communication, park director). Besides this, all the governmental bodies involved in the management of Park Lingezegen contributed to it financially, those are the province of Gelderland, the municipalities of Arnhem, Nijmegen, Overbetuwe and Lingewaard, the water board Rivierenland, and the now defunct city region Arnhem-Nijmegen, whose tasks and responsibilities have shifted to the province. The province of Gelderland contributed the most of these bodies, especially after the Dienst Landelijk Gebied was abolished and Park Lingezegen was left with a hole of 10 million in the budget, as the province covered this loss eventually. Apart from this instance, the finances of the park posed little problems, as the park has stayed within its budget. Not only that, but in 2020 the continued maintenance of Park Lingezegen has been ensured for at least the next 40 years (personal communication). The financial resources were therefore not regarded as problematic during the realization of the park (personal communication, park director, research leader Park Lingezegen, representative Overbetuwe, landscape architect).

Social networks

Social networks are particularly important for the civil society actors. These networks have allowed them to help the cause of their initiatives, as these social connections lend them power and knowledge they otherwise would have difficult access to (personal communication, Natuurakkers Doornik). Because insect conservation partly relies on the civil society actors in Park Lingezegen, it is indirectly benefitted by a social network that funnels knowledge and political power from state actors and the expert system to civil society. The management of Park Lingezegen has also realized the importance of social networks to the local inhabitants and entrepreneurs, and has therefore appointed so called network brokers, who provide opportunities for civil society and market actors to develop their activities in Park Lingezegen in various fields like food and art, while ensuring they comply with the original aims of the park.

Knowledge

This resource is important when it comes to the development of nature areas, because the ecological intricacies of those areas concerning the soil, hydrology, plant and animal life require expert knowledge (personal communication, park director). Besides this, knowledge is also a resource that has built up over time during the course of the realization of Park Lingezegen. The experimental farmers are trying different ways to combine nature and food production as they keep increasing their ambitions regularly, and build up a unique knowledge about ecology and agriculture (personal

communication, Natuurakkers Doornik). They use this knowledge to educate the recreationists and local children, largely urban, about these subjects, adding to and augmenting the discourse around sustainable agriculture. Finally, there is also a lot of room in Park Lingezegen for the knowledge that landscape architects bring to the table, as they have experience with combining nature with other functions like agriculture and recreation (personal communication, landscape architect).

Legal authority

This resource lies almost entirely with the state actors. This resource is often derived from the rules, as they provide legitimacy to the aims of the state actors. For example the policies of the Structuurvisie lend legal authority to the aims of the municipalities and province. Another source is the control over the Bestemmingsplan, which lies with the municipalities of Lingewaard and Overbetuwe, as it is law, and can therefore be used to force a certain type of land use on an area. The state actors also have legal authority as a resource when it comes to land acquisition, as there are mechanics like expropriation that they could theoretically employ to force non-state actors to sell their land.

Power

The province of Gelderland had a large amount of power over the direction of Park Lingezegen, because they are the initiators of the project and one of the main financial backers. As the largest government layer in the park, Park Lingezegen for them was part of a bigger policy context, the Ecologische Hoofdstructuur (Ecological Network), which gave them a solid mandate. They deliberately chose to use this power to play a mediating role, and not an intervening role, thereby ensuring the overall goal of the establishment of a nature based solution, and making sure of local support. Another power imbalance lies between the management board of the park and the local inhabitants. The management consists of governmental bodies, which hold much more legal authority as explained above, but also have more bureaucratic knowledge, making their involvement in spatial planning matters a necessity for civil society and market actors. In order to address this imbalance, over time, the management in Park Lingezegen has shifted from an intervening role, for example through land acquisition, to a more supportive role, giving room to non-governmental actors to get more involved in the planning and the realization of plans (personal communication, park director, representative Overbetuwe).

Opportunities and barriers

The fact that multiple municipalities and government layers have contributed financially, has meant a spread of risk and responsibility in Park Lingezegen. This also allowed them to overcome a financial set back. This indicates that intermunicipal and intergovernmental cooperation is a good financial foundation for nature based solutions. Furthermore, the actors with the most power, mainly through legal authority, were open to initiative because they played a more mediating and supportive role, allowing for more incorporation of nature conservation with agriculture, which benefits insect conservation.

Nevertheless, the heavy reliance on national subsidies can still be a risk to the continuation of a nature based solution when these subsidies are abolished. Moreover, power is heavily on the side of the governmental bodies, and other actors have to rely on these bodies' willingness to play a more supporting role, which could harm insect conservation as they partly rely on initiatives from civil society.

6. Discussion

6.1 Conclusion

The research question of this thesis was: what are the institutional opportunities and barriers of insect conservation in nature based solutions in Gelderland? Several opportunities and barriers have been identified that other nature based solutions can adopt or avoid in order to achieve a better protection of insects.

One of the major opportunities for insect conservation in nature based solutions is the room it can give to bottom-up initiatives from civil society that have to do with sustainable farming and farming with nature. In Park Lingezegen this presents itself in the food forests and Natuurakkers that have been established in the park, where insects are given room to thrive in a variety of habitats while also providing ecosystem services like pollination. Food production and insect conservation are combined and benefit from each other here. These initiatives also help the discourse around the transition to sustainable agricultural practices, which will benefit insects, as they will gain connected habitats without having to face pesticides.

