

**Assessing resilience and
adaptive capacity in
social-ecological systems:
the case of UNESCO Global
Geopark De Hondsrug**

Master thesis

Assessing resilience and adaptive capacity in social-ecological systems

The case of UNESCO Global Geopark De Hondsrug

MSc Leisure, Tourism, and Environment

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List of abbreviations

CAS	Complex Adaptive Systems
EGN	European Geoparks Network
EU	European Union
GGN	Global Geopark Network
L	Latitude
NP	National Park
Pr	Precariousness
R	Resistance
SES	Social-ecological systems
TIP	Tourist Information Points
UNESCO	United Nations Educational, Scientific and Cultural Organization

*Ik zee joe ja dat ik veurig jaor
Achter 'n dichte poorte zat
Op zuuk naor 't goeie sleuteltie
He 'k overal zöcht gewoon omdat
Ik naor buuten mus
En wat dacht ie wat
Toen ik 't bijna opgaf bleek
Da 'k 'm zölf in de buze had*

Daniël Lohues

Preface

This thesis is the result of a long but exciting journey and I would like to take a brief moment to show my gratitude to those who supported me throughout the process of this research.

I would like to thank the organization of Geopark De Hondsrug for giving me the opportunity to do this research. A special thanks goes out to all the respondents and people whom I talked to during the period of data collection. Every input I got was of great importance, and I was once again reminded of the friendliness of the people in Drenthe.

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Thank you, papa and mama, for taking me back into your home for a couple of weeks, and for letting me drive your car all across Drenthe. I hope you both considered this in exchange for the warm cooked meals in the evenings as a good deal. And you know it: kop d'r veur!

My eternal gratitude goes out to all the Emily's. I cannot put into words what an effect you all had on my life. Our diverse, open-minded, queer, and loving Fa-MLE is something that is forever printed in my heart. Or in my liver. Or both. Who knows.

My twin sister Emmah, thank you for being my rock, my teacher, my comedian, and my date to every fast-food dinner.

And Alex, thank you for always providing me with positive vibes, lame jokes, regular updates on your third division football club, and red panda GIFs. You really do bring out the best in me and because of you I never have to feel alone again. Kaas!

Moniek

Summary

This research is exploring the resilience and adaptive capacity of UNESCO Global Geopark De Hondsrug to enhance its sustainable management. Particularly, I aimed to investigate which coping strategies and actions could contribute to higher resilience, by exploring the main elements, the cross-scale interactions, the (potential) disturbances and uncertainties, and their effects on the system. The characteristic features of the Geopark are from the geological and cultural domains, and thus is the Geopark treated as a social-ecological system. Combining this with the resilience framework led to more insight into the system's dynamics and interactions, which contributes to the exploration of fitting coping strategies.

The findings showed a variety of actors that have their influence on the Geopark as a system, and are thus influencing the internal and external interactions, but also the disturbances and uncertainties which with the Geopark is dealing. The prominent disturbances are the financial position of the organization and its dependency on subsidies, preserving the UNESCO status, and the low levels of familiarity of the Geopark among the public. The Geopark could cope with these disturbances and uncertainties by providing clear, simple information to increase the public perception, next to increasing and maintaining the relations with guides and ambassadors, because they can help spread the Geopark's story. In line with this, the organization should foster opportunities for social networking, to increase collaboration between partners and to enhance regional development, and thus influencing the people's incentives. Besides this, the Geopark needs to try to live with change and uncertainties by "expecting the unexpected", and to try to learn from the uncertainties. Increasing the learning capacity of the system will contribute to a greater accumulation of memories and experiences. Collaborating with other geoparks serves to have access to a bigger collection of knowledge and experiences as well.

Some closing thoughts about the theoretical and practical use of the resilience framework formed the last part of this research, and recommendations for future research are given. This research served to contribute to the sustainable management of Geopark De Hondsrug, and can also give insight into experiences for aspiring and existing geoparks.

Keywords: resilience, adaptive capacity, social-ecological systems, UNESCO Global Geoparks, Geopark De Hondsrug

1. Introduction

Imagine a place with unique geomorphology, rich cultural history, and visible archeology. A place that is still showing formation practices that took place during the ice ages, where ice, water, and wind shaped the landscape. This same landscape present-day is characterized by shallow stream valleys and long ridges with layers of peat in between them. On top of this, a vibrant and rich cultural landscape developed, with archeological sites and items still being found to this day. The different soil types found in the region resulted in different human practices over time, creating a diverse cultural history. All of this can be found in the Hondsrug region in the northern part of the Netherlands.

The Hondsrug region is characterized by its unique geological history, cultural heritage, and the current natural landscape, which are all contributing to the identity of the region. The area of almost 1.000 km² stretches out from the southeastern part of Drenthe to the city of Groningen in the north and covers seven municipalities within the provinces of Groningen and Drenthe. The core geological elements of the area are dating from the Saale glaciation, of which the Hondsrug is the only untouched glacial deposit of this period. During this ice age, land ice coming from Scandinavia pushed the soil upwards and left thick layers of sand and clay. The relatively high boulder clay ridges that were formed have valleys in between, formed by meltwater of the land ice and it created the stream valleys that characterize the northwestern part of the region. The highest point of the Hondsrug lies at 28 meters above sea level, which might not sound much, but the glacial deposit created a unique setting: four parallel boulder clay ridges with stream valleys on the sandy soil in between. Such an extensive linear landscape formation cannot be found anywhere else in Europe (Geopark de Hondsrug, 2012). In the eastern part of the Hondsrug region, peatland cultivation used to be the primary economic activity in the 19th century. In the current landscape, these practices are still visible in the long straight canals that were used to dewater the peatlands, and the people lived alongside these canals (Gerding n.d.). The large open fields in the east form a sharp contrast with the forests in the northern region, making the region diverse. In the southern part, there is another stream

valley, and it is where former peat-moor medieval villages can be found. These villages are part of the rich cultural history of the Hondsrug region: since pre-history, the area has accommodated several populations. Remains of the Funnelbeaker culture (3400 – 2850 BC) (Hunebeddeninfo, n.d.) can be found throughout the region, and include the leftovers of their characteristic pottery, weapons, and tools. The people of the Funnelbeaker culture are considered to be the first farmer community of the northern part of The Netherlands, and they are the ones who built the hunebeds. These hunebeds are megalithic tombs and can be found throughout the provinces of Drenthe and Groningen, predominantly in the Hondsrug region. The hunebeds are considered to be one of the characteristics of the region. Nowadays, the traces of these human settlements (e.g. 'esdorpen' and peat villages) and monuments (e.g., the hunebeds) are still visible in the landscape (Geopark de Hondsrug, 2012).

The wide variety of unique natural and cultural features led to the Hondsrug region gaining the status of 'Global Geopark' in 2013, by becoming a member of the worldwide network of Global Geoparks (GGN). Two years later, UNESCO granted 120 geoparks with the UNESCO Global Geopark status, The Hondsrug being the only one in The Netherlands (Geopark de Hondsrug, 2012). This special recognition led to an estimated 10% increase in visitors (Stichting Geopark de Hondsrug, 2016), and thus giving the region an economic boost. However, there are possible developments that might threaten the UNESCO status, and these need to be taken into consideration in order to remain to have the UNESCO Global Geopark recognition and to develop sustainably. The growth in tourism numbers asks for greater availability of accommodations and other facilities (Geopark de Hondsrug, 2012). Besides this, the organization has a low occupancy rate and is reliant on collaboration with their partners and the direction board, but is also highly dependent on subsidy providers. On top of that, the aging of the (tourist) population and policy agreements (e.g., regarding financing for culture and nature development and conservation) form even more challenges for De Hondsrug Global Geopark. These changes and effects increase the need for sustainable innovation and development, to keep the UNESCO status and to preserve the geological structure and cultural heritage the region is so proud of.

1.1 Systems thinking and the resilience approach

Because of this coming together of two fields within the Geopark, geology and culture, two different domains are present: the social and the ecological. To conserve the Geopark over

time, the Geopark needs to be aware of possible threats, but also of potential opportunities. The Geopark is subject to a wide range of internal and external influences, which are both fast and slow processes, and a wide variety of actors that are interacting on different scales are involved. These processes are distributed over these scales and are ranging from local to national or even transnational scale. A sudden, fast process could, for example, be abrupt policy change (e.g., subsidy for nature conservation is declining or cancelled), extreme weather conditions (such as sudden heavy rainfall), or vandals damaging the hunebeds (Albers, 2018; Boelema, 2012). An example of a slow process taking place at the Geopark is climate change: the increase of (mean) temperatures in the summer months experienced in The Netherlands in the last years (KNMI, 2018) might influence tourism numbers, visitor behavior, and the activities and sights offered. Another example could be the loss of interest among the local and regional community, which could result in fewer incentives to support the Geopark. These slow processes can affect the Geopark as a tourist destination, which can be studied as being a system.

The complexity of the processes and interactions calls for a comprehensive approach on the road towards sustainable development, so future generations can also enjoy the Geopark. The concept of 'systems thinking' could be of importance for reaching this goal. Tourist destinations experience issues that are complex, multi-scaled and have both vertical and horizontal linkages (Strickland-Munro, Allison, & Moore, 2010). The first one to mention systems thinking was Von Bertalanffy (1968): "an entity which maintains its existence through the mutual interactions of its parts." Five elements need to be recognized while studying a system: the components, the interactions between these components, the boundary, the hierarchy, and the flow. These elements show how the different parts of the system are related, and how they work and develop over time. The wide range of processes that happen simultaneously in a tourist destination such as the Geopark ask for research on *complex adaptive systems* (CAS) to enhance tourism research (Becken, 2013; Strickland-Munro et al., 2010).

In systems thinking, it is necessary to combine the interactions between the natural and the social environment (Strickland-Munro et al., 2010), which can be described through the concept of social-ecological systems (SES) (Farrel & Twining-Ward, 2005). A SES is defined as "a system that includes societal (human) and ecological (biophysical) subsystems in mutual

interaction" (Gallopín, 2006, p. 294). Berkes and Folke (1998) stress that the term social-ecological system is to accentuate that the boundary between social and ecological domain is "artificial and arbitrary" (in Folke, 2006, p. 262) and mention the importance of the interplay between both domains regarding sustainable management practices. A characteristic of SES is that it considers cross-scale effects (Walker, Holling, Carpenter, & Kinzig, 2004), which is in line with the complex system Geopark De Hondsrug is. The Geopark can be considered as complex and as a SES, because a tourist destination can experience a variety of stress factors from both the ecological and social domains at the same time (Becken, 2013). Looking at the Geopark as being a complex tourism system is essential for developing and maintaining sustainably because this approach includes social, ecological, geological, and economic components (Farrell & Twining-Ward, 2004; 2005).

To explore the system's dynamics and its capacity to benefit from and adapt to change and uncertainties, one can make use of three complementary aspects: resilience, adaptability, and transformability, which are part of the *resilience approach*. Resilience is the capacity to cope with disturbances and to be able to recover from and reorganize itself after a disturbance (Walker et al., 2004). A disturbance is defined as: "stresses and shocks that disrupt ecosystems, communities, or populations" (Resilience Alliance, 2015, p. 51) and it can affect substrates and the availability of (natural) resources. The idea behind the concept of resilience is to increase robustness and flexibility, instead of creating stability in itself (Becken, 2013), often because some disturbances are just uncontrollable, such as extreme weather events. When the resilience of a SES declines, the size of a disturbing event that could potentially cause significant trouble is becoming smaller as compared to a more resilient system (Resilience Alliance, 2015). To manage resilience and to determine the role actors can play in influencing resilience, the concept of adaptability can be used. Adaptability is the capacity of the actors within an SES to manage and adjust to disturbances, so their ability to adapt (Becken, 2013; Gallopín, 2006), and thus is this concept also being referred to as adaptive capacity. Walker et al. (2004) describe adaptability as the capacity of the actors to influence the system's resilience. The third aspect is transformability, which occurs when the current system is going through phases of disturbance and is transformed into a new system with different structures and variables (Gallopín, 2006; Walker et al., 2004).

Coming back to considering tourist destinations as complex systems: the resilience approach takes all of the social, environmental and economic developments into account. Regarding sustainability, this approach is of importance due to its ability to combine several domains and to stimulate the capacity to cope with uncertainty by enhancing robustness and flexibility, which results in the system's ability to undergo and recover from disturbances (Strickland-Munro et al., 2010).

1.2 Social and scientific relevance

Exploring the resilience and adaptive capacity of UNESCO Global Geopark De Hondsrug is of importance due to several reasons. The Geopark is existing for only a few years now and has not undergone many disturbances yet. By being aware of the concept of resilience and what it could mean for the flexibility of the system, the Geopark's development could take a more robust and sustainable form. Resilience research in social-ecological systems is needed to facilitate a more effective shift to sustainability (Farrell & Twining-Ward, 2004), especially with a focus on tourism, one of the largest industries worldwide. The Global Geoparks Network (GGN) aims to be a network in which the exchange of knowledge and experiences between the Geoparks could contribute to the development and conservation of the different geoparks. The members of GGN are committed to working together, and exchange ideas and best practices to raise quality standards of all products and facilities the Geoparks have to offer (Global Geoparks Network, n.d.-c). Since the UNESCO Global Geopark is a relatively new concept, little academic research on it has been conducted so far. Studying the resilience and adaptability of complex adaptive systems and social-ecological systems is place-specific and hard to generalize because each SES has different dynamics and should be considered independently. However, it could have a positive influence on the sharing of experiences between the geoparks. On the road towards managing and governing sustainable development, the resilience approach can give interdisciplinary insights, which are of great importance to the sustainable development of SES (Folke, 2006).

The social relevance of this research is because of the province of Drenthe lagging behind regarding economic development, compared to other parts of The Netherlands. For example, the regional economic growth in 2015 was 1,2% in Drenthe, whereas the national annual average was 2,3%. In 2016, the numbers were 2,0% versus 2,2%; and in 2017 2,4% versus 3,2%, thus clearly showing the province of Drenthe lags behind. The total share of the province in

the national GDP was just 2% in 2017 (CBS, 2018). Based on a report of Ecorys in 2016, tourism numbers in Drenthe have grown in the last decade. In some years, the number of tourists coming to Drenthe grew harder compared to the other provinces. This growth led to an increase in the number of people working in the sector (Recreatieschap Drenthe, 2017a). With this data in mind, one could say the tourism sector could contribute to the economic situation of the province. This contribution should happen sustainably, meaning environmental values do not decline because of the development, something to which resilience research can contribute. An unquantifiable aspect that adds to the social relevance of this study is the importance of preserving and conserving the geological and cultural heritage on which the Geopark is founded.

1.3 Objectives and research questions

The objective of this research is to explore if and how De Hondsrug Global Geopark as a tourism system can be more resilient and increase its adaptive capacity, and what the contribution of the regional actors is or should be to enhance the system's resilience.

To reach this objective, several research questions are established. The main research question is: *"What does Geopark De Hondsrug as a tourist system look like in terms of resilience, and how can the system potentially be made more resilient and adaptive?"*

Three sub-questions have been established to help answer the main research question:

- SRQ1 - What are the main elements and (cross-scale) interactions of Geopark De Hondsrug as a tourism system?
- SRQ2 - What disturbances and uncertainties could potentially affect the system, and what will be the effect of these disturbances?
- SRQ3 - How can the Geopark organization and the Geopark actors be more resilient towards the disturbances and uncertainties?

1.4 Thesis outline

The outline of this thesis will be as follows: first, the conceptual framework is discussed, which is fitting with the questions mentioned above. The concept of social-ecological systems is introduced, and explained is how the dynamics of SESs can be described through the use of the adaptive cycle. After this, the concepts of resilience, adaptability, and transformability are described, with a focus on cross-scale dynamics. To put this theory into practice, the 'resilience

assessment workbook' created by the Resilience Alliance (2015) serves as a guideline. In this workbook, several iterative steps are given, which help to study and to understand the system. An overview of the aspects that could potentially increase resilience and sustainable management is described afterward. To close off the theory chapter, a description of how this theory is applied to the Geopark is given. This description is followed up by the next chapter, which is about the methodology used for this research. Besides a description of the study area, the process of data collection and analysis is also explained, as well as limitations to the research. In chapter 4, the outcome of the data-collection is presented and analyzed, forming the 'findings' section. These findings are presented according to the research questions and the resilience assessment workbook, and are based upon the conducted interviews. Subsequently, a discussion regarding the outcomes will form chapter 5. In this chapter, this research will be critically evaluated. The findings are discussed in relation to the objectives and theoretical framework. Besides this, options for future research are proposed as well as some critical concluding thoughts towards the chosen approach of this research. In the final chapter, a conclusion is presented, in which the objective and research questions are discussed briefly.

2. Theoretical framework

In the following chapter, a theoretical framework is presented, which serves as the basis for this thesis. The chapter consists of five complementary parts. First, the concept of social-ecological systems and its dynamics are described, by making use of the so-called adaptive cycle. Subsequently, the three components of the framework by Walker et al. (2004) are elaborated on, respectively: resilience, adaptability, and transformability. Then, the resilience assessment, as proposed by the Resilience Alliance (2015), is explained and will serve as a guideline for this research. Finally, a collection of aspects that could potentially contribute to increasing resilience and adaptability is described. This chapter ends with a conceptual framework, in which the theoretical concepts are summarized and visualized.

2.1 Social-ecological systems

With the increase of human pressure on the natural environment, the focus on the intensifying interaction between the two grew bigger. The need for research where social-ecological systems are considered as a whole originated from the growing realization regarding the ability to understand and manage aspects of these systems. To do so, both components, social and ecological, need to be taken into account simultaneously (Gallopín, 2006). The growth of (international) tourism numbers can lead to changes in the ways the natural environment is perceived and managed (Cumming, Morrison, & Hughes, 2016), and is thus influencing SES-thinking. The establishment of 'systems-thinking' resulted in scholars looking at the system as a whole, acknowledging different scales and many dynamics (Farrell & Twining-Ward, 2005). A SES can be on any scale, ranging from the local scale and its surrounding environment to a global scale with all environmental systems involved (Gallopín, 2006). No SES is isolated from interactions with other systems, meaning external change factors need to be taken into account as well (Cochrane, 2010), leading to multiple scales and dynamics. SESs are behaving according to three principles: the system needs to be seen as a whole, not as separate parts; the history

of the system is irreversible; and the future of the system is unknown and uncertain (Waldrop, 1992, in Strickland-Munro et al., 2010).

2.1.1 Adaptive cycle

The dynamics of SESs can be studied and analyzed by making use of what Holling and Gunderson (2001) called the *adaptive cycle*: four stages with specific characteristics, often visualized through the infinity symbol (see Figure 1). The four stages are exploitation (r), conservation (K), release (Ω), and reorganization (α), and will be elaborated on below.

Exploitation (r) – the first two stages, exploitation and conservation, are relatively slow phases, in which the dynamics of the system are slightly predictable (Walker et al., 2004). Folke (2006) calls this phase one that has exponential change, in which a new system is being developed (Cochrane, 2010).

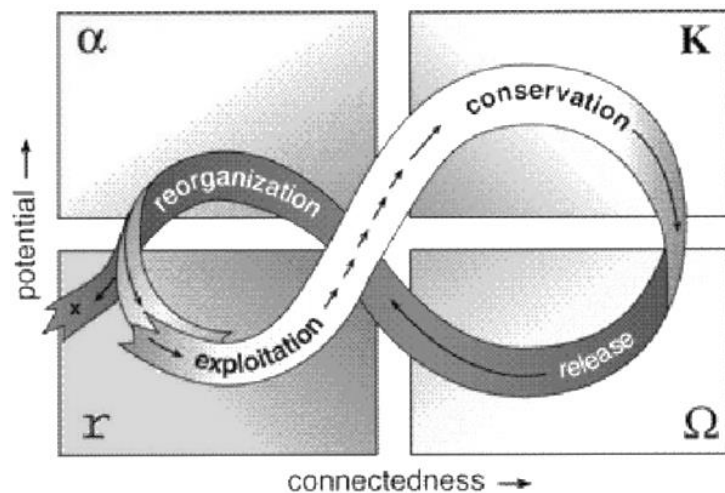


Figure 1 - The Adaptive Cycle, as described by Holling and Gunderson (2001), derived from Holling (2001, p. 394)

Simmie & Martin (2010) call this phase the 'exploitation and growth' phase since it is developing itself and tries to find a stable state. In the case of having a reorganization phase beforehand, this phase is built upon a previous cycle, that has social, natural, cultural, political, etcetera, potential. One could compare this with the 'memory' of previous cycles (Adger et al., 2005), with specific elements that are worth conserving and exploiting. During this phase, a (new) system is being developed through the exploitation of this potential, meaning political and social relationships are formed into new structures (Cochrane, 2010).

