

Networks in the heart of the Veluwe



## **Networks in the heart of the Veluwe**

**A participative scientific method for balanced function combination of nature and recreation in and around nature areas**

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## ABSTRACT

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Het Nederlandse beleid is erop gericht natuurgebieden zoveel mogelijk open te stellen voor recreatieve doeleinden. Het combineren van recreatieve en natuurkwaliteitsdoelstellingen vraagt om een goede balans. In deze studie is een interactieve methodiek ontwikkeld die de kansen en knelpunten voor de duurzame overleving van populatienetwerken in natuurgebieden laat zien. Deze methodiek voor ruimtelijke planvorming is toegepast in het participatieve project 'Hart van de Veluwe' voor een eerste toetsing van het zuidelijke gedeelte van de Veluwe. Met het expertsysteem LARCH is een ruimtelijke populatiedynamische analyse uitgevoerd, waarbij drie soortgroepen, de ecoprofielen van het edelhert, de tapuit en de adder, zijn doorgerekend. Vervolgens is de recreatieve verspreiding berekend met het model MASOOR en gebruikt in LARCH om de effecten van recreatie op deze soortgroepen duidelijk te maken. De methodiek is goed ontvangen door de projectgroep en kan gebruikt worden voor het ontwerpen van een balans tussen natuur en recreatie in landelijk gebied.

**Keywords:** adder, biodiversiteit, duurzaamheid, edelhert, interactieve methodiek, LARCH, MASOOR, natuurbeheer, recreatie, ruimtelijke planvorming, tapuit, Veluwe, verstoring

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## Preface

‘What makes a good scientist?’, ‘What is science?’ and seeing as I want to do interdisciplinary research in the field of nature conservation: ‘What is nature? Is real nature a pristine state untouched by human activities, and if so does it still exist?’ These questions I contemplated at the start of this project, knowing that philosophy is the source of all science. There is no nature devoid of any human influences in the Netherlands, but there are areas where natural processes still dominate (LNV, 2000). For instance in the Waddensea and to a lesser extent in the Veluwe, although the absence of large predators requires humans to intervene continually.

You can conclude that a pristine state of nature does not exist in the Netherlands, or in the world for that matter. Human influences tilted the mythological ‘balance of nature’ already one way (Budiansky, 1995). Human beings now have to deal with areas that still possess a distinct ecological value. Inevitably responsible choices have to be made, bearing in mind that there is no right or wrong answer: nature in the Netherlands is what you make of it. Deciding to let the demand for economic growth and housing rule is also a choice. However, you can try to make the best possible choice for the next seven generations by taking most of the circumstances into account. Scientists can not oversee all the aspects (such as the local politics) and therefore they can only advice and guide during the process, but by no means provide a complete solution. Nature is a common good and the final choice has to be made by the people, often represented by stakeholders. These stakeholders will have to explain their choices to the general public, who often have their own - mythological- view on nature. Honest and none-bias information can aid people to see the logic behind that choice. That is why I believe that most fields of research are undeniably entwined: landscape ecology will need communication, if it wants to convince people that balancing function combinations is the way of the future.

The approach in this research is the result of the substantial contribution of a network of people from rather different disciplines:

- My supervisors: Paul Opdam (landscape ecology), who I thank for his openness to a new approach and stimulation to find my own way, Noelle Aarts (interactive planning), who inspired me with her enthusiasm; and Birgit Elands (recreation), for her contribution at the start.
- The well-organized team of Alterra: René Jochem (recreation modelling), Harold Kuipers (GIS and nature modelling), and Rogier Pouwels (ecology and modelling). I enjoyed our constructive cooperation!
- Theo de Bruin (interim project leader from the Heart of the Veluwe-project), who’s open exchange was invaluable and had a significant influence on this study.

I would like to thank the Natuurplanbureau, and in particular Dirk-Jan van der Hoek, for their funding, because it was vital for this project.