In Park Lingezegen, room for civil society initiatives has been given by a hands-off approach by the management board consisting of several governmental bodies: the province of Gelderland, the municipalities of Arnhem, Lingewaard, Nijmegen and Overbetuwe, and the water board Rivierenland. They established a frame for civil society and market actors to work with, playing a more and more mediating role as the development of Park Lingezegen progressed. This cooperation between government layers was established by a *Gemeenschappelijke Regeling* (Communal Arrangement) making the board of Park Lingezegen a political and juridical entity, and sharing the financial responsibility. For park Lingezegen, this resulted in easier cooperation across municipal borders, which made the implementation of an ecological network, integrated in the nature based solution that is Park Lingezegen, in the region coherent. As ecological networks are very important to insect conservation (Samways, 2007), their proper implementation provides an opportunity for insect conservation, and their implementation in Park Lingezegen has been successful in part because of the ability for the governmental bodies to cooperate effectively as a result of the *Gemeenschappelijke Regeling*.

Furthermore, the societal need for recreation and landscape preservation creates an opportunity for insect conservation, because if these goals are integrated in a nature based solution, as is the case for Park Lingezegen, efforts can be made to combine societal and environmental functions into one. In Park Lingezegen this has been done by providing recreational facilities like cycling paths in nature areas. This way insects benefit from a need for recreation, as more nature is preserved in the process.

The opportunities particularly come down to the blending of functions. Insect conservation is ideal to incorporate into other functions like recreation, landscape preservation, water safety and agriculture. Because NBS are an ideal way to combine various problem definitions, both environmental and social, and come to one solution using nature, NBS have the potential to give insect conservation a place in areas with little focus on nature, like densely populated areas and agricultural areas.

Barriers for insect conservation in nature based solutions are the bureaucratic processes of land acquisition and *Bestemmingsplan* (Zoning Plan) procedures, as they are time consuming, expensive and complicated processes that require smooth cooperation and expert knowledge. They can hinder insect conservation by preventing bottom-up initiatives concerned with experimental agriculture, as civil society and market actors often have little power over and knowledge about these processes. In Park Lingezegen the board managed to overcome this barrier by keeping these actors involved during

the course of the planning process, giving them a high degree of freedom to fill in their place in Park Lingezegen and supporting them with issues of land acquisition and Bestemmingsplannen. Another barrier is the lack of attention insects receive within nature conservation laws and policies, both national and local. This is a discrepancy with scientific literature, which agrees on the importance of insects for ecosystems and ecosystem services. There is a missed potential to integrate insect conservation into the bigger picture. Right now it is relying on general nature conservation and civil society actors that often don't cater specifically to insects. Furthermore, Park Lingezegen heavily relied on financial resources provided by a national government service. This has proven a big risk, as this service was shut down due to a financial crisis and an anti-environmentalism discourse at the national level, leaving the park with a big deficit. For Park Lingezegen the province of Gelderland provided the necessary funds, but relying on the national government for funds could have dire consequences for nature based solutions.

The biggest barrier is the condition of cooperation. Government layers have to be able to work well with each other, take cooperation as the basis of every action, and depart from the assumption that their aims can be combined into one solution. Additionally they have to be able to let go of power in order to involve both market and civil society actors into this cooperative sphere, because that way insect conservation can receive more room outside of nature preserves.

6.2 Recommendations

The scope of this thesis was small, as it contains only one case study. This makes it hard to extrapolate conclusions from this research to other nature based solutions, especially outside of the Netherlands. Future research should consider multiple cases from different parts of the world, in order to make conclusions that can be applied more broadly.

This thesis was also limited to researching the institutional side of nature based solutions by using the policy arrangement approach, which does not consider environmental variables that may play a role. Future research should strive to combine institutional and environmental dimensions, for example by using insect monitoring data, in order to figure out insect abundance and/or diversity of the different kinds of insect habitats like food forests versus ecological stepping stones.

Alternatively, future research could also focus on the effect of a single institutional variable of nature based solutions on insect conservation, for example the effect discourses have on insect conservation, in order to gain a more accurate picture of the topic.

6.3 Reflection

This thesis could have been improved in a number of areas. The biggest mistake is that the elaboration of the theory, in particular the policy arrangement approach, was not comprehensive enough before starting the data collection. This has led to late revisions of the methodology and results that could have been avoided. Another result of this was that the operationalization of the dimensions of the policy arrangement approach lacked before starting the data collection and was not revised quickly enough after starting the data collection, leading to a messy way of codifying the primary data, and also leading to missed opportunities in the data collection. Furthermore, the way the results of the discourse dimension were organized (according to the general goals for Park Lingezegen) turned out to be cumbersome, this I would do differently in the future. So overall, I would better prepare myself before data collection in future research, and revise the methodology and operationalization much earlier into the data collection than I did in this instance. Despite these mistakes I have learned so much about the practice of spatial planning and policy making, as well as the possibilities of sustainable farming methods like the food forests and their contribution to biodiversity, which has really inspired me to keep pursuing the integration of nature conservation into agricultural and urban landscapes.

Thank you for reading my thesis.

7. References

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