Conservation (K) – in this stage the construction of a new stable state takes place and is a relatively slow phase because it can remain in this stage for an extended period. As the system develops and the right management is not applied, the system might get inflexible and rigid, causing the system to be vulnerable to shocks and stressors (Cochrane, 2010; Walker et al., 2004), which can result in a shift to the next phase: release.

Release (Ω) – a disturbance took place, causing the system to destabilize, where stored capital (social, financial) is being released (Walker et al., 2004). During this phase, two things can happen: re-adjustments to the current system, or a collapse (Folke, 2006). In case of a collapse, the destabilizing event(s), cause the next phase to occur: reorganization (Cochrane, 2010) (see also chapters 1.1 and 2.4).

Reorganization (α) – a rapid change after a destabilizing event occurred and a new system is being developed, which creates opportunities for improvement and innovation (Walker et al., 2004). Both stabilities and instabilities help to re-organize and develop a new system (Folke, 2006), and based on knowledge of previous stages, a new system will occur, as described in the exploitation phase.

These four phases are not fixed in time and scale and can move around within the cycle. For example, a system can move back from Ω to K or can go directly from r to Ω . The exploitation (growth) phase and the conservation phase is being referred to as the “forward loop” as the system is in development here. The phases of release and reorganization are described as the “back loop”, since they are undergoing significant changes (Strickland-Munro et al., 2010).

2.2 Resilience

There are different definitions of the term resilience, mainly because the approach initially comes from the ecological sciences and is now also being applied in the social sciences. The first one to define resilience was Holling (1973), which was based on ecological studies that emerged in the 1960s (Folke, 2006): “a measure of the persistence of systems and their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables” (Holling, 1973, p. 14). Some decades later, Walker et al. (2004) defined resilience as “the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks” (p. 2). With the introduction of the concept of social-ecological systems, the social domain also had its entrance to the resilience approach, and Adger (2000, p. 347) defines social resilience as “the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change.” Nowadays, resilience is conceptualized by three distinct perspectives: engineering, ecological, and evolutionary resilience. *Engineering resilience* is the more traditional version of resilience and concentrates

on stability near a particular stable state and focuses on the speed of returning to this state of stability (Holling, 1996). The faster the system can return to the equilibrium, the higher the level of resilience (Davoudi, 2012). This version is in line with Holling's definition (1973), whereas the second perspective is more related to Walker et al.'s definition (2004): *ecological resilience* is not focused on a state of stability, but more on the area where one system can flip into another system with a different regime and dynamics. The focus is on the magnitude and severity of the disturbance that a system can absorb before the system transforms into a new state (Holling, 1996). The third and relatively new perspective is *evolutionary resilience*, which challenges the idea of having an equilibrium and here, resilience is not a process of returning to its original state. This resilience perspective is a result of scholars seeing the world as complex and uncertain instead of orderly and predictable (Davoudi, 2012). Instead, it is the ability of SES to change, adapt, and transform in response to disturbances (Carpenter, Westley, & Turner, 2005; Davoudi, 2012).

The concept of resilience has also been applied to tourism systems. Cochrane (2010) illustrates this by explaining how the resilience model was initially used to study the fluctuations in animal populations, which grow by using resources until those resources are drained. Cochrane then makes the comparison with tourism as an SES, where the stakeholders of the tourist system are the 'predators' who benefit from the tourists through financial profits but feed on the 'prey,' which are the tangible and intangible attractions of the tourist destination.

Applying resilience that derived from ecological sciences to social science cannot happen uncritically (Gallopín, 2006). The difference with ecological resilience is that, in social science, it looks at the capacity of the system to absorb disturbance while remaining in the same state, instead of looking at the amount of time the system needs to return to its initial state (Cote & Nightingale, 2012). This is also described in the three different perspectives that currently exist on resilience, as mentioned above. Besides this, there is more attention to cross-scale dynamics, also referred to as panarchy (see chapter 2.2.5). These cross-scale interactions are of importance because a social-ecological system is rarely isolated and thus always influenced by external influences, experienced on different (vertical and horizontal) scales (Strickland-Munro et al., 2010). Legitimate use of the concept of resilience requires the same assumption for both types: it has a character of multi-stability, meaning there are more than one points of stability within the system (Gallopín, 2006).

Resilience research is complementary to vulnerability studies; a type of studies that is widely used within tourism research. Turner et al. (2003) define vulnerability as “the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress/stressor” (2003, p. 8074). Even though the perspectives are complementary, they differ in epistemology. The resilience perspective is rooted in complex systems within ecological sciences, where social dimensions were added later on. The system is studied as a whole and is therefore system-oriented. The vulnerability perspective, on the other hand, is actor-oriented and is focusing on making specific groups and components less vulnerable. This approach is static: a community that is vulnerable has a lower degree of adaptability, and is therefore sensitive to shocks and stressors, and is thus viewed as less resilient (Becken, 2010). Resilience is not static: “it can absorb and adapt to recurrent disturbances and cope with uncertainty and risk” (Cumming et al., 2016, p. 650), and can be considered flexible if the system can cope with disturbances. In theory, this would mean a SES can be vulnerable to disturbances, but when it is resilient at the same time, it can cope with these disturbances. This conflicting meaning and application of the concepts result in divergent perspectives within academic literature. Within a conceptual framework, both approaches tend to be difficult in the sense of where to put them exactly: following Gallopín (2006), there is no agreed upon meaning of the concepts, and it is unclear whether resilience is an element of vulnerability, or that it is a separate concept. Because of this reason, although vulnerability is a popular approach within tourism studies, it will not be used within this theoretical framework and resilience will be the focal approach. Besides that, this research is system-oriented, whereas the vulnerability approach is actor-oriented and is therefore considered as unsuitable.

2.2.1 Resilience framework

The resilience framework proposed by Walker et al. (2004) consists of four aspects of resilience: latitude (L), resistance (R), precariousness (Pr), and panarchy. Each aspect can be visualized in the three-dimensional 'stability landscape,' that shows one or more basins of attraction (Figure 2) and is central to the resilience approach. The stability landscape is the so-called state space of a system, which is "the set of values adopted by all the variables of the system at a given time" (Gallopín, 2006, p. 297). Within the

stability landscape there are basins of attraction, also referred to as 'stability domains,' which contain one or more attractors. An attractor is a point (location) in the basin where the system tends to remain (Walker et al., 2004), or to go to, as a stable state (Gallopín, 2006). It is the disturbances that tend to move the system away from this attractor, which means that, even though the system is often

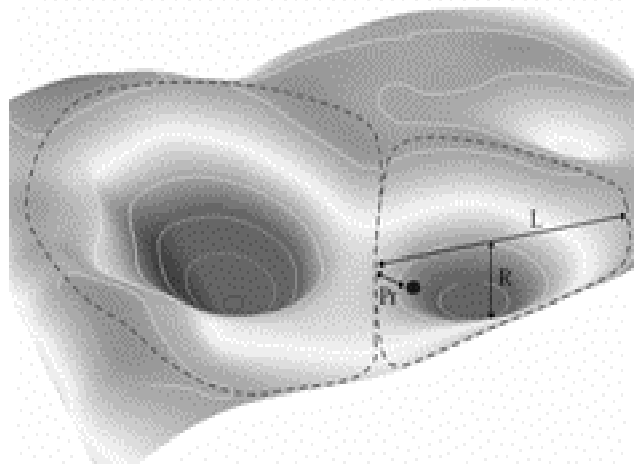


Figure 2 - The three dimensional Stability Landscape with two basins of attraction, showing the Latitude (L), Resistance (R), and Precariousness (Pr) of the system. The current position of the system is indicated with the dot (Walker et al., 2004).

fluctuating, it is considered resilient when the system remains in the same basin (Becken, 2013; Gallopín, 2006), without crossing any thresholds (the border or breakpoint between two basins of attraction) (Resilience Alliance, 2015). So to conclude, the resilience of a system refers to the limit of the stability domain (Gunderson, 2000).

Stability domains are not fixed structures: they can expand or contract as a result of slow variables (as mentioned in Chapter 1.1) Both fast and slow variables can change the position of the system, but the domain itself can only be influenced by slow processes, which are influenced by the deeds of actors (see chapter 2.3). Resilience can take place on multiple scales, because of the interaction between different scales (Walker et al., 2004). A decline of resilience in one scale can lead to the increase of resilience in another scale (Gallopín, 2006). When a system loses resilience on a lower scale, the whole system will remain more resilient compared to when the loss occurs on a higher scale (Walker et al., 2004). In this sense, Gallopín (2006) distinguishes three levels of stability. The first level describes the stability of the system when it is close to the attractor, called local stability. The second level of stability takes place on a

larger scale, where different domains are the focus of study. It looks at changes in the system between the different domains within the same stability landscape. The third level looks at the changes in the stability landscape itself and refers to structural stability, which is in contrast with structural instability, which can eventually lead to the transformation of the system into a new one (see chapter 2.4).

The stability landscape can be described by looking at the *resistance*, *latitude*, and *precariousness* of a domain. A fourth aspect as described by Walker et al. (2004), is *panarchy*. Panarchy is not visualized in the stability landscape as seen in Figure 2, because it describes the cross-scale effects between different stability domains. These four aspects of resilience and the stability landscape are discussed separately below.

2.2.2 Latitude

Latitude (L) refers to the maximum amount of change a system can go through, and the number of different states it can assume before losing the ability to recover (Becken, 2013; Walker et al., 2004). In the visualization of the stability landscape (see Figure 2), latitude is symbolized as the width of the basin of attraction. A wide basin means that the system has a high degree of latitude since the system can move around freely without crossing a threshold. The latitude is considered large when the system has a wide range of response options combined with a high degree of self-organization (Gunderson, 2000). On the other hand, the latitude of a system is considered small when a system has a limited ability to change and adapt (Becken, 2013).

2.2.3 Resistance

The difficulty of changing the system describes the resistance (R) of a system. A system that is responding to minor disturbances is considered not to be very resistant. In the stability landscape, the depth of the basin is the amount of resistance it can give (Becken, 2013). The deeper the basin is, the more resistance it has to offer. The lowest point of the basin is considered to be the furthest away from the thresholds. Therefore it is seen at the most stable position – a significant force of change is needed to move the system towards or over a threshold.

Together with latitude, resistance forms the topology of the attractor (Becken, 2013), which means that the levels of L and R will determine the amount of change (or force) that is needed

to move the system away from the attractor, and an even bigger force is needed to move the system across a threshold. When both L and R are considered large, it indicates that the system is wide and deep, and can, therefore, undergo a significant amount of disturbances before a threshold is reached.

2.2.4 Precariousness

The third aspect of resilience in the stability landscape is the aspect of precariousness (Pr). Precariousness can be described as the distance between the current position of the system, and the closest threshold. The smaller the degree of precariousness, the closer the system is to a threshold, after which recovery is difficult or impossible (Walker et al., 2004).

Linking the above three concepts (L, R, Pr), one can state that social-ecological systems can accommodate disturbances while remaining in the same domain on a scale of small to large *latitude*; the system can be easy or hard to change (*resistance*); and can be close to, or far away from a threshold (*precariousness*) (Walker et al., 2004).

2.2.5 Panarchy

Not visualized in the stability landscape, is the concept of panarchy (P). A SES cannot be understood by solely examining the scale in which the SES is located, because the social domain of the SES is consisting of various people operating at multiple levels and multiple perspectives. (Walker et al., 2004). These different social interactions influence the SES from multiple scales, e.g., governmental bodies or local communities, and can be referred to as cross-scale interactions. Panarchy is the term that refers to these cross-scale interactions that take place between systems (Becken, 2013) and is influencing the three aspects mentioned above. These cross-scale interactions can take place vertically or horizontally: the vertical interactions are across levels of organization (e.g., policy structures), and the horizontal ones are of geographical nature (e.g., across regions) (Strickland-Munro et al., 2010). The dynamics of the system are influenced by the (sub-)systems above or below the studied one, so the concept of panarchy makes sure both internal and external influences are added to resilience research (Walker et al., 2004). An example of external influence can be the political climate a system is in. In a SES, the system itself consists of the actors and their ability to cope with disturbances, and one of these disturbances could be a change in policy that is affecting their system.

In the light of multi-cross-scale dynamics and panarchy, Folke (2006) looked at how one system could influence the other, by making use of the adaptive cycle (as mentioned in chapter 2.1.1). Folke describes the interplay between different scales, and how one can learn from, or is influenced by the other in the phases of conservation (K) or release (Ω), by using the terms 'remember' and 'revolt' (see

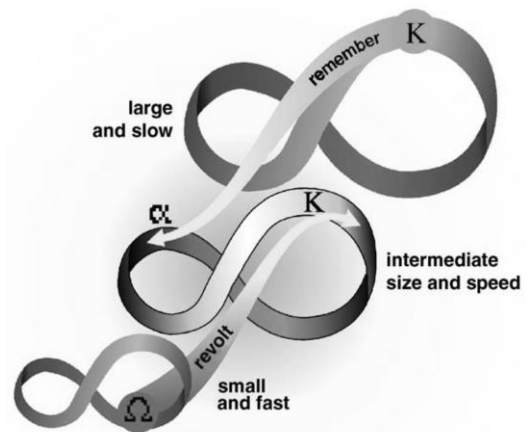


Figure 3 - Panarchy in a nested adaptive renewal cycle. Source: Folke (2006, p. 258)

Figure 3). *Remember* refers to the ability of learning of previous experiences, whereas *revolt* refers to the (slow) spread of disruption. Folke illustrates *revolt* by explaining it as the spread of a bushfire, which started with one tree being lit on fire and spreading out to burn part of the forest down. Followed up on this, 'remember' can then be explained by the ability of seeds, the physical structure, and surviving trees to recover from this fire. From a human perspective, the ability to adapt to a disturbance is therefore highly dependent on the influence of the dynamics of other scales. An example of this in relation to the Geopark is the input and experiences from other Global Geoparks. Panarchy can thus be described through both historical and current processes, where building upon experiences of its own and other systems takes place. This cross-scale interplay sustains at the same time as it develops (Holling, 2001). Another term to refer to this interplay of 'revolt' and 'remember' is the term feedback loops. The Resilience Alliance (2015) describes them as an indicator within a system that is looping back to control the SES. Feedback loops can be both positive and negative. A negative feedback loop contributes to maintaining the stability within a system, and a positive feedback loop can speed up processes and changes within the system. A negative feedback loop (remember) can be seen as a regulator, whereas positive feedback loops (revolt) are reinforcing interactions in the system (Farrell & Twining-Ward, 2005). These feedback loops are the same as the memory of the system, as proposed by Adger et al. (2005).

According to Carpenter et al. (2001) social-ecological resilience can be interpreted in three ways:

- 1) the amount of stress and disturbance an SES can handle while remaining in the same basin of attraction;
- 2) to what extent the SES is able to organize itself (in contrast: lack of self-organization, or external factors forcing the system to organize); and
- 3) the extent to which the

SES can increase its learning and adaptation capacity. Based on these three ways, we can conclude Carpenter et al. (2001) see adaptability as a component of resilience. However, some authors have different views on this matter, which makes the distinction between the concepts of resilience and adaptability unclear (Gallopín, 2006). We can conclude that social-ecological resilience is closely related to the concept of a system's adaptability or adaptive capacity, which forms the second part of Walker et al.'s framework.

2.3 Adaptability

Adaptability is the capacity of actors involved in an SES of influencing the resilience of the system. In other words: how the actors collectively manage resilience (Walker et al., 2004), and to what extent they are capable of managing it. The adaptive capacity of a SES consists of two components: (1) the capacity of the system to cope with environmental risks and disturbances, and (2) the capacity of the system to improve its state in relation to its environment (Gallopín, 2006).

The challenge of building adaptive capacity is to build knowledge, expertise, and incentives within and beyond the system (Folke, 2006). One other aspect that is not often described within academic literature is the aspect of capital that is available. Farrell and Twining-Ward (2004, p. 281, Figure 2) mention the release of stored capital in relation to the concept of the adaptive cycle, but not in relation to adaptive capacity. Calgaro, Lloyd, & Dominey-Howes (2014) mention the importance of the set of stored capital and the effectiveness of governance structures in the ability to cope with shocks (fast processes). Stored and available capital is one of the determining factors that add to the adaptive capacity of the system's actors, not only in terms of financial capital, but also the accumulation of experiences forming social capital. This research will, therefore, take four aspects into consideration when determining the adaptive capacity of a system: knowledge, expertise, incentives, and capital.

The actors can influence the current state and position of the SES, and they could change the shape of the stability domain (Becken, 2013). Although the system as a whole is self-organizing unconsciously, the actors and their capacities and intentions highly influence the resilience of the SES. The adaptability of the actors can take several forms, such as enlarging desirable basins, and decreasing undesirable ones (Walker et al., 2004), meaning they could change the current state of the basin, by making it wider or deeper (Gallopín, 2006). The influence actors

within the SES have on dynamics in other scales, is also considered to be a part of the adaptive capacity of a system (Folke, 2006; Walker et al., 2004).

In academic literature, there is no agreement upon whether adaptability is independent or an element of resilience (i.a., Becken, 2013; Carpenter et al., 2001; Gallopín, 2006), meaning adaptability is often not studied on its own, but always in combination with resilience. According to Folke (2006), social-ecological resilience has a focus on adaptive capacity and transformability and tries to increase the learning and innovation capacity of a system. This is in line with the description given by Carpenter et al. (2001), where they mention that the use of adaptability is a component of resilience and is reflecting the learning ability of a system in case of a disturbance. Becken (2013, Fig. 3, p.522) describes how resilience and adaptive capacity are both influencing each other, whereas Smit and Wandel (2006) discuss how some authors see adaptability and resilience as parallels. Cochrane (2010) concludes that the recovery after a stress event (which is in line with the definition of resilience given by Walker et al. (2004)) is dependent on the adaptive capacity of the SES. Therefore, one could say that (social-ecological) resilience is an umbrella term which covers a variety of related aspects, although the exact relationship between the concepts remains unclear due to the diversity in views (Gallopín, 2006).

2.3.1 Resilience, adaptability and the adaptive cycle

The concepts of resilience and adaptability have been described, but what is the relation with the adaptive cycle? Resilience is one of the factors that is expanding or declining through each of the phases of the adaptive cycle (Sheppard & Williams, 2016). For example, during the exploitation phase, the system is the most resilient. At the end of the conservation phase, the system goes into the release phase, where the system experienced a significant disturbance and it is destabilizing, the resilience is low. As mentioned in the previous paragraphs, capital is considered to be one of the aspects that is adding to the adaptive capacity of the system. The accumulation of capital also varies in the adaptive cycle and is somewhat comparable to the level of resilience, but develops slower over time. The accumulation of capital grows the most in the exploitation phase and will continue to grow in the conservation phase. After a disturbance causing the system to destabilize, the amount of capital declines. The visualization

of both resilience and capital accumulation across the phases of the adaptive cycle can be seen in Figure 4.