Next I wish to thank the province Gelderland for the use of their maps, and especially Bram Vreugdenhil for enthusing me to take the Veluwe as a case-study and his contribution to the research, and Willem Eckhardt for helping us to select a suitable project.

My gratitude goes out to Bart Boers from the NP Hoge Veluwe, Frank van Bellen from Natuurmonumenten, Gerard Belt from the RGV, Rinus Boordman from the county of Ede, and Martin Goossen from Alterra for their essential contributions to this research.

Furthermore my dear friend Ross Frith deserves special credit for directing my focus with the words: 'I'll always wonder if we will love our parks to death'. Mockrát děkuji, dobre camo Zbyněk Malenovsky for your scientific remarks. Dank je, Edwin Cornelissen for our trips outside away from the computer. Mangpo tukh deh cheh Amchi Lobsang Tsultrim and Tsona family for your support. Most of all a warm embrace for my amazing sister Wendy Grobбен for her endurance during the creative process and for her support in the realm of social sciences. Last but not least I would like to show my loving appreciation for my parents: Peter Grobбен and Suzy Grobбен-Kriek, two wonderful and remarkable persons, without whom I would not have developed into the person that I am now.

## Summary

A balanced combination of land use functions is one of the key interests in a densely populated country as the Netherlands. The Dutch government strives for nature and landscape development for and by the people. This leads to complex interactive planning processes in nature areas in which policy makers, terrain owners and recreational organisations participate. A sustainable integration of biodiversity and recreation is essential for spatial planning in nature areas, but these equivalent functions are often viewed as contradictory. By combining local knowledge of the stakeholders with a scientific argumentation sustainable spatial planning can even lead to an enhancement of both functions. Therefore we developed a preliminary method that supports interactive processes by providing well-founded information on the ecological and recreational networks of a region. We use the concept of ecological networks as the ecological base for the approach in the method. The theory of networks learns that fragile ecological networks pressured by recreation can be compensated by a reinforcement of the network elsewhere (Opdam, 2002). Habitat development in the form of an enlargement or increase of areas or the connections between the habitats is a possibility, while those measurements can also improve the recreational quality of the landscape (Opdam, 2002). A solid knowledge about the location of these networks can accommodate planners with flexible solutions for function combinations with nature. The scenarios that emerge during the interactive process can be assessed with this method for areas of potential synergy or conflict between nature and recreation. This aids the stakeholders to make a justifiable choice, because the possible advantages and disadvantages of a scenario will be depicted in the early planning stages. A presentation of the most likely scenarios for the local inhabitants can enhance the support for the execution of the project.

The interdisciplinary method is realized by integrating the knowledge of Alterra and Wageningen University with the experience of the main stakeholders from the interactive Veluwe 2010-project: Heart of the Veluwe. The ecological networks in the region are depicted through an analysis with the model LARCH. This model gives an indication of the potential biodiversity based on some carefully chosen ecological profiles. An ecological profile is one (fictional) species that represents a range of species with comparable spatial and qualitative habitat demands. Red deer, wheatear and viper were selected for this research, of which wheatear is the most sensitive to recreation. The recreational influence is depicted through the leisure cyclist, which is simulated with the model MASOOR. This results in a map with the distribution of the recreants over the entire area during a norm day. An overlay of both maps in GIS shows a network for both nature and recreation on the southern-Veluwe. The method and the first results were evaluated by the main stakeholders of the project and they positively see a future for this interactive and integral method.