2.4 Transformability

Cochrane (2010) describes the connection between resilience, adaptability, and transformability in a simple way – two things happen after it experienced one or more disturbances: the system is either able to adapt and can remain in the same state, and is thus

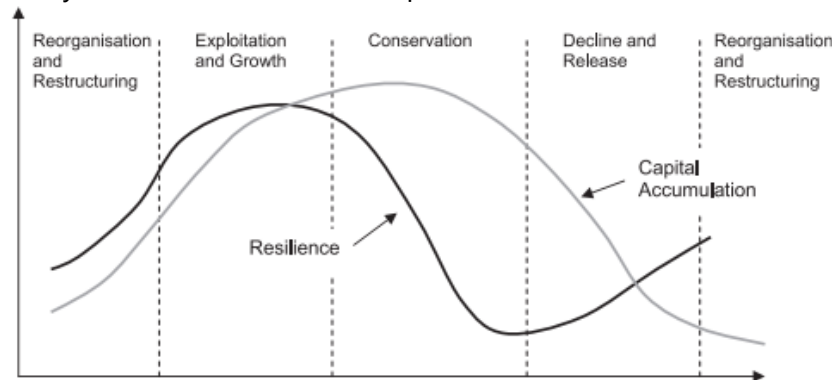


Figure 4 - The phases of the adaptive cycle. Source: Simmie & Martin (2010, p. 34)

resilient, or it shifts towards a new system. As described in the adaptability section above, the actors of a system can change the existing system if the current state is undesirable. When the current ecological, economic, or social structure of the current system is untenable (Folke, 2006; Walker et al., 2004), the system can be transformed into a new state. Transformability is therefore described as the capacity of creating a fundamentally new system with different characteristics (Gallopín, 2006). When transforming into a new system, the actors involved need to search for a way of becoming more resilient in the current system, which is done by building upon knowledge and experiences, obtained over time and over different scales (Adger et al., 2005; Folke, 2006), a process that refers back to the adaptive cycle.

2.5 Resilience assessment

For this research, the workbook of the Resilience Alliance (2015) will serve as a guideline to help put the theory into practice. This workbook is consisting of five levels and is meant for practitioners to assess resilience in SES. In short, it starts with describing the system, followed by understanding the dynamics of the system, then exploring the system's (cross-scale) interactions, then assessing governance and social networks, and finally acting on the assessment. The five levels are not meant to be evaluated chronologically per se: the actual

assessment is iterative, and looking back at and learning from earlier stages is necessary. In the following subchapter, these five components are explained and serve as a guideline for conducting this research.

2.5.1 Step 1 – Describing the system

The first thing to do when assessing resilience is defining the boundaries of the focal SES, and these boundaries can be both spatial (scale) and temporal (a period of time). After this, the main issues and key components that are SES are identified, but (main) issues may vary during the assessment period. These are issues and components that need focus, and they might be the very reason to do a resilience assessment in the first place. Setting the boundaries and identifying the main issues at stake is not a one-time thing, since it is an iterative process and the components may change over time.

The starting questions of a resilience assessment are the following: resilience *of* what and resilience *to* what? The question 'resilience of what' is pointing at the key components of the system and how stakeholders value these components. These components can be both ecological and social, and can also change over time. It gives an image of how important these components are to the system. Are these components public, private, common, or a combination? The second question, 'resilience to what,' describes the potential disturbances and uncertainties with which the system is dealing. When asking these two questions, the so-called *specified resilience* is addressed. One can also decide to assess the resilience of a system without considering a particular kind of disturbance, which is referred to as *general resilience*. General resilience looks at the system as a whole, whereas specified resilience applies to a specific disturbance or threshold. It is of importance to consider both types of resilience, because by only looking at general resilience, one might overlook certain disturbances. When the focus is only on specified resilience, the ability to cope with unexpected disturbances might decline.

To identify disturbances, one can divide these, as mentioned before, into two groups: fast and slow processes. With the concept of cross-scale interactions within multiple SESs in mind, the division of internal and external processes should also be studied. These disturbances can be characterized in further detail by looking at the frequency of the disturbance, but also the duration, its severity, the components that are affected, and the predictability of the

disturbance. Describing these characteristics of the potential disturbances contributes to a better understanding of the system's disturbance regime. For an even further understanding, a historical profile of past and present disturbances might give insight in future disturbances as well.

At the beginning of this first step, boundaries of the system have been identified. However, regarding cross-scale interactions, it is a necessity to describe the systems above and below the system's scale as well. These 'external' systems can be larger and smaller scales, and social and ecological dimensions should be taken into consideration. Including historical events will give insight in driving forces that contributed to (significant) changes in the system. If possible, obvious patterns in the timeline become clear (e.g., scale X triggered event Y several times).

2.5.2 Step 2 – System dynamics

After the historical timeline of both the system and the systems above and below the focus system have been described in step 1, the adaptive cycle can be applied to identify the phases the system went through. Selecting one or more variables that serve as indicators of how the system changed over time gives insight into the timing and nature of changes in the system, and to future potential disturbances.

To further elaborate on the dynamics of the system, potential thresholds should be described by how it could be crossed and how this will happen (smoothly, abrupt). Looking at the social and ecological sub-systems, do 'their' thresholds interact? For further description, the most undesirable states should be explained. The disturbances identified in step 1 can steer the system towards a threshold, so it is of importance to study these as well. For this step, both specified and general resilience need to be taken into consideration. Attributes that outline general resilience are diversity, openness, tightness (response time) of feedbacks, system reserves, and the modularity of the system. Which processes form the most significant thread to general resilience? And to specified resilience?

2.5.3 Step 3 – Interactions

To explore and identify the internal and external interactions of the system, the larger- and smaller-scale systems need to be described. To do so, influences from both systems need to be taken into account, such as essential sources of memory and capital, and a description of the main influences these systems have on the focal system. Better insight in the interaction

with other systems will contribute to learning from their knowledge and experiences in the form of feedback loops. Doing this assessment can open up the discussion on how to learn more effectively from other sub-systems.

2.5.4 Step 4 – System governance

Fundamental to understanding a SES, is understanding individuals, organizations, rules, and traditions within the system: the system's governance. Understanding the system's governance will give insight in key actors and their power. Governance systems know two key-characteristics: adaptive governance and social networks. Both are elaborated on below.

Adaptive governance is defined as "a range of interactions between actors, networks, organizations, and institutions emerging in pursuit of a desired state for social-ecological systems" (Chaffin, Gosnell, & Cosens, 2014). Adaptive governance can enhance resilience by encouraging the flexibility, diversity, inclusiveness, and innovation of the system. It can help strengthen capacity and adaptation to change, reduce vulnerability, and promote innovation. To study the adaptive capacity of a SES, key institutions and their influence on the flexibility of the system needs to be described. What power relations are present and how are they influencing the system? Are there any conflicts?

The second characteristic of system governance is social networks. Understanding social relations within a system is of high importance, since sufficiently managing resilience is dependent on the cooperation and incentives of stakeholder within the SES. To understand the social network of the system, a map can be produced to create an overview of the number of relations, the centrality of certain groups, and the identification of potential subgroups. With the help of this map, several questions can be answered: are there key stakeholders that are not connected to others and how could that affect the probability of solving conflicts? In case of a central actor, do they represent the views and interests of the other stakeholders, and how can everyone contribute from this central network? Moreover, is this concept of centrality adding to social cohesion, or is it forming a barrier? Is there an isolated subgroup that might form a barrier to the system? Answering these questions and creating an overview of the social network will also contribute to the understanding of cross-scale interactions and their influence on the system.

2.5.5 Step 5 – Acting on the assessment

Now that the wide variety of key components of the system have been identified and studied, it is time to put this information into practice and to gain insight into resilience-building options. The strategies and actions to build resilience are shown in Table 1.

Table 1 - General strategies and actions to enhance resilience in social-ecological systems (modified from The Resilience Alliance, 2015)

Strategy	Actions
Internal organization	<ul style="list-style-type: none">• Clear and transparent leadership at all relevant levels• Create an environment where leadership is developing trust• Communicating vision and goals
Adaptivity	<ul style="list-style-type: none">• Support innovations that foster economic novelty and diversity• Foster stabilizing feedbacks that sustain natural and social capital• Learning from multiple cultural and disciplinary perspectives that enhances diversity• Facilitating dialogue and knowledge co-production by multiple groups and stakeholders• Use scenarios and simulations to explore consequences of alternative options
Enhancing community participation	<ul style="list-style-type: none">• Clear, simple, tailored information• Visualizing the entire system as an interconnected social-ecological system• Building trust with communities through personal interactions and regional teams• Community information sessions• Recasting problems as opportunities• Regular updates
Stakeholder cohesion	<ul style="list-style-type: none">• Preparing for change: staff expertise, timing of actions, information availability• Briefing key players and communicating with other key actors• Monitor public opinion• Foster social networking that bridges communication and builds accountability among existing organizations.

2.6 Enhancing resilience and adaptive capacity

Besides the points noted in the assessment workbook of the Resilience Alliance (2015), scholars have also studied the practical measures that could enhance resilience and related adaptive capacity. There is a variety of measures available, but since every SES has its specific dynamics and situations, it is difficult to say up front which ones are useful and which are not. Therefore, a description of general guidelines and aspects worth considering are described in the following paragraphs.

A framework that can be used to put the assessment into practice is one conducted by Cochrane (2010). In her analysis of tourism resilience, and tourism systems as SESs, she takes the position of actors and external dynamics (panarchy) into consideration, which is in line with the above-described theory. In her framework, called "The Sphere of Tourism Resilience" (Figure 5), she elaborates on three central principal elements of the sustainable

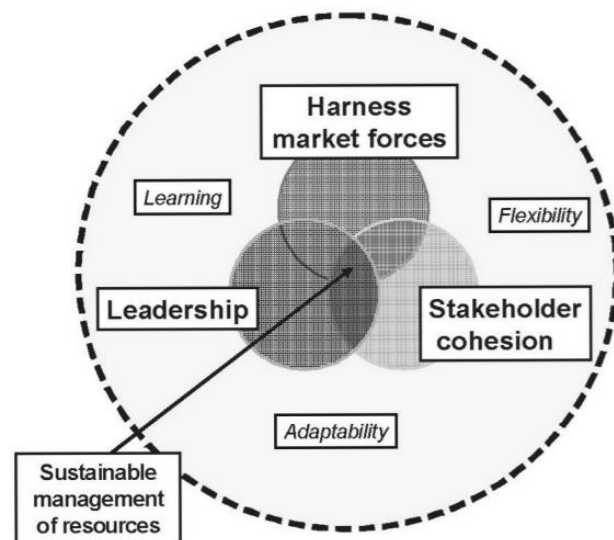


Figure 5 - The Sphere of Tourism Resilience. Source: Cochrane (2010, p. 182)

management of resources, respectively: awareness of market forces, stakeholder cohesion, and leadership. Besides this, she uses three contextual elements of the system: flexibility, learning, and adaptability. Awareness of market forces is essential for resilient management. In the case of Geopark de Hondsrug, a significant aspect of the system is tourism, and developments and forces of the tourism market are of importance for the Geopark to keep into consideration. Another essential element is that of stakeholder cohesion: better contact and communication with stakeholders and actors will contribute to more incentives and joint expertise. The third aspect is leadership, which should be strong and consistent (Folke, Chapin, & Olsson, 2009). The organization of any system should have a clear vision and good management, which is needed to resolve conflicts, stimulate innovation, and promote cohesiveness. To reach these three principal elements, the system needs to improve learning and adaptive abilities, and try to be as flexible as possible in order to accommodate disturbances and thus to be more resilient (Cochrane, 2010).

Some scholars have built further upon this (e.g., Berkes & Seixas, 2005; Folke, Colding, & Berkes, 2003; Folke et al., 2009; Ruiz-Ballesteros, 2011) and their work can be divided into four groups, respectively: learning to live with change and uncertainty, nurturing diversity for reorganization and renewal, combining different types of knowledge, and creating opportunity for self-organization (see Table 2).

Table 2 - Building resilience and adaptive capacity in social-ecological systems (adapted from Folke, Colding, & Berkes, 2003, p. 355)

Building resilience and adaptive capacity in social-ecological systems	
Learning to live with change and uncertainty	<ul style="list-style-type: none"> - Evoking disturbance - Learning from crises - Expecting the unexpected
Nurturing diversity for recognition and renewal	<ul style="list-style-type: none"> - Nurturing ecological memory - Sustaining social memory - Enhancing social-ecological memory
Combining different types of knowledge for learning	<ul style="list-style-type: none"> - Combining experiential and experimental knowledge for learning - Expanding from knowledge of structure to knowledge of function - Building process knowledge into institutions - Fostering complementarity of different knowledge systems
Creating opportunity for self-organization	<ul style="list-style-type: none"> - Recognizing the interplay between diversity and disturbance - Dealing with cross-scale dynamics - Matching scales of ecosystems and governance - Accounting for external drivers

The first one is about creating learning environments, mainly focused on disturbances and how to deal with those, to which coping strategies can be established (Berkes & Seixas, 2005). This will help to increase the capacity to respond to environmental change and to manage disturbances (Ruiz-Ballesteros, 2011). The second aspect, nurturing diversity, is one that should be treated carefully since resilience is not existent if diversity is not cherished. Here, it is vital to create memory: an accumulation of social and ecological memory as a foundation of innovation and novelty (Berkes & Seixas, 2005). Gathering this memory will contribute to general resilience because it is the collection of experiences of past conflicts and the resolutions to these conflicts, and the previous functioning of the system (Ruiz-Ballesteros, 2011). It will contribute to a diverse palette of experiences, which can create space for experimentation (Folke et al., 2009) and to build trust among users (Sheppard & Williams, 2016). The third aspect covers combining different kinds of knowledge, where it is deemed to be necessary to build the capacity to monitor the environment and to increase participatory management by incorporating systems of local knowledge. Local knowledge and expertise about the system are invaluable to the overall management, and it will make the decision-making process more diverse and comprehensive (Folke et al., 2003; Ruiz-Ballesteros, 2011). The last aspect is about

creating opportunities for self-organization because how else “could we survive change?” (Ruiz-Ballesteros, 2011, p. 664). It means that the committee can organize itself and participatory strategies are promoted to the community (Sheppard & Williams, 2016). Networks, communication, and confidence are the main facets of a resilient system, and by creating multi-level governance, this can be reached.

One of the focus areas of the UNESCO status is enhancing public participation and rural development. In this sense, strengthening the resilience of the community will play an important role in fulfilling this aim of UNESCO. Resilience arises from a set of adaptive capacities, whereas community resilience is the collection of networked adaptive capacities. The four main categories of building community resilience are based on the work of Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum (2008) are economic development, information and communication, social capital, and community competence. Each of these categories is referred to as “different areas of capacity” (Brown & Westaway, 2011, p. 334), and each has their own set of adaptive strategies, which can be seen in Figure 6. Although the focus of this research is on social-ecological systems, and therefore on the resilience of these SESs, aspects of the community resilience framework are deemed to be of importance for the case of the Geopark as well.

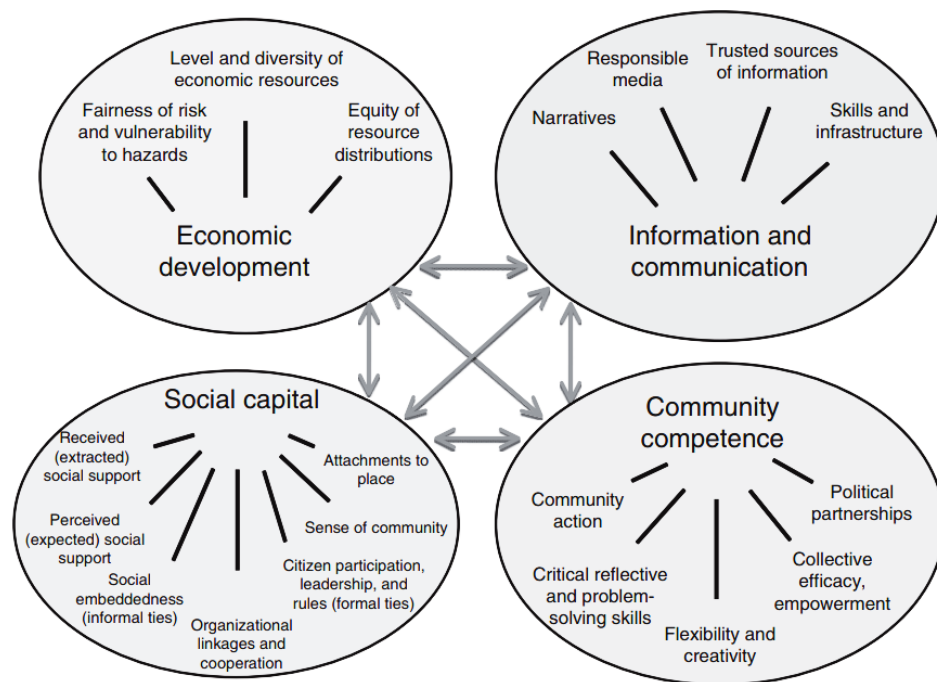


Figure 6 - Community resilience as a networked set of capacities (Adapted from Brown & Westaway (2011, p. 334), based on the work of Norris et al. (2008, p. 136)).

2.7 Conceptual framework

To apply the above-described theory to the case of the Geopark, the conceptual framework below will be used (Figure 7). The first box in the framework starts with the description of Geopark De Hondsrug as a social-ecological system, and will help determine the question of *resilience to what?* The second aspect covers the disturbances and uncertainties the Geopark is currently dealing with, or could potentially have to deal with in the future. Exploring the disturbances and their effect on the system will help answer the question of *resilience to what?* The third component of the framework is adaptive capacity, which describes how the Geopark is dealing or should be dealing with disturbances. The last aspect is that of resilience, which explains the reaction of the system to the disturbances; how well it can deal with (potential) disturbances. The coping strategies described in the previous subchapters will be having their effect on the adaptive capacity and resilience. The four boxes have two-sided arrows in between because they are affecting each other in both ways.

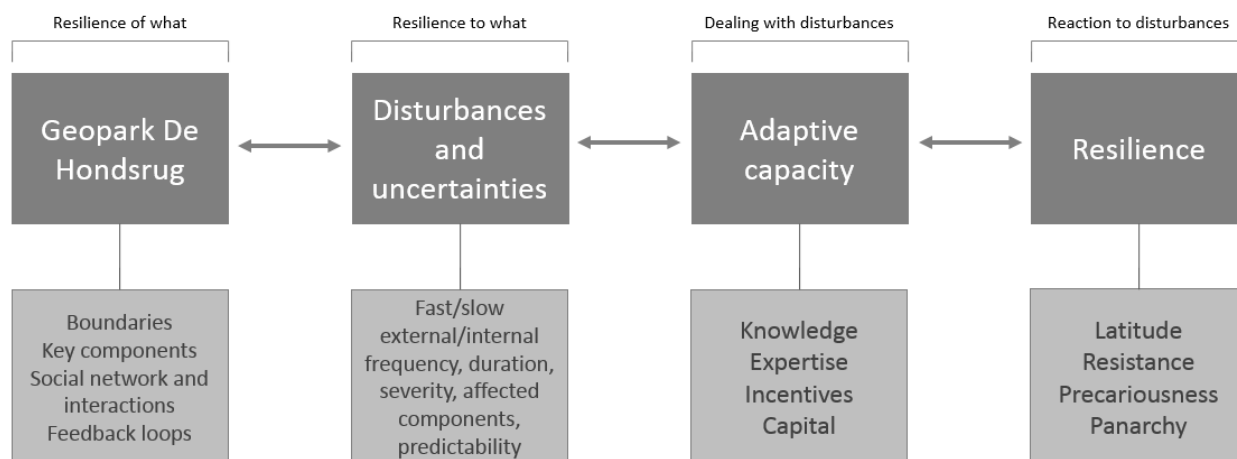


Figure 7 - Conceptual model. Source: author

For the first item, the Geopark as a SES, several aspects are described to give a comprehensive overview of what the system looks like. By doing so, the organization of geopark forms the focal system, and actors such as the provinces or UNESCO are considered to be part of the larger scale, whereas parties such as ambassadors and the local community form the smaller scale (Resilience Alliance, 2015), the combination of these actors and their interactions together form the social network of the system. In between these scales, there are interactions, and potential feedback loops could take place (Walker et al., 2004), for example through the sharing of experiences with other Global Geoparks. The cross-scale interactions are part of the SES, just as key components, boundaries, and the main issues at stake (Resilience Alliance, 2015). Followed-up on the main issues, the disturbances and uncertainties are described, based on the interviews. The description of the disturbances cover fast or slow processes; internal or external influences; and, when applicable, draws upon aspects such as the predictability, magnitude, or components that are affected. Examples of (potential) disturbances to the system may include the financial position of the Geopark, the unfamiliarity of it among the residents and tourists, losing the UNESCO Global Geopark status, or aspects of climate change.

To explore how well the Geopark can cope with these disturbances it is possible to look into the adaptive capacity and resilience of the Geopark as a SES. The adaptive capacity of the Geopark is based on four aspects: knowledge, expertise, incentives (Folke, 2006), and capital. Knowledge and expertise, for example, links back to the cross-scale interactions as described in the first aspect of this conceptual framework. In chapter 2.5.5 and 2.6, several coping strategies and actions are described which serve to enhance adaptability and thus resilience.

The final component of this framework is resilience, which is explored in two ways. First, it is described how the system reacts to disturbances and uncertainties, by explaining its 'behavior': the system bounces back after a disturbance into a better state; it bounces back to its previous state; it bounces back, but into a state that is not preferred; or the system collapses and transforms into a whole different domain (Walker et al., 2004). For example, what would happen if the province of Drenthe decides to give half of the agreed amount of subsidy? The second aspect to explore the resilience of the system, is to look at how it is measured: the latitude (width of the basin), resistance (depth of the basin), precariousness (distance towards a threshold), and panarchy (cross-scale interactions) (Walker et al., 2004).

The components shown in the figure above are in line with the research objective and questions. An explanation of how these concepts are being operationalized to conduct this research forms the following chapter: methodology.

3. Methodology

This chapter explains the contextual settings of the research and the theoretical rationality to incorporate three methods of data-collection in one study. The part of contextualization starts with a brief explanation of the study area by drawing upon physical features, governmental bodies involved, the partners or ambassadors of the Geopark, and the network and process of UNESCO and GGN regarding Global Geoparks. The purpose of this contextualization is to create a deeper understanding of where the study is taking place and in what setting. After this, the research design is explained, and the data collection is described separately for each sub research question. The process of fieldwork is explained as well, followed by a description of the data analysis. To close of this chapter, a brief overview of fieldwork reflection and limitations is given.

3.1 Case study area

This study aims to explore the resilience and adaptive capacity of the Geopark as a tourism system towards disturbances and uncertainties. To do so, it is necessary to have insights on, among others, what the Geopark is offering, how it was established and the global network it is in. In this chapter, a brief overview will be given to build further upon the description that was already introduced in the first chapter of this research.

The Hondsrug Geopark project originated from January 2011, where the province of Drenthe and private parties took the initiative to develop the Hondsrug region. The Hondsrug region is characterized by four boulder ridges (in Dutch: 'ruggen') of which the Hondsrug is the most visible: it is 70 kilometers long, 3 kilometers wide and the highest point lies at 28 meters above sea level (figure 8).



The geological features were shaped by the forces of a thick layer of ice coming from what we now know as Scandinavia, around 200.000 years ago in the Saale glaciation. In the northern part of the Geopark is the Drentsche Aa, a stream valley that lies in between the ridges and is the last untouched stream valley in The Netherlands (Geopark De Hondsrug, 2012).

Besides geological features dating from the ice age, the Geopark also knows a rich cultural history, with the 'hunebeds' as dominant sights that are still visible present day across the Hondsrug. Hunebeds (in Dutch: hunebedden) are megalithic tombs that served as burial chambers above the ground and are made of large rocks. These hunebeds are built around 5000 years ago by the communities of the Funnelbeaker culture (in Dutch: trechterbekercultuur), a culture that is named after its typical shape of pottery (Koops, 2017). The remains of their settlements form archeological treasures and add to the rich history of the Geopark. More recent examples of human settlements can be found on the 'essen,' which were agricultural fields located on the higher lands. The remains of the so-called 'esdorpen' can still be seen in the structures of some villages. In the eastern part of the Geopark, the landscape is shaped by the peatland cultivation of the 19th and 20th centuries: it resulted in large open views with long, straight canals. One of the largest peat-moor areas of The Netherlands is located in the southeast of Drenthe, called Bargerveen. To conclude, besides the geological influences, the landscape is also immensely shaped by years of human activities.

These three components of geology, archeology, and culture, form the three key aspects of the area, which led to the initiative of developing the Hondsrug area back in 2011. The parties involved concentrated on collaborations between active organization, strengthening the identity of the region, and focused on the regional community and tourists (Geopark De Hondsrug, 2012). The collaborating governmental agencies at the time were the province of Drenthe, and the municipalities of Aa en Hunze, Borger-Odoorn, Coevorden, Emmen, and Tynaarlo. In the years after, the region became a member of the European Geoparks Network and also the Global Geoparks Network, which eventually led to the status of UNESCO Global Geopark in 2015. Shortly before this, the province of Groningen and the municipalities of Groningen and Haren became part of Geopark De Hondsrug as well, which means that at this moment, the Geopark is covering seven municipalities within two provinces.

The GGN was created in 2004 by eight Chinese geoparks and 17 members of the EGN and were supported by UNESCO (UNESCO, 2017d), which had started working on geoparks in 2001

already (Global Geoparks Network, n.d.-b). Geopark De Hondsrug joined the GGN in September 2013 (Geopark De Hondsrug, 2018d). The network got more members over the years, and in 2014, when the network had 111 members, it acquired legal status (Global Geoparks Network, n.d.-a). The member states of UNESCO ratified the creation of the label of Global Geopark in November 2015, which “expresses governmental recognition of the importance of managing outstanding geological sites and landscapes in a holistic manner” (UNESCO, 2015), and thus the label UNESCO Global Geoparks was established. However, not all members of GGN have a UNESCO status; they can be part of GGN without having the actual international status. When applying for the UNESCO Global Geopark inscription, the site needs to be a member of the GGN, and needs to meet the set criteria: the area must have geological heritage of international value; the site should promote awareness of key issues that society is facing (e.g., increasing understanding of geoprocesses or climate change); the management of the geopark should be appropriately equipped; the visibility of the geopark should be increased via communication with residents and tourists; cooperating with other geoparks through the GGN; and the geopark must respect local and national laws regarding geological heritage (UNESCO 2017b; 2017d). When applications are being denied by the Council, which is the decision-making body (UNESCO, 2017-c), the geopark still remains a member of GGN. A field evaluation takes place before the decision on granting the status to the applicants is made, which is conducted by an independent evaluation team. This team will give recommendations after their visit, which the managers of the geoparks should put into practice before the Council decides on their application half a year later (UNESCO, 2017-c.). A similar process is also taking place once a geopark has been granted the status: another round of evaluation takes place every four years, and this evaluation is done by managers of the geoparks, resulting in not only the evaluated geopark learning from the feedback they are given but also the evaluators themselves. When a geopark fulfills the criteria, they receive a ‘green card’ and can continue for four more years. When a geopark can no longer live up to the set criteria, they will receive a ‘yellow card’ and get feedback on which steps of improvement to take within a two-year period. When the geopark is able to meet the criteria, they will receive the green card, or a red card when they cannot fulfill the criteria, and they will lose the status of UNESCO Global Geopark (UNESCO, 2017c).

One of the goals of the Global Geoparks program is to involve local people in the process of preserving and celebrating their culture. Geopark De Hondsrug aims to achieve this rural development in different ways, for example, via educational programs or regional co-management. The Geopark is working together with the so-called ambassadors, their partners (Geopark De Hondsrug, 2018b), which are companies that help organize activities for visitors, such as accommodations, museums, restaurants, etcetera. These ambassadors help to strengthen the identity of the region and supply visitors and residents with information actively. When becoming a partner of the Geopark, the ambassadors can join for the 'ambassador course', a four-day course with an excursion through the Geopark. During this course, ambassadors learn more about the Geopark and its history, and how they could be of help to the Geopark.

3.2 Data collection

This study is of qualitative nature and will have an explorative approach. Resilience research has gained much attention in the past years, but not on Global Geoparks specifically. Measuring the aspects of a social-ecological system that determine its resilience (latitude, resistance, precariousness, and panarchy) be difficult, but qualitative research gives room to the multiple interpretations actors of the system have. It can occur, when a quantitative approach is adapted, that tourist operators are not able to work with the set-out concepts (Becken, 2013). Hence, it is of importance that through an explorative case study with interviews as a way of data collection, people's interpretations, meanings, and perceptions are being studied (Mason, 2002), that could contribute to understanding their adaptive capacity and resilience. The resilience and adaptive capacity of a system are context-specific, varies over time, and is different for each country, community, or another type of system (Smit and Wandel, 2006), causing that there is no interest in generalization in this research. The outcome can, however, serve as a guide for other Global Geoparks.

For this research, qualitative methods are used to gain an in-depth understanding of the issues and developments at stake at the Geopark. The qualitative methods that have been selected as appropriate to use for conducting this research are recorded semi-structured interviews and observation. Besides this, tourists and residents have been approached randomly to have a short conversation (a maximum of five minutes) about the Geopark and field notes were taken immediately afterward. Besides this, secondary data is used as well. For example, to get a

further understanding of what aspects could add to greater resilience. Selecting multiple qualitative methods leads to the triangulation of methods by assuring the study's validity, reliability, and credibility (Boeije, 2010).

To arrange interviewees, the method of purposive sampling was used. The actors that were chosen to be interviewed are in relation to the focus of this research. In qualitative research, it is often problematic to choose the sample size in advance (Mason, 2002), which was also an issue for this research. To improve this situation, snowball sampling was used to find more adequate respondents, which is based and derived from the following statement of Mason (2002): "the sample size should help to understand the process rather than representing the population, and it should be a dynamic and ongoing practice."

The interviews themselves were semi-structured, meaning a set of questions were prepared beforehand, as a means of guiding the interview. However, this meant there was also space for the input the interviewee, which could potentially lead the interview in a different direction. The difference with closed interview questions is that there is no space for additional conversation, which could potentially mean that the interviewee does not give the desired information because it is not in line with the interview outline. Therefore, the method of semi-structured interviews is the best option: it gives freedom to the interviewee, but the prepared questions will help to keep the conversation on the desired track (see Appendix A).

The interviewees were approached at the beginning of August via e-mail, in which the research and the goal of the interview were explained. In this e-mail, anonymity and confidentiality were mentioned as well. Before each interview, these aspects were mentioned again, and all interviewees agreed upon the process. Table 3 is an overview of the conducted interviews. The interview codes represent how each interview is being referred to in text in the upcoming chapter. For example, interview code 1 refers to interview 1 or respondent 1.

Table 3 - Overview of the conducted interviews

Interview code	Interviewee	Duration
1	Employee organization Geopark	1h 40 min
2	Employee Marketing Drenthe	48 min
3	Tour Guide	52 min
4	Volunteer for the Geopark organization	39 min

5	Ambassador of the Geopark	1h 20 min
6	Employee Tourist Information Point	17 min
7	Two employees Tourist Information Point	11 min
8	Ambassador of the Geopark	10 min

The interviews were recorded and transcribed afterward. Because all interviews took place in Dutch, the transcriptions are also in Dutch (see Appendix B). The quotes used in the findings chapter (chapter 4) are translated from Dutch to English, as literal as possible to avoid the loss of data and meaning.

The main research question of this study is: *"What does Geopark De Hondsrug as a tourist system look like in terms of resilience, and how can the system potentially be made more resilient and adaptive?"* and three sub-questions have been established to answer the main research question. Each of these questions and how the used method is considered appropriate is discussed separately below.

RQ1 – What are the main elements and (cross-scale) interactions of Geopark De Hondsrug as a tourism system?

How to understand the main elements and cross-scale interactions of the Geopark, data was gathered in two different ways. First, secondary data was collected by accessing documents provided by the Geopark. For example, the application document that was sent to UNESCO for approval contained an overview of the organization and management structure of the Geopark. This knowledge then served as a basis of better understanding during the semi-structured interviews. During the interviews, respondents were asked to mention what they thought were the key components of the Geopark. In other words: which elements are most important to conserve? By discussing issues at stake, both internal and external interactions were discussed as well. Follow-up questions were asked to the respondents when they mentioned an actor, to let them explain in more detail what the role of that specific actor is. The complementary input the respondents gave resulted in an overview of cross-scale interactions: (key-) players at larger and smaller scales are identified and studied.

RQ2 – What disturbances and uncertainties could potentially affect the system, and what will be the effect of these disturbances?

A list with an overview of disturbances and uncertainties that could form a possible threat to the Geopark was made before the period of data collection. This list is created through the gathering of secondary data, of which some were focused, and some were not explicitly focused on the Geopark. Some of the items on the list were mentioned during the interviews, and some were not, which is reflected in this research because the accumulation of data was an iterative process.

This list also served as examples that were sometimes mentioned during the interviews by the interviewer, to help the respondent understand the question better. Not every respondent was able to grasp what disturbances could affect the Geopark. They mentioned it was because they had never really thought about it before. Only after the respondents mentioned they could not think of anything themselves, some examples were given. When giving examples, there is a possibility that the researcher is steering the respondent in a particular direction. In an attempt to avoid this, the examples that were given were broad: ranging from the social to the ecological domain (aging population, policy changes, extreme hot summers, heavy rainfall) and ranging from global disturbances to local disturbances (climate change, policy changes, lack of incentives, lack of financial resources).

The questions that were asked to the respondents were straightforward (e.g., "do you (fore)see any disturbances or negative effects currently or in the future?") and afterward follow-up questions on their responses were asked.

RQ3 – How can the Geopark organization and the Geopark actors be more resilient towards the disturbances and uncertainties?

To get a better understanding of the elements on which the Geopark needs improvements, the respondents were asked to elaborate on the current and future state of the system. For example, if disturbance X happens, what would that mean for the Geopark? Most respondents mentioned several disturbances and uncertainties, so all of these were discussed separately. A reference to the key components mentioned earlier in the interview was made to see if anything was threatening these.

After some interviews, it became clear that one of the main aspects that was flagged as a problem in the Geopark was its familiarity among residents and tourists, which was backed up

by two other ways of gathering data. One of them is observation: the researcher visited multiple places where information for tourists was offered to check the presence of brochures and flyers of the Geopark, but also the other offers. Besides this, 48 people were approached to ask them whether they knew about the Geopark, and what they could tell about it. These short talks did not last longer than five minutes and were not recorded, but field notes were taken immediately afterward. There were two questions I asked the people: if they are a resident or a tourist, and whether they knew about the Geopark or not.

During the interviews, respondents were asked how they could potentially prevent or mitigate all the issues they had mentioned earlier in the interview. They were asked to describe their role in this process, but also the role of the organization and the whole system (so the organization, ambassadors, government, etcetera). The respondents were also asked about their opinion on how resilient the system currently is, which often led to respondents giving examples of what they thought could be done better.

To gain a better understanding of aspects that help increase resilience and adaptive capacity, secondary data is used. Optimal conditions have been discussed in the theoretical framework, and these served as a guideline to answer this sub research question. It is discussed below how well the system is living up to these optimal conditions in a descriptive manner.

3.3 Data analysis

The raw data obtained in the fieldwork phase was structured by making use of the concept of 'open coding,' which means that the collected data is being divided and grouped into fragments of the same subject and are labeled with a code (see Appendix B). This was done in the first round of analysis, and there was no selection made based on the usability of the data (Boeije, 2010). When everything was grouped, patterns became clear, and a subdivision was made based on the main issues at stake in the Geopark. Then, the second round of labeling and grouping took place based on the division of the main issues. The data is presented as text and in figures, for example, the overview of the social network of the system.

The nature of this thesis is deductive, meaning that the theoretical framework is produced before the fieldwork phase took place, and the outcome of the data collection will be tested on this theory. For the coding and analysis part of this research, again the workbook for assessing resilience (Resilience Alliance, 2015) was used to serve as a guideline. To have a better

and fluid connection between the literature and the findings (Boeije, 2010), minor changes were made to the literature section. The structure of the findings chapter is in line with the research questions, and throughout the chapter, aspects of the guidelines of the resilience assessment workbook (Resilience Alliance, 2015) are used when suitable and applicable.

3.4 Limitations

During the phases of data collection and data analysis, I stumbled upon some limitations that had their effect on this research. First, the fieldwork took place during the summer holidays, which sometimes resulted in actors declining the invitation for an interview because of this reason. For example, I was not able to meet with one of the employees of Recreatieschap Drenthe, an organization that conducts research on leisure and tourism in the province of Drenthe, and is one of the subsidy providers of the Geopark. Especially in the light of resilience and related future scenarios, their input could have been of importance for this research. I also approached owners of tourism facilities, who are ambassadors of the Geopark, but some of them declined because they were too busy working; it was holiday season after all.

A second limitation of this research lies in the language that was used. The conducted interviews took place in Dutch and were transcribed in Dutch. When using quotes to support the analysis in chapter 4, the quotes were translated into English, which sometimes led to the loss of meaning, because there are certain things you simply cannot translate. On top of that, some of the statements in the interview were said in Drents, the dialect some people in Drenthe speak. Going from Drents to Dutch is sometimes leading to the loss of meaning, let alone translating it again to English. I speak the dialect myself, and I knew what the respondents were saying, but that is still a matter of interpretation, and some information might not have been translated or interpreted completely correct.

A third limitation I encountered was that not every respondent understood the concept of resilience completely. Before the interview started, I explained it to the interviewees and asked them if they understood it, to which all of them responded that they did. However, during the interview, I noticed they did not understand it completely. Before the interviews were conducted, I practiced twice with different people, and they both gave feedback. During these practice interviews, I already noticed this was an issue I could encounter, and I prepared myself for this by having a list of examples of disturbances that could threaten resilience. However, as

mentioned before, giving examples might steer people in a particular direction, so I made sure to give a wide variety of examples. When people are able to visualize certain things, they often understand them better, which I then also noticed during the interviews. Sometimes, the respondents were building further upon the examples I mentioned by applying them to situations they encountered in the Geopark, but some also came up with other examples. Therefore, I think this did not affect the research tremendously.

4. Findings

In this chapter, the findings of the collected data are presented. In the first subchapter, a description of the park will be given by drawing upon the key elements, and the involvement actors of different scales and the (cross-scale) interactions, which will serve to answer research question 1. The second section will help answer research question 2, where the (potential) disturbances and uncertainties which with the Geopark is dealing are described. The third subchapter will cover research question 3, by illustrating how the Geopark can cope with these potential disturbances and what the role of actors could be in enhancing resilience.

4.1 Description of the Geopark

A description of the Geopark as a system will be given in the following subchapter, by elaborating on several aspects such as the main issues, key components, the system's

governance, and cross-scale interactions. This subchapter serves to describe the context of the Geopark, the focal system.

4.1.1 Boundaries, main issues, and key components

When doing a resilience assessment, the boundaries and main issues of the focal system need to be described first. There is not necessarily a temporal border of the Geopark; a resilience assessment can be conducted as long as it is existing, depending on its UNESCO status. Setting the spatial boundaries for the Geopark seems to be rather straightforward: it is just following the border of the Geopark itself. However, looking at the tourism system of the Geopark requires to also look outside these borders: the Geopark finds itself in the provinces of Groningen and Drenthe, and within these provinces, there is a network of tourist destinations and activities. Organizations such as Marketing Drenthe and Marketing Groningen, but also the municipalities, try to attract tourists to come to the region, where Geopark De Hondsrug is part of. The focus of these marketing organizations is on The Netherlands, Flanders, and the border regions of Germany (interview 2). To look at the Geopark as a system in itself is maybe incorrect, it is rather a subsystem within the larger tourism system of Groningen and Drenthe.

The main issues and key components have been discussed during the conducted interviews. The issues and uncertainties present in the Geopark, ranging in the magnitude of the effects, will be discussed in chapter 4.2. The key components of the Geopark as identified by the respondents are ranging from the social domain to the ecological domain, resulting in a variety of elements of the social-ecological system being valued as a key component. Exploring the key components will answer the question of *resilience of what?* The majority of respondents considered both geological and social aspects as the main elements of the Geopark:

"It is two things: the genesis is very special, with those ice masses coming from Scandinavia two hundred thousand years ago which formed the nature. But also the settlement history, then we are speaking of five to five and a half thousand years ago, of the hunebed builders." (Interview 5)

As mentioned before, the glacial geology is currently visible in the landscape, among other things, through stream valleys, ridges, and pingorains. Pingos are small hills of earth-covered ice that are formed by ground (ice) water that is pushing the soil upwards. When temperatures rise and the ice melts, the hills 'collapse' and a small lake or mere is formed (interview 3). The

cultural elements of the Geopark are for example the hunebeds and human settlements. Another interviewee illustrated the elements respondent 5 mentioned with some examples:

"The core elements? Then we are immediately talking about the hunebeds, which is a good example. You also have the pingoruijn; there are many pingoruijn in Drenthe. (...) But the hunebeds, those are the main elements, although you also have viewpoints and hotspots." (Interview 3)

These viewpoints and hotspots are specially selected sites within the Geopark, which are particular places with geological, archeological, and cultural features. For example, monastery "Yesse" or the "Bargerveen" peat area.

One respondent chose only the geological aspect as "the core" element of the Geopark and had a somewhat negative stand towards the cultural elements:

"The core of the Geopark is the glacial geology. The structure of the Hondsrug is unique, and that is also why it became a UNESCO Global Geopark. Not because of some villages with old and nice Drents farms." (Interview 4)

Overall, the respondents illustrated a coherent mix of social and ecological elements that they thought were the key components of the Geopark.

4.1.2 Social network and interactions

To analyze the social network of the Geopark and to see how they influence the resilience of the system, we have to look at the focal system (the internal organization of the Geopark) but also to larger and smaller systems. Together, they form the social network of the Geopark. However, as mentioned in the above 'boundaries'-section, the Geopark is subject to a larger tourism system that stretches out over a larger region. Thus, the Geopark as a (sub-) system knows a set of interactions within its scale, but also external interactions. These system scales are classified hierarchically: actors such as the government or UNESCO are located on a higher scale than the Geopark organization, whereas the ambassadors and residents are placed on a lower level. Figure 9 contains a brief overview of the actors of the Geopark. However, there are more actors involved than the ones described in the figure, and some are combined with an umbrella term. For example, 'municipalities' includes the seven municipalities in which the Geopark is located. The term 'ambassadors' covers all the actors that are considered to be a

partner or ambassador of the Geopark, such as campgrounds, hotel, and bed & breakfast owners, but also organizations and companies that organize activities for tourists. The organization of the Geopark is dependent on subsidies, and some of these are coming from European funding programs, which are displayed in the figure under 'European organizations.' An example is the LEADER program, which is a European initiative to support rural development projects. Besides this, the focal system is consisting of more than three bodies, which is described in further detail in the part on the internal interactions. In this subchapter, the social exchanges of the entire system will be described by drawing upon, among other things, interactions, conflicts, and influences.

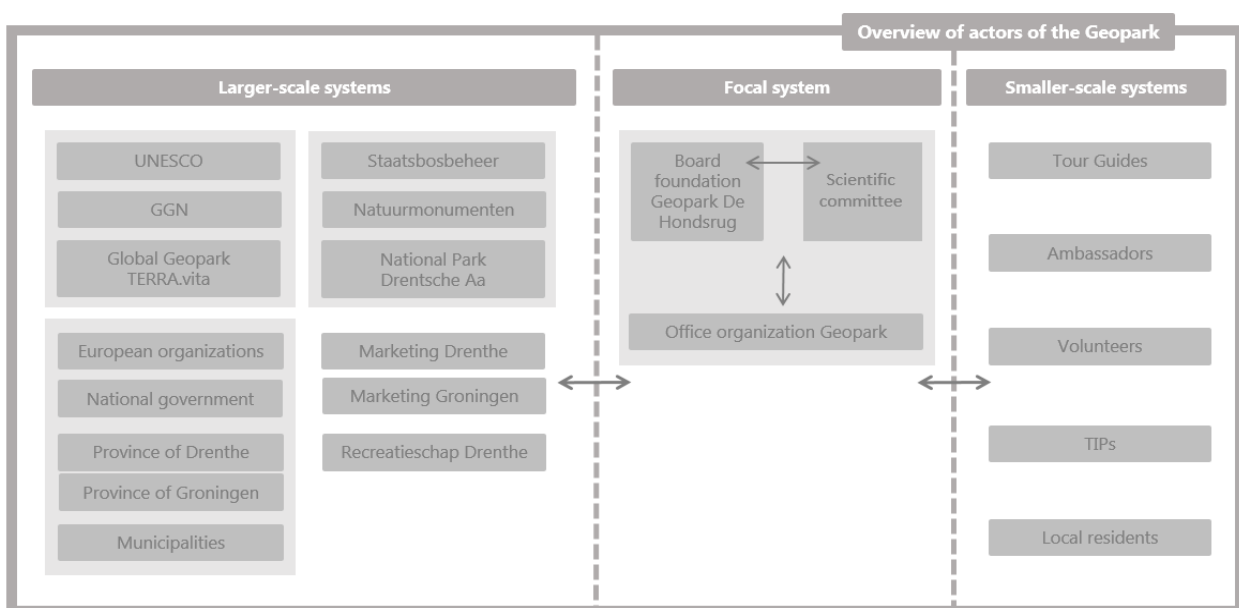


Figure 9 – Overview of the actors of the Geopark. Source: author.

In the Geopark system, there are horizontal and vertical relations present. The horizontal relations are between the systems scales, and the vertical relations are between the different actors. In this case, UNESCO is a 'higher' body than GGN, which is after that 'higher' than an individual Geopark. The same goes for the governmental bodies: the national government is higher than the provinces, which are higher than the municipalities. There are several grouped actors within the system. For example, the different governmental bodies are grouped, and so are the 'nature' organizations of Staatsbosbeheer, Natuurmonumenten and NP Drentsche Aa. The dotted line between the scales represent the fluid borders: there are no strict and isolated scales and systems.

In the following three parts, the internal, and larger and smaller scale interactions are described, which is of importance for the chapter that follows afterward, which is a description of the issues at stake in the Geopark. Combining these two will lead to an overview of disturbances and actors, and now these are related to each other. By doing so, a better overview of the system is created, and relations and influences are easier to determine.

Internal interactions

Within the focal system, internal relations are determining how the Geopark functions. The office of the organization of the Geopark is the central actor, and regarding hierarchy, they are subject to the Board of Directors and the Academic Committee. Besides that, they are also cooperating with the agenda committee and the Geopark Network Consultation Partners. In Figure 10, the partners are also seen as part of the internal structure. However, in Figure 9, these are placed outside of the focal system and are divided over the larger and smaller system scales.

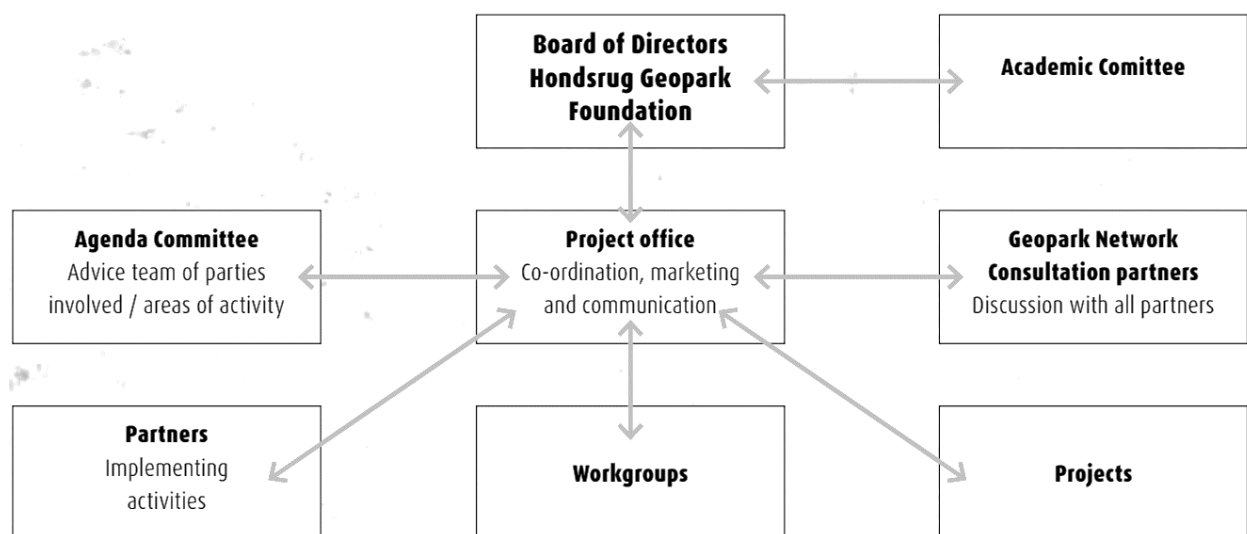


Figure 10 – Overview of the organizational structure of the focal system. Source: Geopark De Hondsrug (2012, p. 8)

The project office is the central organ in the system scale and is named 'organization of the Geopark' throughout this research. Their duties cover the execution of plans and the chosen framework into the desired direction, by developing the Geopark concept. They are responsible for marketing and promotion, and to strengthen the identity of the region via educational programs. The board of directors consists of five persons who do this job voluntarily and is made up of two directors nominated by the province of Drenthe and local authorities, the director of Recreatieschap Drenthe, and two directors on behalf of the Geopark Network

Consultation Partners. Their responsibilities cover determining the direction and framework in which the organization is working, the annual plan and budget, and it provides management support. The Agenda Committee consists of a mix of people from the province of Drenthe, local authorities, Staatsbosbeheer, Recreatieschap Drenthe, and a representative of local businesses. Their function is to advise the Board of Directors and has a coordinating function. They monitor where necessary, give management support, and contribute to the social embedding of the Geopark. The Geopark Network Consultation Partners is another mix of people supporting the organization through the exchange of information and they form a sounding board. The people that form this body are from, among others, tourist business in the region, IVN (Institute for nature and sustainability) the ANWB (national motoring association), Drents Archive, Marketing organizations, and Tourist Information companies. As seen above, some of these actors are placed separately in Figure 9, which is because, in this research, their influence on the system is seen as vital. These actors will be elaborated on below. The Academic Committee is consisting of several people working in a variety of fields, such as a landscape historian, and archaeologist, physical and cultural geographers, and a geologist. Respondent 1 had the following to say about the development of the relationship between the academic committee and the Geopark organization:

"The academic committee, we have a meeting with them a few times a year. They do research and have new technologies compared to years ago. For example, they now research old cart tracks on the ridge of the Hondsrug. In the beginning, it was difficult; we really had to search for the role that each of us should play. Now that we have the Masterplan, we have a clearer view of what our research questions are and where we want to develop more. The academic committee works on starting research on those things, by putting students on that, for example." (Interview 1)

The workgroups and projects mentioned in Figure 10 are covering the various activities organized throughout the region of the Geopark, and are arranged by experts, local businesses and interested organizations.

As mentioned above, the wide range of actors and related interactions within the focal system are influencing the decision-making process and the related outcomes. They are the ones to decide what to focus on, where to invest in, etcetera. However, besides these internal interactions, there are also external interactions influencing the activities of the Geopark.

Larger-scale systems

Outside out the focal system, the larger and smaller scales are also having an influence on the functioning of Geopark, how it behaves and how it can develop over time. These system scales are not only influencing the organization but the Geopark as a whole. For instance, the governmental bodies are playing a significant role: they are in charge of legislation and the execution of, for example, signs along the road and the development of infrastructure. The landowners of the Geopark area are the municipalities and Staatsbosbeheer. The municipality takes care of legislation and such, but the hands-on management is carried out by Staatsbosbeheer, a forest and nature organization commissioned by the Dutch state (Staatsbosbeheer, 2018). As mentioned above, they also take part in the Agenda Committee and is thus working closely together with the organization. Besides practical and legal aspects, the governmental bodies also have another influence, because they are the main subsidy providers, of which the provinces are the biggest players. The Geopark also receives funding from European funding programs and Recreatieschap Drenthe, which is an organization that coordinates the collaboration between municipalities in the field of leisure and tourism (Recreatieschap Drenthe, 2017b). The Geopark needs to clarify what they did with the provided funds, and one respondent had the following to say about this:

"The Hondsrug region in general is being promoted, but that piece of Global Geopark De Hondsrug is another story. The Geopark cannot join [in this promotion], because the Geopark is for a substantial part dependent on subsidies and they look very carefully where they spend the money on. Imagine, they spend the money on such a [promotion booklet], then they will say: that is not what the money is for." (Interview 6)

In the statement above, the respondent mentions to what the friction the subsidy-dependency can lead. Another respondent also raised these issues, by explaining how thorough the application for and use of subsidies is:

"It is difficult to apply and get the funding. When we want to apply for funding, we have to request several quotations [from different companies]. We cannot choose any random person or company to do something for us. We have to judge these quotations objectively, and that is sometimes difficult. For example, for European funding programs, everything has to be super clean. You cannot make any deals with 'friends.' If you are

applying for grants higher than €20.000, you have to have several quotations, and you have to explain carefully on what grounds you have selected the quotations.” (interview 1)

These statements show it can be difficult to obtain funding from governmental bodies and what to do with it, but respondent 1 explained how these subsidies are also of positive influence for the region. The money they get to spend in the region will also influence the organizations and companies operating there because they will also benefit from a better-developed tourism system. Another respondent mentions another positive effect of working together with governmental bodies, which is the collaboration with the provinces and thus to make use of their network:

“We work closely together with the province [of Drenthe], and because of that, we also work together with a lot of other organizations. The province is the overarching body for all of these organizations, so for the Geopark but also for the national park, for example.” (Interview 4)

The Geopark is mostly collaborating with the province of Drenthe, while most of the Geopark is located in that province, plus the province of Groningen became a member of the Geopark later. The provinces and their network form a vital source of memory, knowledge, expertise, and capital for the Geopark. However, there are some frictions related to the collaboration with the provinces; these will be discussed in chapter 4.2.6. Nevertheless, the province (of Drenthe, mostly) is often stated as one of the leading players (interview 1, 2, 4, and 6).

Another external relation is one of global scale: UNESCO and the Global Geoparks Network. Every four years, UNESCO chooses to renew the Global Geopark status to Geopark De Hondsrug or not, and the Geopark is heavily reliant on that status. UNESCO does provide some guidance to the Geoparks, by evaluating the Geoparks every two years:

“After getting the status [of Global Geopark], a commission will come to visit to see if we are working and developing properly. (...) For example, how much are we doing with education? That is a very important point. We try to work on those points [of improvement] one by one. We have to work more on education; road signs should be improved, I am just naming some examples. And then, when you have done all of that, you get a new certificate after six months, and you can continue for two more years. (...)”

It is organized by the UNESCO Global Geoparks organization. It is a systematic research to see if [the Geoparks] are 'behaving' properly." (Interview 4)

Before the status of Global Geopark is renewed every four years, an evaluation team will come and visit the region and will give feedback, which contributes to the decision on receiving a green, yellow, or red card from UNESCO. This means, every four years, a large amount of feedback becomes available to the organization to work with. The evaluation and feedback is something a Geopark can use to develop themselves more sustainably because an accumulation of knowledge and expertise contributes to having more experience and memory to deal with disturbances and uncertainties. The committees consist of people that work for Geoparks across the world, which means that members of the organization of Geopark De Hondsrug also need to travel to other Geoparks to evaluate those, which is only available to the Geoparks that have had a 'green card' for four consecutive years (interview 1), which is the case for Geopark De Hondsrug:

"[name employee Geopark] often travels to other Geoparks, too see how they are working and how they are doing. That information also comes back to us in that sense. That way we do not only learn from ourselves, but also from others." (Interview 4)

During interview 1, the respondent mentioned that UNESCO takes care of the "formal part," so the approval of the status and such, and the Geopark is allowed to use their logo. UNESCO says that the usage of their logo is already "an economic added value." When asked if UNESCO provides any support on how to make use of the given feedback and how to conserve the area, the respondent replied that they do not. However, the Geopark is actively involved in the EGN, the European section of the GGN. There is an annual conference; one year is an EGN conference, the other year they meet with the GGN. Besides that, the EGN has a meeting every year, so the European Geoparks see each other twice every year. The respondent describes these meetings as informal and very helpful: they share knowledge, best practices, and experiences. There are keynote speakers that share visions for the future of the Geoparks. This way, the Geoparks can learn from each other. The value of being part of this network is therefore invaluable for better sustainable development. The cooperation with other geoparks is happening on a more regional scale as well:

"There is an official collaboration with the Geopark in Germany, just across the border here. It is called TERRA.vita, and the collaboration project we are part of is called Interreg. We have a good connection with them, and we learn a lot. We visited them a while ago and noticed immediately that the Geopark has a clearer profile over there. The people are more familiar with the concept of Geoparks. When you would enter the city hall, you immediately see a large information billboard about UNESCO and Geoparks. They do way more work, but they also have more employees than we do. So from that, we can learn a lot. How did they do this? How are they promoting? Why are they more visible than we are? That is why it is so good to have an international working relationship." (Interview 4)

Respondent 1 also mentioned the importance of regional and international collaboration:

"We work closely together with TERRA.vita, and we see each other on a weekly basis. That goes very well. We are going to do the Interreg project. Besides that, I am also often on the phone with Denmark, and they say they would like to work with us, so I reply: come and visit us! That is truly magnificent. For example the topic of education, then we can learn a lot from each other." (Interview 1)

This regional collaboration is vital because the Geoparks are somewhat comparable. Of course, they differ in many aspects, but there is more overlap between the Geoparks in Germany and The Netherlands than between The Netherlands and Japan, especially considering governmental funding programs, for example. To illustrate, respondent 1 mentioned that the Danish Odsherred Geopark developed an app where someone can have a look at what the area looked like thousands of years ago, an innovative concept called augmented reality. Respondent 1 would like to have such an app as well but then specified for their Geopark. Developing an app is expensive, but using the expertise of the Danish Geopark opens room for possibilities.

Marketing Groningen and Drenthe are other players that are operating in a larger-scale system and are influencing the Geopark. These parties are providing information on their websites and other communication channels about the activities to do in their province. During an interview with one of the employees of Marketing Drenthe, the following about their relationship with the Geopark was said:

"We have some sort of mutual interest: we both want more tourists to come here. (...) We make use of each other in the right way. We support each other, and we advise each other. (...) I think the Geopark is a stimulus for a small specific target audience, people who love culture. The target group we focus on [is different]. (...) it is not that we always try to address the same target group, which sometimes leads to us drifting away from each other." (Interview 2)

The respondent mentioned, although their target group is sometimes differing, that they will always redirect people to the Geopark if needed. On the website of Marketing Drenthe, there is a link to the website of the Geopark at several places (Marketing Drenthe, n.d.). The website of Marketing Groningen, on the other hand, does mention the storyline of Geopark De Hondsrug, but there is no link which redirects people to the website of the Geopark to be found (Marketing Groningen, 2018).

The last external influence coming from a larger scale is the relationship with National Park Drentsche Aa. The Drentsche Aa is a stream valley in the northern region, and a large part of the NP overlaps with the Geopark. One of the respondents mentioned that there is sometimes friction between the NP and the Geopark:

"The Drentsche Aa area, the Geopark covers most of that. They have a similar format, their area is also shaped by interesting geology, just like us. So they do the same: they promote it, and their goal is to get as many people to visit, and they make it interesting to visit. Where the national park is, they do not want any Geopark signs standing there. And vice versa. (...) I think we should collaborate with others more, especially with the Drentsche Aa, because we have several common goals and we offer many of the same things." (Interview 4)

The frictions between the NP, but also between the Geopark and governmental bodies will be described later in this chapter, as well as the importance of better collaboration.

Smaller-scale systems

The external relations described above are all happening on a larger scale than the focal scale, but there are also external interactions with lower scales. An example of this are the guides that are working voluntarily for the Geopark. These guides are telling the story of the culture and

nature of the Geopark. Respondent 3 is a guide and mentioned the following when asked about their relationship with the Geopark organization:

"I have good contact with everyone. If something is up, we can always go to the [the organization of the Geopark], and I have a lot of contact with [them]. Actually, with whom not? It is just fun, and everything goes in a friendly way. You can always tell your story, if something is not going well, for example (...) I have noticed that when there are some problems, there is immediately attention being put to it to prevent the problem from getting bigger and to solve it." (Interview 3)

The other respondents had similar explanations about their relationship with the organization of the Geopark (interview 2, 4, 5). The organization is a central actor within the entire system, and because they appear to be very approachable, they stimulate better interaction with the actors. Respondent 3 also explained her relationship with other guides and further actors involved with the Geopark (see below). The communication with other guides is for the sake of sharing knowledge and experiences, and how to improve and develop in the future. The respondent is also in contact with foresters of Staatsbosbeheer because they manage the forests where the respondent is doing their guided tours. Besides this, they are in contact with several campgrounds, because that is where they get their customers: the people who will join for a tour.

Another group of people that the Geopark often interacts with are the ambassadors or partners of the Geopark. In September 2018, the list of partners on the website (Geopark De Hondsrug, 2018b) counted nearly 200 partners, ranging from accommodations to art studios, from historic associations to tourist information points, and from restaurants to museums.

"We organize activities ourselves, but we try to also do things together with partners. We have many nice activities already (...). We do this at [different locations], and we organize it, but together with the local companies and such, the partners." (Interview 4)

The wide range of partners that are associated with the Hondsrug makes that the offer of activities is wide-spread throughout the whole Geopark area. It was sometimes mentioned that the area is almost too big (interview 4, 5, and 6) and that that sometimes would form an obstacle for creating unity and solidarity. It makes that "the organization and their network are

thinly spread over the whole area" (interview 4), but the Geopark theme is so rich in storylines, that you can tell different parts of it at many different places.

The ambassadors, the partners of the Geopark (see chapter 3.1), often also have contact with each other, but respondent 5 mentioned that that often happened out of "economic incentives" instead of from the Geopark point of view.

"I think there are more ambassadors who [would like more interaction from the Geopark point of view]. Sometimes I speak to other ambassadors who were with me on the course, which was two years ago, and afterward, it remained silent. So then [the interaction] fades away. Those ambassadors say that also sometimes. But maybe we, as ambassadors, are not active enough to get the information. We [as a company] do, because it is part of our story, but I do not see hotel owners going to the Geopark and ask: "tell me something new for my guests." That is not how it works, I think." (Interview 5)

Figure 9 also includes volunteers, which are people who carry out work for the Geopark. The organization of the Geopark (interview 1) mentioned several times the importance of these people, and they highly value them. These volunteers are often retired people who are in best interest with the region and have much experience. Besides this, the TIPs are also mentioned. TIPs are Tourist Information Points, which are located at four places throughout the Geopark and they provide information to tourists.

The final 'actor' mentioned in the figure, are the residents. In all of the interviews it was mentioned that the residents are not familiar with the Geopark, and therefore the Geopark does not really 'live' among the people. However, it is desirable to teach the residents about the Geopark and their cultural history, because it adds to the identity of the region. A growing feeling of identity, unity, and solidarity could highly contribute to the incentives of the people to contribute to the Geopark. Important to mention here, is the character of the "Drent," certain character traits are typical for "Drenten" (the inhabitants of Drenthe). They tend to have an attitude of "doe maar normaal, dan doe je al gek genoeg," which would translate into something as "act normal, then you are already behaving weirdly enough." This attitude results in the people from Drenthe being modest towards things, which makes it difficult to make them enthusiastic about projects such as the Geopark. If there are residents of Drenthe who

are enthusiastic about certain things, they are often not outspoken about it but keep it to themselves.

"I get the impression people are dismissive towards [the Geopark], while it is exceptional that the Hondsrug got the UNESCO status. It is at the same level as the Wadden Sea World Heritage. However, here in Drenthe, there is not much publicity given to it. [They will say:] "Oh, there you have another organization that is committed to nature, we already have so many of those." So there is work to do, to create more awareness."
(Interview 4)

During the fieldwork period of this research, several people were approached randomly on the street, and they were asked what they knew about the Geopark. The majority of the approached people had never heard about it, while others had heard of the name, but could not say in much detail what it meant and what the Geopark is offering. Respondent 1 also mentioned this by saying:

"We are dealing with people from Drenthe here. (...) For them to be positive or enthusiastic about something, they do not do that often. Last May, we gave a lecture, and there were 100 people in the room, and everybody was very enthusiastic. For a lecture! Everybody liked it, but there are of course also many people who do not attend these lectures, and they do not read anything, and they do not know anything. So yeah, if you ask those, they will not know the Geopark." (Interview 1)

To summarize the above subchapter: the system of the Geopark is part of a larger touristic system that spreads out over a larger region than the Geopark itself, and is, therefore, a subsystem of this bigger tourism system. The Geopark organization is the central actor within this subsystem. The main actors that influence the system are the provinces (due to legislation, expertise, and subsidies), UNESCO and the Geoparks Network (the Geopark status and exchanging knowledge and experiences), and the volunteers, partners, and guides (organizing activities and spreading the story of the Geopark). There are other actors within the system, but their interactions are less compared to the other actors. The influence these actors have on the respondent's key elements lie all in the sense of preserving and celebrating these elements. All key elements are historical practices, something that cannot be changed. Nonetheless, the way these practices are visible in the current landscape is something to preserve, on which the

actors can have an influence. For example, the governmental bodies provide subsidies, parties such as Staatsbosbeheer are responsible for the practical execution of this, and the guides and ambassadors help to spread the story about these historical practices. However, a Global Geopark is responsible for giving (international) recognition to these sites that are worth preserving, by promoting the importance of protecting the geological structures by engaging with local communities (UNESCO, 2017f) and spreading more awareness, but not the actual preservation itself. It is because of this reason that there is a limited connection between the key elements, the (cross-scale) interactions, and potential disturbances, although this is a common perception within the concept of resilience in social-ecological systems. Yet, disturbances and uncertainties are affecting the Geopark, and the main issues existing in the system will be discussed in the following subchapter.

4.2 Disturbances and uncertainties

In the following subchapter, the disturbances and uncertainties the Geopark has to deal with will be drawn upon and will help to answer the question of *resilience to what?* For each disturbance or uncertainty, a description of it is given, namely, fast/slow; external/internal; and if possible, aspects such as the frequency, duration, severity, affected components, and predictability are described. The disturbances and uncertainties are clustered into seven groups, and each is discussed separately below.

4.2.1 Familiarity

As described before, the familiarity of the Geopark among the residents and the tourists is currently low. Many people have not heard from the Geopark, or they did but do not know what it means and offers. Being so unknown by the public means the potential demand for cooperation between the Geopark and companies is less compared to when it would be more familiar.

"The Geopark is relatively unknown at the moment. The Geopark needs the partners, they need to advertise [them], and brochures need to be found. So I can imagine that a disturbance would be that the partners do not see the added value in being a partner of the Geopark anymore. That it is declining or weakening, while those are the people that need to advertise it." (Interview 5)

The Geopark should focus on maintaining or increasing the added value they have for the region, to attract more collaborating ambassadors, but also more tourists. If tourists are not interested in the Geopark and fewer people are coming to visit, this will lead to a decline in people willing to become or to be a partner of the Geopark. The parties that are already collaborating with the Geopark are also interested in seeing the Geopark doing well, so they can benefit from its developments (interview 6). One of the things the Geopark proposed to tackle this issue, is organizing 'resident excursions,' but these did not take place often (yet). During such an excursion, the participants are transported through the Geopark by bus, and they will visit hotspots and other exciting locations to visit, such as the peatlands and the hunebed museum (Geopark de Hondsrug, 2018c). Before the excursion, there is a series of lectures on several evenings and respondent 3 mentioned that it was comparable to following a course.

"I have noticed people become more enthusiastic. (...) Sometimes, they do not completely know their own environment, and if you [show them around] they will say: "do we have this here?" and "I did not know this was here," so that is very nice." (Interview 3)

The familiarity of the nearby Geopark in Germany is higher and that is something Geopark De Hondsrug is trying to learn from. Although it is difficult to compare the two since the concept of geoparks is longer known in Germany. This fact is something the Geopark cannot change. However, they could try to improve the situation in the future.

"Look, if you ask about a Geopark in Germany, most Germans will know what it is, because they have several geoparks there. In The Netherlands, this is the first Geopark. People do not have any idea what it is, let alone that they will think it is worth the effort to come here." (Interview 6)

An issue is that the geological features in the landscape are clearly visible in the German Geopark, whereas this is not the case for the Hondsrug. In order to see and understand the geological features, one must hear the story the Geopark has to tell:

"When you are going to a Geopark in Germany, then you will see the steep rocks and mountains, but here in the Hondsrug, it is more subtle. The height differences in The Netherlands are simply not that big, so you will have to emphasize that. The story needs to be told along with it. That is a challenge, but it is possible." (Interview 4)

An issue that is increasing the unfamiliarity of the Geopark lies perhaps in the name: the word 'park' makes some people believe it is an actual park, surrounded with a fence and a gate. The confusion about the name and content of the Geopark is probably adding to the high levels of unfamiliarity:

"Sometimes people ask about the Geopark, they will say: where is the park, where is the fence, or where is the entrance gate? That [name], that it is a gigantic area without a fence around it, that is something we have to explain first. It is not a park, so the name 'Geopark' is not clear for everybody. That is something we need to explain." (Interview 5)

The Geopark spreads out over a large area, and for people who hear about it for the first time, it might be an overload of information all at once. Respondent 5 mentioned the possibility of more regional offers towards the tourist, so the information coming at them is easier to comprehend. However, the Geopark should then focus more on marketing channels and work more closely with municipalities and other local organizations:

"[The municipality of] Borger-Odoorn recently came out with a new cycling map, together with advertisers and I am one of them. I think the whole concept of Geopark is not on that map. I think that those channels through which the tourists is being approached, about that there is a Geopark, that those should be studied. I think there should be a marketing plan about how to shed some more light on the Geopark." (Interview 5)

As mentioned above, the resident excursions seem to be effective, potentially partially because the approach is on a regional scale and not throughout the whole Geopark. It could be of interest to also approach tourists this way: at first, the Geopark might seem big, and there is much information coming at the tourist at once, but approaching them on a more local and smaller scale might be something to think about.

To summarize, the Geopark is unfamiliar among residents and tourists due to several reasons, which could potentially lead to fewer incentives among the residents and collaborating ambassadors or a decline in tourism numbers. This aspect could also form a threshold: when the situation of declining incentives is taking extreme forms, and there is no support from the local community, the Geopark's position in the stability landscape is reaching a threshold and

could potentially shift into a new state. This is a slow process and influences are coming from both internal and external systems, and the key components described by the respondents are not affected by the low levels of familiarity in any way.

4.2.2 Telling the story

An issue related to the unfamiliarity of the Geopark and the ability to understand the concept is the story about it that needs to be told. To do so, the Geopark is dependent on their connections with their guides and ambassadors. This leads to the following uncertainty the Geopark is dealing with: the restrained influx of new guides.

"I think it is important we get some more guides because the current guides are not very active at the moment. Some are active, but it could be more. There are also a few that dropped out. I do not know what it is, maybe that they do not feel like it or they are too busy with other stuff. More attention needs to go to this; it is an issue I came across."
(Interview 3)

If there are not enough active guides, the story of the Geopark will not be told properly, leading to the Geopark remaining to be unclear to the wider public. Respondent 4 mentioned the aging of the available guides and the possibility of having no successors, which is "affecting our resilience because we cannot do what we want to do" because they do not have the right people to do so (interview 4).

Another group that could contribute to telling the story of the Geopark and making it more well-known among the people are the ambassadors. The ambassadors are the ones who should help advertise the Geopark.

"Behind us right now there is a valley, which is a beautiful area but only if you also know the story. If you are walking through it, you think "yeah, nice," but that is it. You have to tell people about it, and you need ambassadors for that. So I think that is risky, that if you do not provide the ambassadors enough with information and news and material, then [the incentives of the ambassadors] decline." (Interview 5)

Earlier in the interview, respondent 5 suggested that ambassadors should be more active in getting information and material from the Geopark, in order to spread the story more. However, this is questionable and was later on also corrected by the respondent. The activities

the respondent is offering are closely related to the story of the Geopark. Therefore, they need to get the material actively. *"I do not foresee hotel owners going to the Geopark and say: give me something new for my guests. That is not how it works"* (interview 5). Hotel owners and similar tourism companies need to be approached by the Geopark, not the other way around. If these people are considered ambassadors, those who are supposed to help promote the Geopark, but they are not able to carry that out properly, are they fulfilling their task as ambassadors? It is therefore of high importance that these people are provided with enough information and material to help spread the story of the Geopark because they have better access to the tourists.

For example, the organization of the Geopark is trying to develop an app with augmented reality: a person can stand on a specific place and look on the screen of their phone and see what the area looked like a certain years ago.

"If you can imagine that, how [the area] looked like, you can do so much with that. We can do nice things with that, but so can other partners. The hotel can show it to their guests and suggest they go hiking behind the hotel, in the valley. Then there [could be] six hotspots where your phone is suddenly showing you amazing things of the past. With that, you have something nice for your guests, and that attracts tourists." (Interview 5)

Again, none of the key components are harmed by this uncertainty. However, it is affecting how the Geopark is perceived and how 'popular' it is. Spreading the story of the Geopark and the uncertainties that go along with it, is a slow, internal process and, without changes, will affect the position of the Geopark in the future, because it is not able to live up to UNESCO's expectations of promoting the importance of preserving geological heritage (UNESCO, 2017f).

4.2.3 Demographic change

An aspect that was not often discussed during the interviews, but was stated as something that needs to be taken into consideration (interview 4), is the aging of the population. This aging can be looked at in two ways: the aging of the partners and guides, and the tourist population. Two respondents mentioned the aging of the guides as worrisome (interview 3 & 4) because it restrains the influx of new guides (see chapter 4.2.2). However, when asked about how an aging population might affect tourist businesses, the respondents mentioned this is not an

issue, because they had the impression most of the operators were able to find successors when needed (interview 1, 3, & 4).

"Let's take the example of yesterday, it was a beautiful day, and then thousands of people come here to cycle, but those are all 'grey' people. In that sense, that is the aspect of an aging population that should scare us. Do those people have enough interest in what the Geopark has to offer? Or are they only here to tour around on their electric bicycle? I see that more as a threat, but not the average citizen and the aging of the workforce, that is not that bad." (Interview 4)

The aging of the tourist population is another story as respondent 4 rightfully mentioned. Many of the people that visit the area are all of the "baby boom generation" (interview 4), and when this group is declining, a gap occurs. This gap needs to be filled up by attracting the next generations to come and visit the Geopark. Otherwise, it will have its effect on the tourism business in the region. This process of an aging population is a slow process, but its magnitude is enormous. It will affect the tourism numbers in the region tremendously, and it is difficult to predict how well the next generations can help fill up the gap.

"I think we first need to recognize the issue and then we should do some sort of identification of what specific populations groups are coming here. We have families with children, and we have old people, but in between, we have less, I think. What do we have to do to make those families more enthusiastic? We have some projects for that. What can we do to get that 'middle group' here, and what kind of special needs or wishes do the older people have that we can help with? We have not had that discussion yet, but there is something to gain." (Interview 4)

The Geopark is not the only one that has to deal with demographic change. Also other areas and regions experience the same problem. This aspect opens up opportunities for collaboration, where all parties try to come up with solutions, and they can learn from each other.

When asked about how to cope with demographic change, Respondent 1 mentioned the focus the Geopark has on educational programs. This is not only one of the requirements of UNESCO, but also their way of coping with demographic change and attracting a more substantial and wider variety of tourists to the region. By investing in the education of children, they will not

only become more aware of the importance of geological and cultural conservation, but they could also influence their parents. As a follow-up on this, the Geopark is investing in activities where all 'age groups' have something to do simultaneously. For example, while the kids are playing games with an educational hint to it, the adults can do the same but more focused on their interests.

4.2.4 Environmental change

Climate change and related environmental change is taking place on a global scale, but its effects are also noticeable in the Geopark. Less, admittedly, but noticeable. Respondent 3 described this and mentioned it does not necessarily have to be a negative thing:

"Look, with the changing climate; you can notice that it comes dryer here. (...) I can see how much has changed over the years. [The eastern side of the ridge] used to be swampy and peat was dug there, you can still see [the remains of that]. Currently, it is very dry and there used to be many adders, but I do not see those anymore because it is so dry. That is how things change every time. You also see that with certain flora; some of them disappear, and sometimes it is replaced by something new. It is constantly changing, but that also interests people, it lures them here to have a look." (Interview 3)

The respondent shows that environmental change can also be a source of exciting developments. However, it could potentially disturb the nature in such a way, that some of the characteristic components are affected. For example, the stream valley and its rich vegetation could change, or the pingoruians are drier.

An effect of climate change was noticeable during the warm summer of 2018, where it was sometimes too warm to do any activities (interview 4). If hot summers like these are happening more frequently, there might be a shift in the high season; people might choose to visit in May or September when the temperatures are lower. This would happen in extreme occasions (Interview 2), but it could mean that activities also need to be offered outside the current peak season.

"There are bed & breakfasts and hotels that close outside of the summer season. Those are the partners, but not the actual Geopark. Although, we could promote that the opening hours are longer. That is a problem in Drenthe anyway, if you are here after August, many things are closed. (...) There is something to gain." (Interview 4)

Although the Geopark mentions to organize activities all year round, and some of their partners do that as well (interview 5), it is not in accordance with the touristic facilities; some of those have limited opening hours. If these two are better aligned, it will open up possibilities of accommodating tourists for longer than one day outside of the peak season. However, exploring these possibilities is outside the scope of this research, so no concrete statements can be given.

4.2.5 Financial position

One of the main uncertainties the Geopark is facing is its dependency of the organization on subsidies from external parties:

"We are purely dependent on subsidies. We would like to be less dependent, but I do not know how. If somebody would tell me how to do that..." (Interview 1)

Every respondent shared their concerns about the current and future financial position of the organization of Geopark. When talking about solutions, there were no concrete answers. Respondent 1 mentioned that they do not know if solutions even exist. This financial instability is one that could potentially affect the system the most: when there is no money, no development is possible. The reduced amount of available money, or even the absence of money entirely, forms a threshold in the stability landscape of the Geopark system. In 2017, the province of Groningen did not supply the Geopark with the agreed amount of subsidy (interview 1, 2, & 4), thus influencing the precariousness of the system by steering the Geopark closer towards a threshold. The Geopark was able to cope with this specific event and its magnitude: the share the province of Groningen pays is lower compared to the province of Drenthe. Groningen is budgeted to pay € 44.000 but paid € 22.000 in 2017, whereas Drenthe provided € 125.000 as agreed (Stichting De Hondsrug UNESCO Global Geopark, 2017). In a scenario where the province of Drenthe is not providing the budgeted funding, the magnitude of such a financial disturbance would be immensely more significant.

An aspect that could cause a fast disturbance regarding finances, and is also affecting the respondent's key components, is vandalism. In August 2018, around 200 m² of vegetation was burned around a hunebed in Emmen, caused by a disposable barbecue. Other forms of vandalism like this, for example, a campfire, also form a potential risk, especially during the warm and dry summer months (Albers, 2018). Disturbances like these are fast and external, and

aspects such as their duration and severity are dependent on each situation. In the past years, it occurred three times that vandals made a fire near hunebedden causing damage to the hunebed and its surroundings (Boelema, 2012). Repairing the damage done to these hunebeds is costing a lot of money and considering the scarcity of money, is this forming a disturbance.

The uncertainty of the finances of the Geopark's organization can be considered as a fast process because it can change at any moment. At any moment in time, a fund provider can decide to change their mind about the subsidy, which makes it difficult to say anything about the predictability and frequency of such a disturbance.

"You can ask the companies and such that they should give us money, but then we will probably also lose many of them. That is a real fear." (Interview 1)

When respondent 1 shared their insights on the financial situation, they mentioned that even if they asked the companies for some money, it would not make much of a difference. The Geopark could potentially ask them for a small amount of money because a larger amount would scare them off. Respondent 1 then said: "with those 100 euros per company we would also not make it, it will not help. I really need the subsidy of the governmental bodies."

The situation regarding subsidies is also related to the added value as described in 4.2.1 because the Geopark needs to be able to show the funding providers what the added value of the Geopark in the field of tourism and recreation. Funding suppliers, but also the collaborators Marketing Drenthe and Marketing Groningen, need to be convinced of this added value because it determines their willingness to invest in and to provide money to the Geopark (interview 2). Respondent 4, a volunteer of the Geopark, mentioned they regularly give lectures to potential subsidy providers, thus creating more name recognition and awareness.

A threat related to the financial position of the Geopark is the low utilization rate of the organization of the Geopark. In total, three people are working for the organization: a manager, project officer, and an administrative assistant. When respondent 4 was asked about their opinion on the resilience of the Geopark, they had the following to say:

"I think we are somewhat resilient. We have just enough personnel to cope with setbacks, just enough materials, and guides to get through the tough times. However, it is on the edge, I think. (...) that is wearing on our resilience, which we cannot do what we want to do. And, that is also a bit because of lack of money, we do not have the financial

possibilities to hire new paid staff. Resilience has to do with how many people are employed and what they are capable of. These people should not be busy all the time, so they have a bit of [time] to cope with disturbances if needed." (Interview 4)

Based on what respondent 4 said, the amount of people working at the organization is just enough. However, if one of them would be leaving, for whatever reason possible, the organization is facing difficulties. Other respondents also mentioned this issue briefly (interview 5, 6), but respondent 1 did not see this as a problem: "I think it works fine just like this, I would also not want more people to work here. I want it to stay manageable and transparent."

4.2.6 Government

The geopark is dependent on governmental bodies and is subject to their agendas and their relationships. The Geopark stretches over the provinces of Groningen and Drenthe and is, therefore, making it an interprovincial project. According to respondent 3, such projects are difficult to realize:

"A bit of competition between the provinces also plays a role. It is in [the three northern provinces of The Netherlands] nearly impossible for Friesland, Groningen, and Drenthe to collaborate. Those parties do not go well together. (...) So to start an interprovincial project, that is very difficult." (Interview 4)

The Geopark region in Groningen was added later, and the relationship with them needs to be improved. So far, the province of Groningen seems to have their focus somewhere else, most likely the Wadden Sea region, a site with a UNESCO World Heritage List inscription. "The province of Groningen is challenging, but the province of Drenthe does want to collaborate. However, they are poor" (interview 4), especially compared to Groningen, a province that has a bigger budget (interview 1). Considering the provinces being not the most ideal partners to work with, the Geopark seems to be dependent on the municipalities. These, however, also lead to some difficulties:

"(...) the municipalities also don't really see the importance [of the Geopark]. They see it costs money, but what they do not see is that it will most likely also makes some money. (...) We have to keep promoting our UNESCO status that we have a Geopark, and we should be proud of that. But we need money for that, and that will pay itself back eventually. To get the municipalities to do that, that is a difficult process." (Interview 4)

Respondent 4 continued to explain more about the internal concerns of the municipalities, by critically drawing upon the more personal issues that are at stake:

“That is probably because of the type of personnel that is working for the municipalities. They do not have the visions and qualities to value and appreciate the Geopark. That is quite cold to say, but that is the bottom line.”

Another aspect related to municipalities was already described before, where the municipality of Borger-Odoorn produced a new cycling map and did not include the Geopark (interview 5). Maps and promotional booklets like these are the most suitable ways of promoting the Geopark: it is happening on a regional scale and reaches many tourists. The issues the Geopark is experiencing in their relationship with these governmental bodies can be considered as fast and slow processes. It is a fast process because governmental decisions can change abruptly, as we have seen with the province of Groningen not paying the right amount of subsidy. On the other hand, getting governmental bodies to become aware of the added value of the Geopark is a slow process; it can either decline or grow over time, which both will have their effect on the Geopark.

The relationship with National Park Drentsche Aa forms another facet of uncertainties for the Geopark. The stream valley in North Drenthe is labeled as a national landscape, and part of this stream valley, where there are no buildings, is marked as a national park. This NP can be seen as a provincial organization, whereas the Geopark is a UNESCO organization (interview 4). The NP covers part of the Geopark and is famous for its stream valley, a geological feature, which makes it to have a similar foundation compared to the Geopark. There is some competition going on between the NP and the Geopark because they are so similar. The Drentsche Aa, however, is more familiar among the people, because it exists for longer and it has the status of a national park (interview 5). Their mission is to conserve the area, but also to attract more tourists, so it has economic importance. In January 2017, a cooperation agreement between the Geopark and NP Drentsche Aa was signed by the chair of the Board of Directors of the Geopark and the chair of the consultative body of the Drentsche Aa. In the annual report of the Drentsche Aa it is stated that “collaboration is required” (p. 6) and both parties should make use of each other’s strengths (Nationaal Park Drentsche Aa, 2017a).

"The north of Drenthe covers [the national park and the Geopark], so automatically there is some competition. (...) I have the impression that we should collaborate more [with other organizations], especially with National Park De Drentsche Aa. We have many of the same goals, and we offer the same things. At the same time I notice, and maybe that is also because of the personalities, that there is some friction. Some sort of rejection between the two [parties], where collaboration would be more productive."
(Interview 4)

Although both parties claim to want to collaborate more and better and want to make use of each other's strengths, this appears not to be reflected in practice. An interesting fact to mention here is that the chair of the consultative body of the Drentsche Aa is also, "in their personal capacity", the secretary of the Board of Directors of the Geopark (Nationaal Park Drentsche Aa, 2017b).

In political matters, there are sometimes conflicting interests as a result of personal agendas of policymakers. Respondent 4 mentioned two examples where the personal characteristics of policymakers are influencing the situation of the Geopark, as described above. This is not necessarily something the Geopark can influence, but they do have to find a way to deal with it.

4.2.7 UNESCO

Besides the availability of subsidies, the preservation of the UNESCO Global Geopark status forms the biggest threat to the Geopark. The magnitude of losing this status is enormous, because the Geopark is so dependent on this status, but also on the Global and European Geoparks Network. All respondents mentioned this aspect as being a potential disturbance, but they did not foresee this as one that is likely to happen anytime soon. The magnitude of losing the UNESCO status would be a catastrophe and would threaten the Geopark's right to exist. It can be considered as a slow process because in a scenario where UNESCO would decide to take the Geopark status from De Hondsrug, it means that the Geopark has already been declining in quality (from UNESCO's perception that is) for some time. Especially considering the feedback moments UNESCO is offering to each Geopark.

During the last evaluation moment, the Geopark got a list of aspects that they should improve. They managed to do so within the agreed timeframe, which resulted in an extension of the

UNESCO status (interview 1 & 4). One of the aspects was that more attention needed to go to education. Currently, there are several projects with schools in the Geopark, and there are plans to expand this even further by hiring an educational employee. Another example is that there are several hiking and cycling paths, of which one is international and in collaboration with the German TERRA.vita Geopark and there are more road signs. The Geopark is learning from itself, but also from other Geoparks so that they can preserve the UNESCO status (interview 1 & 4).

4.3 Actors and disturbances

Figure 11 shows a summary of the relationships between the disturbances, and which actors are involved with them. This involvement can be in two ways: those that are affected by it, and those who could potentially positively influence them. For example, demographic change has a negative effect on the visitors and guides, whereas a low degree of familiarity will have negative effects on the incentives of residents. An example on a positive influence on coping with disturbances are the ambassadors and guides, who can help to share the story of the Geopark. The GGN and its members can have a positive effect on keeping the UNESCO status through networking and the sharing of knowledge and experiences. The seven disturbances described above are also influencing each other. For example, troubles with telling the story means troubles with the familiarity of the Geopark as well, or the willingness of governmental bodies to collaborate is influencing the financial position.

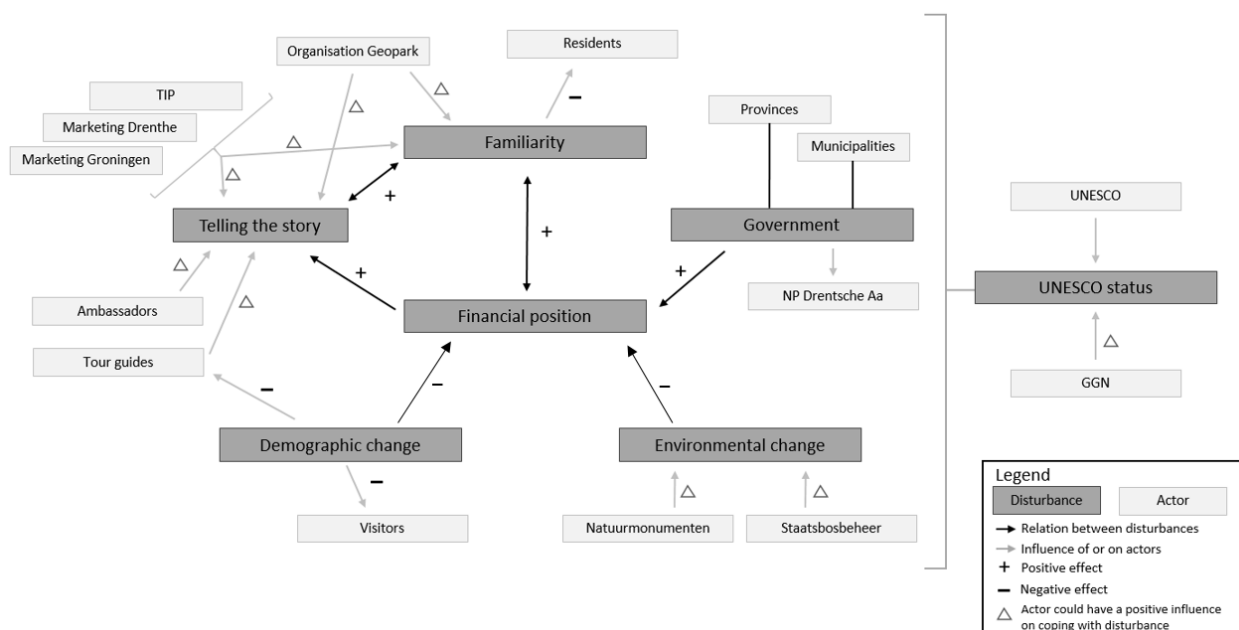


Figure 11 – Overview of the social network in combination with the identified (potential) disturbances. Source: author.

4.4 Resilience and the future of the Geopark

At the end of each interview, each respondent was asked about their opinion of the resilience of the Geopark and their view on what the future might bring. The general idea was in the sense of 'it is okay, but..'. The Geopark is on the right track, but for further sustainable management and development, some issues need to be taken into account.

"I think it is in an ascending line, but the UNESCO status is uncertain. You see now that more entrepreneurs are interfering, and I think they will also start to embrace the Geopark. You have to keep that. (...) You have to keep showing results, so innovation is an important thing for that. (...) and that you can do all of this within nature, that it does not suffer from it." (Interview 2)

Respondent 2 mentions the importance of collaborating with the ambassadors. Respondent 3 mentioned that besides that, the collaboration with partners abroad is essential, as well as being active in attracting more (qualified) guides. Respondent 4 mentioned that the Geopark is "somewhat resilient" and "on the right side, but close to the edge" (see chapter 4.2.5), but they do see a positive future:

"I see a future for the Geopark and I do believe it will continue, but I think its growth will be really slow. That's because of all the problems we have discussed, like the lack of enthusiasm of several parties. But I think it will continue, although it won't be easy. There's definitely a future." (Interview 4)

The lack of enthusiasm of governmental bodies or the local community is something that needs more attention to have sustainable developments in the future. The Geopark needs to continuously put attention to the UNESCO label, to promote it as something to be proud of (interview 1, 3, 4, 5, & 6).

"We have to promote [the UNESCO status] more, and say: it's not something to be taken lightly. (...) that feeling of proudness is something we have to spread out more in Drenthe. I think we can manage to do that, but it will not be easy, there are frictions and competition, we are not the only organization." (Interview 4)

These frictions and competition are mainly taking place in the relationships with governments and parties such as National Park Drentsche Aa. Continuing to insist on better collaboration,

as agreed at the beginning of 2017, is essential. The collaboration with the ambassadors is then also of importance, because those are the people who can help spread the story of the Geopark, but also increase its familiarity. However, respondent 5 had some points of improvement regarding the connection with the ambassadors:

"What they do with the ambassador's course is very good, because that way, you put the knowledge at a bed and breakfast, hotel, campgrounds, and other entrepreneurs in leisure and tourism. That makes them literally an ambassador of telling and sharing the story. (...) It is a good idea, only too small-scaled, which makes it is a long road. (...) Occasionally, I speak to some of the other ambassadors. After [the ambassador course], not that many activities are being organized to share more knowledge, or to get the ambassadors in contact together." (Interview 5)

What respondent 5 is mentioning here, could be of interest to the Geopark. By organizing more activities for ambassadors to gain knowledge on the Geopark, so they have more exciting things to tell their guests, but also to network together. That way, ambassadors can share experiences and ideas, which opens up opportunities for further development, and that makes it more interesting for others to become an ambassador. The Geopark can play a central role in creating more incentives among the regional community.

Another aspect that was mentioned regularly during the interviews was the benefits focussing on education can have for the Geopark. By investing more in educational activities, more children will learn about the story of the Geopark, and they can potentially influence their parents. Focussing on education is also one of the pillars UNESCO is focussing on, but it also has an economic value to it. Respondent 3 mentioned, in the light of education, that after obtaining the UNESCO status, the organization got more serious and focused, which also led to the connection with the scientific committee. Nowadays, among others, archaeological research is taking place, which all is adding to the story of the Geopark.

The aspect that is defining the resilience and future of the Geopark the most, is its financial position. As mentioned earlier, all respondents shared their concerns about it. Which is logical, because nearly every disturbance or uncertainty is linked to finances: the promotion to get more familiar, the developments to grow more, the funds to innovate and offer activities for all age-groups, etcetera.

5. Discussion

This research explored the resilience of Geopark De Hondsrug as a social-ecological system by looking at the cross-scale interactions between the focal system and other system scales, and (potential) disturbances and uncertainties. The findings showed that several developments are forming a threat to the Geopark, and comparing this with the presented theoretical framework of this research shows some overlap, but also some conflicting gaps. This chapter aims to link literature and the presented findings by drawing upon coping strategies and actions to enhance resilience and the adaptive capacity of the system in relation to the findings presented in the previous chapter. An important point to note here is the context-dependency of coping strategies: these are not static and will have to change over time, because of the dynamics and inevitable changes in social-ecological systems (Walker et al., 2003).

5.1 Resilience and adaptive capacity

One of the threats the Geopark is dealing with is that of the unfamiliarity of the Geopark among residents and tourists. This issue was mentioned several times during the interviews, and all respondents clearly showed their concerns about it. The low levels of familiarity have its influence on the Geopark by limiting the (touristic) growth and development of the region. In order to increase the public perception, the Geopark is providing clear and simple information, and the complete system is visualized as one (Resilience Alliance, 2015). A practical example of things the Geopark did to improve this situation is the residents' excursion, where residents could attend lectures and go on an excursion through the Geopark, which is contributing to place attachment and identity building (Norris et al., 2008). Despite the Geopark's efforts, its familiarity remains limited. To strengthen this, personal interactions and regional teams could be an option: it helps to build trust among the public. The findings have shown that the Geopark is reliant on their ambassadors and other partners to help tell the story of the Geopark

and spread awareness. Getting the residents to be more familiar with the Geopark and making the added value of it more clear, could trigger the influx of ambassadors and guides, which could form a win-win situation that will add to the social capital of the system (Brown & Westaway, 2011): the ambassadors and guides, but also the owners of tourist accommodations, get customers because they can offer their guests more, and the Geopark gets more familiar among visitors.

The findings showed that social networking within the Geopark is sometimes limited, which is limiting the regional collaboration and development. Respondent 5 mentioned the absence of contact between the ambassadors after they attended the ambassadors' course. To enhance the adaptive capacity of the system, the Geopark should encourage linkages, cooperation, and collective empowerment of the community, to increase the social capital of the system (Brown & Westaway, 2011; Norris et al., 2008). Besides this, another aspect related to stakeholder cohesion is clear communication and fostering opportunities for social networking (e.g., Resilience Alliance, 2015; Folke et al., 2003). Aside from the insufficient networking opportunities, there is another aspect regarding the communication of the Geopark: some respondents gave conflicting statements, which questions the degree of how clear the communication is. For example, the conflicts present with NP Drentsche Aa, where agreements on collaboration have been signed, but there are conflicts nevertheless (interview 4). By facilitating dialogue and knowledge (Resilience Alliance, 2015), the possibility of accumulating a wide range of knowledge occurs (Folke et al., 2003; Ruiz-Ballesteros, 2011), which will contribute to the growth of social capital, such as bigger citizen participation and perceived public support (Norris et al., 2008). By combining different types of knowledge and (local) expertise, the system is on its way to establish more comprehensive participatory management (Folke et al., 2003), which is in line with the aims of UNESCO on community involvement (UNESCO, 2017e). The findings corroborate the theory of having a diverse palette of knowledge and expertise by showing the variety of ambassadors that are currently appointed (Geopark De Hondsrug, 2018b). Besides this, combining different types of knowledge could also take place via feedback loops of the focal system, adding to the collective memory of other systems, such as other geoparks. Learning from cross-scale interactions and their influence on the system will nurture the diversity of the system and opens possibilities for more flexibility and variety (Folke et al., 2003).

All of the aspects mentioned above are subject to financing: the overarching problem of the Geopark. Out of interview 1 it can be concluded that this is not something the Geopark has much influence on, although several efforts have been put into obtaining more funds (interview 4). Besides that, the Geopark tried to come up with projects to earn some money themselves, but these revenues were marginal and is thus influencing the possibility for self-organization (Folke et al., 2003). To cope with this uncertainty, the Geopark needs to be prepared for change and can do that by having reserves and by improving its flexibility and avoid rigidity (Cochrane, 2010). The dependency on actors is of importance here, because they could serve as a social safety net.

The range of disturbances threatening the Geopark are of both fast and slow nature, which calls for the need of preparing to live with change and uncertainties. During the interviews, I sometimes did not get the impression they were thinking about issues like these on a long-term timeframe. To try to live with change and uncertainties, the Geopark needs to acknowledge that these uncertainties are there and that they cannot be neglected and are something to take into account. The main argument for an adaptive assessment is to try to describe what is known and what is not about various organizational issues (Resilience Alliance, 2015). It calls for the creation of coping strategies, in order to be more flexible and adaptive. An inherent thought in resilience thinking is that of self-organization and being able to rely on itself (Davoudi, 2012), which is difficult due to the Geopark's complete dependency on subsidies. Looking from that perspective to case of the Geopark, self-organization could mean a lesser influence of and reliance on the government (classified in the larger system, Figure 9), but their ability to take responsibility, share expertise and support communities leads to greater resilience of the other system scales. It is thus of importance to find a balance between self-organization and dealing with feedback loops and cross-scale dynamics.

5.1.1 The adaptive cycle and the stability landscape

One of the methods to explore the dynamics of a social-ecological system is by applying the (nested) adaptive cycle to the system (see Figures 1 & 3). However, applying this is difficult in the case of Geopark De Hondsrug, while it has been existing for a short amount of time and no severe disturbances occurred nor did a transformation take place. The influence of the cross-scale interactions have been described in chapter 4.1.2, and position of the Geopark system within the (nested) adaptive cycle could be placed somewhere in the phases of

exploitation and conservation. The Geopark is placed somewhere along these two phases because it is still in development and finding a stable state. The management of the system tries to find the right way to execute their plans and innovations and is thus preventing to move further along the adaptive cycle. Studying the adaptive cycle regarding resilience (Figure 4) shows that the system is in the exploitation and growth phase, as its resilience is not at its peak level. This is because the Geopark is still young and growing, is dependent on subsidies and money is scarce, and it needs to get more familiar and recognition of several parties as it is developing itself. The developments that are happening now in the Geopark in the past few years can be seen as positive developments, although there were some setbacks. However, looking at the bigger picture: it is gaining more attention among residents and visitors compared to when it started, it has developed itself in several ways (website, education, brochures, and activities) and was able to maintain the UNESCO status after getting a wide range of feedback. The majority of developments and efforts can be seen as positive and based on Figure 4 this would mean that the Geopark is currently in the exploitation and growth phase of the adaptive cycle.

There are upcoming developments that will determine whether or not the Geopark is able to remain in this phase, or that it will move towards the reorganization phase. Keeping the UNESCO status can be one of them because that determines the Geopark's right to exist. Besides that, its financial status, the influx of suitable tour guides, the incentives of the ambassadors and the local community, policy agreements, and the familiarity among the public could have their influence on the Geopark as well, and could potentially move the position of the system around through the adaptive cycle. These disturbances and uncertainties can also influence the position within the stability landscape. When looking at the *latitude* of the system, the width, we can conclude the system has a moderate latitude, because the system has an average amount of response options and a seemingly high degree of self-organization, except for its financial stability. Other aspects, such as the number of partners it could potentially rely on for sharing the story and creating awareness, is rather high, which is causing the latitude to be bigger. However, these issues regarding the financial position of the Geopark cause the *resistance* of the system to be smaller than the latitude is, yet it is acceptable. If the financial position would be improved, meaning the dependency gets lower and more capital could be stored, the resistance would grow. A higher level of resistance means that the Geopark can

respond better to disturbances, and with more access to capital, the resistance and the depth of the basis would be larger. The distance between the positions of the system to the closest threshold of the stability landscape, the *precariousness*, is small. The dependency on subsidies is the main reason for this because if one of the subsidy funds would not be received, for example, that of the province of Drenthe, the Geopark would be in huge troubles, causing it to reach a threshold. The *panarchy* of the system, the cross-scale interactions, have been described before in chapter 4.1.2, where it was explained that the organization of the Geopark works closely together with other parties, such as guides and ambassadors, but also governmental bodies, marketing companies, local companies, and other Geoparks.

A critical side note should be mentioned when giving statements about the position within the adaptive cycle, the stability landscape and the aspects of measuring resilience. The (theoretical) elements that ought to determine these concepts are all very abstract and sometimes unclear, and this gives reason to discuss the theoretical and practical use of the resilience concept in the following subchapter.

5.2 The theoretical and practical use of the resilience concept

After linking the findings with the conceptual framework, the theoretical and practical use of the resilience concepts needs to be discussed, because there are some points of criticism. First off, the definition of resilience is unclear, mainly because it derived from the ecological sciences and is now being applied to the social sciences as well (see Norris et al., 2008, p. 129 for a detailed overview of definitions of resilience). As mentioned earlier, it is unclear where to put the concepts of vulnerability and adaptability in relation to resilience. The discussions range from vulnerability being connected to resilience (Calgaro et al., 2014) or not (Gallopín, 2006); and from unclear perceptions about whether adaptability is an aspect of resilience or a separate subject (Becken, 2013; Carpenter et al., 2001; Gallopín, 2006). Besides thinking of resilience *of what* and *to what*, there is a third question to ask: *resilience for whom?* In society there are always winners and losers; a greater resilience of one system may cause a loss of resilience in another system (Davoudi, 2010). A fictional example of this could be derived from the story of respondent 3, a tour guide working for Staatsbosbeheer and the Geopark. If this guide would decide to contribute to the resilience of the Geopark by focusing their work more on that and

becoming less active in their activities for Staatsbosbeheer, Staatsbosbeheer, as a system, would lose some resilience. In the social context, one cannot study resilience without taking fairness and justice into consideration, especially when taking cross-scale interactions into account, which could mean that, hypothetically speaking, the decision-making process of a system could be influenced by what effects it might have on another. One more aspect related to applying the resilience approach to the social domain is the identification of thresholds, which are abstract and difficult to determine in both quantitative and qualitative studies. Besides that, it is hard to identify thresholds due to the unpredictability and impulsiveness of human activities in the social domain (Calgaro et al., 2014).

The second point of criticism is more of practical nature. The workbook of the Resilience Alliance (2015) consists of a wide range of factors that need to be studied to do a proper resilience assessment. However, during the data collection and analysis phase of this research, it appeared to be challenging to find useful and relevant answers to these issues. For example, Ostrom (2009) set up a broad framework consisting of grouped variables (e.g., demographic trends, political stability, and market incentives) to analyze social-ecological systems. Basurto, Gelcich, & Ostrom (2013) then expanded this framework by adding components similar to the ones used in the resilience framework, which resulted in a list of over a hundred elements possibly needed to study the system. In their closing notes, they mention that not every variable can be studied and does also not need to be studied. However, deciding upfront which aspects are relevant and which are not is tricky and subjective, and therefore debatable. An example encountered in the process of this research that can be used to illustrate this issue regarding the testing of multiple variables is the question of where to draw the boundaries of the system. Setting boundaries is difficult in the case of the Geopark, it is something that might seem straightforward, but is actually not regarding tourism research. The tourism system in which the Geopark is present stretches out over the whole of the provinces of Drenthe and Groningen and consists rather of patches than of a coherent region. To take cross-scale interactions into account, necessary for the resilience and panarchy concepts, boundaries need to be clear to determine what the internal and external interactions are. The borders of the Geopark are based on the geological structures found in the landscape, but the cultural elements do not always match these borders, resulting in some practices being excluded. To conclude, aspects such as setting the boundaries are difficult but vital. When encountering this

problem, one could think of leaving it out, while later on it might appear to be of importance, and hence the earlier statement of making these decisions upfront being subjective and tricky.

However, the subjectivity of choosing the relevant variables is not the only matter of subjectivity related to the resilience assessment. The purpose of doing a resilience assessment can vary. Often, outcomes are perceived as desirable, but how is 'desirable' defined? In this research, it was defined as sustainable management or development, but even those are subjective terms. Once again, this issue, together with the assessment itself, are context-specific features and may differ for each manager or planner, depending on how they perceive the situation (Davoudi, 2010), and thus it may differ for the Geopark organization as well. Besides that, aiming to be resilient as a system is "not always a good thing" (Gallopín, 2006, p. 295). Sometimes change is desirable; often at larger scales, in the hope the new established, desired system characteristics will drip down to the lower scales (Walker et al., 2004). Since the overarching threat the Geopark is dealing with is the dependency on subsidies, a change in the behavior and perceptions of governmental bodies is desired, but that is outside of the Geopark's capacities.

The pros of assessing resilience in social-ecological systems is that it combines aspects, uncertainties, and dynamics of the system as a whole, in which external influences are also taken into account. The usage of the workbook with the application based guidelines led to having a decent hold on the research process, although some elements of it are debatable as mentioned above.

5.3 Recommendations for future research

The reasoning for doing a resilience assessment at a Global Geopark was, among others, that it is a new concept within the domain of UNESCO's heritage site designations. UNESCO knows two other variations of heritage conservation programs: the widely known World Heritage List and the lesser known Biosphere Reserves. According to UNESCO, the combination of the three programs is to celebrate heritage while simultaneously conserving cultural and natural landscapes. Biosphere Reserves focus on the management of biological and cultural diversity, whereas Global Geoparks give international recognition to sites that are promoting the importance of protecting geodiversity by actively engaging with local communities. The World

Heritage List is to promote the conservation of natural and cultural sites of outstanding universal value (UNESCO, 2017f).

An option for further research would lie in the intentions of UNESCO for creating three different site designations, where the following questions could be of interest: are the different site designations of the same importance? Why is the World Heritage List so widely known and used as a marketing instrument, whereas the Global Geoparks are not on this level? What does the introduction of two other statuses mean for the World Heritage List and vice versa? Is the value of sites on the World Heritage List declining because of the introduction of other sites of importance?

Some of these questions are of interest in the case of Geopark De Hondsrug. For example, if the designated heritage sites are all of the same importance, then why the province of Groningen is putting so much effort in conserving and developing the Wadden Sea area (status of World Heritage) and not in the Geopark? A similar issue goes for the uneven relationship of the province of Drenthe with the NP Drentsche Aa, compared to their relationship with the Geopark: the province is handing over a more substantial amount of subsidies to the national park compared to what they provide to the Geopark. The Geopark has international status, yet they are not treated as such.

From a methodological perspective, the recommendations for future research lie in the duration and how detailed the obtained data is. To do an appropriate resilience assessment, the time over which the research is stretched out should be longer. Complex and dynamic systems are continually changing, and a large amount of data needs to be collected to do a fitting assessment. By the time one thinks to have collected everything, the first things you have collected could be outdated and need to be researched again. Increasing the durability of the research will result in the ability to see patterns and repetitive dynamics, which can then be connected to aspects that could trigger disturbances. More insight in these triggers is essential and should be obtained through more in-depth interviews with a more substantial amount and variety of actors over a larger time frame. Doing comparative studies with other Geoparks might also give insight into the dynamics and processes of geoparks, and how they could potentially learn from each other.

A third recommendation is how to operationalize the coping strategies provided in this research and other resilience assessments, specified on geoparks. The ideas opted for increasing adaptive capacity and resilience are all of strategic nature, while managers often prefer to receive operational plans. The operationalization of the proposed strategic plans is context-specific and often hard to generalize. However, systems could then make use of those studies in the light of best practices and feedback loops.

Some concluding thoughts to end of this discussion chapter are covering the methodology used for this research. Each social-ecological system is subject to different dynamics, contexts, and features, resulting in not every step of the resilience assessment being applicable. In the case of the study on the Geopark, some items of the resilience workbook were being left out, and some were added. However, after finalizing the data collection and analysis, it made me realize studying the Geopark as a social-ecological system was not the best way to explore its resilience, a social approach would have been more fitting. During the interviews, the respondents asked to share their thoughts on what they thought were the key elements of the Geopark. The geology that shaped the natural landscape of the Geopark was considered to be the key element, together with the history of human settlements (visible through, among other things, land use practices and the hunebeds). When asking the respondents about possible threats to these key elements, none of them replied they were foreseeing any. The disturbances and uncertainties that are forming a threat to the Geopark were all of the social context, except environmental change. Therefore, concepts such as social resilience or community resilience, together with some ecological influence perhaps, would have been more fitting for this research.

6. Conclusion

In this research, I studied the dynamics of Geopark De Hondsrug as a tourist system in the aim of exploring its resilience and adaptive capacity. Particularly, I aimed to investigate which coping strategies and actions could contribute to a better resilience, which meant exploring

the main elements, the cross-scale interactions, the (potential) disturbances and uncertainties and their effects on the system. Seeing the Geopark as a social-ecological system and combining this with the resilience framework, led to more insight in the system's dynamics and interactions, which contributes to the decision of fitting coping strategies and thus enhancing sustainable development. The main research question *"What does Geopark De Honsrug as a tourist system look like in terms of resilience, and how can the system potentially be made more resilient and adaptive?"* will be answered below by drawing upon the three sub-research questions separately.

SRQ1 - *What are the main elements and (cross-scale) interactions of Geopark De Honsrug as a tourism system?*

The main elements of the Geopark is a mix of geological and cultural aspects. The geological settings make the region unique: nowhere else in Europe is such a well preserved and untouched glacial, linear landscape formation to be found. These geological features are visible through four boulder ridges, of which the Honsrug is the largest, being 70 kilometres long and the highest point being 28 meters above sea level. In between these ridges, there are stream valleys with distinctive vegetation patterns. In the eastern flank of the Geopark consists one of the largest peat-moor areas in The Netherlands. The wide variety of natural landscapes has accommodated a variety of human settlements, resulting in valuable archaeological relics being one of the key elements of the Geopark. The traces of the Funnelbeaker culture are visible through remains of their typical pottery and weapons, but also through the spread of the characteristic megalithic tombs, called hunebeds, across the region. Other forms of (cultural) land use are visible nowadays in the 'esdorpen', and the long straight canals and adjacent houses as a side effect of peatland cultivation. The respondents valued the unique geology and the cultural land uses as being the key components of the Geopark.

Looking at the Geopark as a tourism system requires to look outside the borders of the Geopark as well. Namely, the network of the tourism system goes further than those borders and is spreading out over the provinces of Drenthe and Groningen. The Geopark can therefore be seen as a subsystem of a larger tourism system. To study this system and the interactions between the actors, the social network, the system was split up into three system scales, namely the smaller and larger system scales, and the focal system. The focal system consists of the Geopark organization, whereas the key actors of the larger system include governmental

bodies, marketing associations, nature conservation organizations, and the transnational network of UNESCO and GGN. The smaller scales systems include tour guides, ambassadors, volunteers, and residents. A complete overview of the actors can be seen in Figure 9.

There is a variety of cross-scale interactions taking place related to the Geopark. The main interactions take place between the Geopark organization and the governmental bodies, but also with the guides and ambassadors. The interaction with the governmental bodies is related to finances and legislation, and the interaction with the guides and ambassadors is about sharing the Geopark's story. Another essential interaction is that with other geoparks, of which TERRA.vita is the closest (near Osnabrück, Germany). The network of geoparks works together by sharing knowledge and experiences.

SRQ2 - What disturbances and uncertainties could potentially affect the system, and what will be the effect of these disturbances?

One of the central disturbances the Geopark is dealing with is the low levels of familiarity of it among the public because not many people are aware of the Geopark's story or even its existence. UNESCO's aim for Global Geoparks is to spread awareness on the importance of preserving geological and related cultural heritage, but if the Geopark is not widely known, this awareness is not being spread. Thus, the aims of UNESCO are not fulfilled completely. However, since the Geopark is a relatively young concept, the awareness still needs to grow, and the outcome of the interviews showed that the organization is working on this through information brochures and flyers, an active website, and promotion stands. To help share the story and spread awareness, the organization is depending on its guides and ambassadors. These are the people who are in contact with tourists and can create more awareness among them. Another aspect related to the guides is demographic change. Due to the aging of the population, the influx of the guides is restricted, causing the Geopark to have less people to share its story. The aging population is also affecting the tourist population. Currently, a large part of the visitors are above 65 years old, which leads to two things. First, what is the Geopark offering them and is this sufficient, and do they have any special needs? And second, if they do not visit anymore due to the aging process, a gap occurs in the visitor numbers, which needs to be filled up by attracting the next generations to the region.

Another identified disturbance is that of environmental change. Potentially, having more weather extremes as a result of climate change can have an effect on the duration of the high season, and people could decide to visit the Geopark outside of the current high season, to prevent being there during hot days as experienced in the summer of 2018. One of the respondents mentioned the ever-changing nature, but did not necessarily see this as a negative thing: it makes it more dynamic and therefore more interesting. Though, as also mentioned in the Masterplan 2017-2027 (Stichting Geopark de Hondsrug, 2016), the environmental changes could lead to some of the characteristic components being affected.

The biggest threat and uncertainty to the Geopark is its financial position because the organization is entirely dependent on subsidies. Recently, some efforts were made to make some money for themselves, but those revenues were marginal. The subsidies are mostly coming from governmental bodies, such as the provinces, the municipalities, and Recreatieschap Drenthe, but also from the European LEADER program. The precarious financial position leaves hardly any space for building up reserves, making it difficult to respond to fast, sudden disturbances, such as the damage to a hunebed due to vandalism.

Related to the financial position, are the internal and external interactions of governmental bodies. For example, the province of Groningen did not grant the agreed amount of subsidy in 2017. Their focus is more on the Wadden Sea World Heritage, and are condescending towards the Geopark according to one of the respondents. This lack of focus maybe also has to do with issues mentioned in chapter 5, regarding the meaning of UNESCO's heritage sites, where I argued that the meaning of the three different site designations might be affected by the large number of inscriptions and the different existing heritage lists.

The interactions between the governmental bodies are also affecting the Geopark. One respondent explained it is difficult for the provinces to collaborate in an interprovincial project. The Geopark is covering two provinces, and their collaboration leaves something to be desired. A similar issue is the difficult relationship with National Park Drentsche Aa. A large part of the NP is overlapping with the Geopark region, and because of their similar foundation, collaboration would be beneficial for both parties. Although attempts have been made in the beginning of 2017 by signing a cooperation agreement, a respondent mentioned that the situation is still not as preferred. The issues with governmental bodies also show that there is no coherent and collective collaboration in advertising the Geopark. For example, one

municipality recently published a new cycling map, but the whole concept of the Geopark is not mentioned in it. Such an informative booklet or map is an excellent opportunity to reach both tourists and residents. However, the collaboration with the municipalities is not on such a level that opportunities like these can be realized.

The last identified disturbance that could occur is the Geopark losing its UNESCO status, although the respondents do not see this as likely to happen due to the organization's efforts in improving and developing the Geopark.

After exploring the interactions, dynamics, and disturbances and uncertainties of the Geopark, a figure was made to visualize the relationship between the actors and the disturbances (Figure 11).

SRQ3 - How can the Geopark organization and the Geopark actors be more resilient towards the disturbances and uncertainties?

One of the coping strategies to increase the public perception and spread the awareness on the existence of the Geopark is that the provided information should be clear and straightforward, and the region should be presented as one. A growing awareness of the local heritage adds to place attachment and identity building. The guides and ambassadors are playing a role in helping the organization of the Geopark to share the story and awareness, and it is therefore of importance to maintain a good relationship with them and to keep them up to date with developments in the Geopark. The findings showed that social networking between the partners of the Geopark is sometimes lagging, thus the cooperation between them should be encouraged, and opportunities for networking have to be created. A result of this is the potential growth of social capital, which is adding to public support.

Dealing with the political issues described is difficult because (organization of) the Geopark would have to influence a large and ponderous organization. The coping strategies to deal with this should therefore not be on trying to change them, but rather on approaching the situation as it is and work from there. It asks several actors of the system to be more flexible and prepared for change. In the light of self-organization, the Geopark's organization should

try to see any negative influences as opportunities for further development, especially since it is still in the growth and development phase. Making use of the knowledge and expertise of the other geoparks could be of importance here, to have a look at how other organizations are tackling similar (governmental, organizational) problems and how they are attracting and approaching more visitors and residents. These feedback loops coming from other geoparks will also contribute to maintaining the UNESCO status.

The resilience of the system is mainly affected by the financial position of the Geopark. It limits its growth, but it also causes uncertainties which restrict the Geopark in experimenting with innovations and developments. The resilience can be improved because as of right now, many things are just sufficient. Important right now is that the incentives are there and the people working for or with the Geopark are enthusiastic and motivated to work on the project, so if they manage to transfer those attitudes onto the public, there's definitely room for optimism.

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8. Appendices

Appendix A - Interview guide

Below you can find a list of interview questions that were asked during the conducted interviews. These questions served as a guideline throughout the interviews, but since these were semi-structured, follow-up questions were asked, and thus other questions besides those listed below were asked. Note that these interview questions as written below are translated from Dutch to English, as the interviews themselves were conducted in Dutch.

Part 1 – Personal and Geopark

1. Can you give me a description of your work?
2. What is your connection with the Geopark?
3. Since when are you a partner of the Geopark?
4. Why did you decide to become a partner?
5. Can you describe the situation before and after the realization of the Global Geopark?
 - a. What influence did it have on your company / work? (e.g. increase of visitors)
 - b. Do you think the Geopark is a stimulus for tourists to visit the region?
6. What do you think are the key components of the Geopark?
7. Do you have any idea what the opinion of the tourists in the region is on the Geopark?
8. What is the contact and communication with the Geopark like?
9. Do you have any contact with other partners of the Geopark? Can you give a description?

Part 2 – Disturbances and resilience

10. Do you think any problems and uncertainties are present or could happen in the

Geopark?

- a. What kind of problems and uncertainties are happening or could potentially happen in the future?

11. What do you think will happen in such a situation (mention answer to Q10)

- a. What are the effects
- b. Can you give examples?

12. How likely are these effects (Q10+11) to happen? How big is the chance?

13. If such a situation would occur, how could you contribute?

- a. Ask about collaboration with other partners

14. Earlier you mentioned the key components [repeat their answer to Q6], do you foresee any problems with those?

- a. If not, what is needed to prevent problems from happening?

15. What is your opinion on the resilience of the Geopark at this moment?

16. To close off: how do you foresee the future of the Geopark and your relation with the Geopark?

Appendix B – Coded interview transcriptions

To assure the anonymity of the respondents, the coded interview transcriptions are left out of the public version of this thesis research. However, the interview transcripts and/or the coded transcripts can both be requested by sending an e-mail to moniekwiers@gmail.com.