## Samenvatting

Het rijk streeft naar natuur- en landschapsontwikkeling voor en door mensen. Dit leidt tot complexe samenwerkingsverbanden tussen provincies, gemeenten, gebiedsbeheerders en de recreatie sector. Een duurzame balans tussen biodiversiteit en recreatie is essentieel voor de ruimtelijke planning in natuurgebieden, maar deze gelijkwaardige functies worden vaak als tegenstrijdig gezien. Door de regionale gebiedskennis van belanghebbenden te combineren met een wetenschappelijke onderbouwing kan een gedegen planning zelfs leiden tot een versterking van beide functies. Daarom is bij dit onderzoek een preliminaire methode ontwikkeld, die het interactieve proces kan ondersteunen met gefundeerde informatie over de ecologische en recreatieve netwerken in de regio. Het concept van ecologische netwerken wordt gebruikt als de ecologische basis voor de benadering. Deze theorie leert dat kwetsbare ecologische leefgebieden die onder druk van recreatie staan gecompenseerd kunnen worden door het netwerk elders te versterken (Opdam, 2002). Habitatontwikkeling door gebieden te vergroten, extra gebieden aan te leggen of verbindingen tussen deelgebieden te versterken is een mogelijkheid, terwijl dergelijke maatregelen de landschapsbeleving eveneens kunnen verbeteren (Opdam, 2002). Een gedegen kennis van de positie van deze netwerken kan planologen voorzien van flexibele oplossingen voor functie combinaties in natuurgebieden. De scenario's die tijdens het interactieve proces naar voren komen, kunnen met deze methode getoetst worden op potentiële synergie of conflicten tussen natuur en recreatie. Dit helpt de belanghebbenden om een betere afweging te maken bij de inrichting van het gebied, omdat de mogelijke voor- en nadelen van de scenario's gelijk in beeld gebracht worden. De scenario's kunnen ook aan de inwoners van de regio voorgelegd worden, wat het draagvlak voor de uitvoering van het project alleen maar zal versterken.

Deze interdisciplinaire methode is ontwikkeld door de kennis van Alterra en Wageningen Universiteit te integreren met de ervaring van de deelnemers aan een interactief Veluwe 2010-project: Hart van de Veluwe. De ecologische netwerken in de regio zijn in beeld gebracht door een analyse met het model LARCH. Dit model geeft een indicatie van de potentiële biodiversiteit aan de hand van enkele zorgvuldig gekozen 'ecoprofielen'. Een ecoprofiel is één (fictieve) soort die een reeks van soorten met vergelijkbare ruimtelijke en kwalitatieve habitatseisen vertegenwoordigt. Bij dit onderzoek zijn de ecoprofielen van het edelhert, de tapuit en de adder geselecteerd, waarbij de tapuit het meest gevoelig voor recreatie is. Als recreatievorm is de recreatieve fietser op de Veluwe gekozen, die wordt gesimuleerd met het model MASOOR. Dit levert een kaart met de verspreiding van de recreanten over het gehele gebied gedurende een norm dag. Een 'overlay' van de beide kaarten in GIS laat een netwerk van zowel natuur als recreatie voor de zuid-Veluwe zien. De methode en de eerste resultaten zijn geëvalueerd door de belangrijkste deelnemers en zij zien zeker een toekomst voor deze interactieve en integrale methode.



# 1 Introduction

The Dutch government state their main objective on nature conservation as follows: ‘conservation, restoration, development and sustainable use of nature and landscape as an essential contribution to a viable and sustainable society’ (LNV, 2000). Their policy aims to improve the quality of nature areas with integral strategies and refers to nature as a collective good. The government considers this a social task: nature and landscape for and by people, and will support cooperation of all involved parties for the implementation of regional nature policy (LNV, 2000). A balanced combination of land use functions is one of the key interests in a densely populated country as the Netherlands. Effective and sustainable use of space asks for the integration of land use functions. Within the setting of interactive planning processes, we explore the combination of function in and around nature areas. The main question is: how can a scientifically founded method support stakeholders to create a sustainable combination of land use functions in nature areas?

## 1.1 Research problem

This study focuses on the functions nature and tourism, because they play a crucial role in most nature areas. Nature and recreation are both equally important functions in nature areas, but often seem to be at odds with each other in the eye of nature conservationists. Finding a sustainable balance between nature and recreation can prove to be a challenge. Often terrain owners use zoning to protect areas with a high ecological quality from the disrupting influence of recreation, but their spatial implementation has no scientific basis. Decisions made in this manner lack the necessary public support and risk failure. Nowadays policy processes have a ‘network-like’ structure, and the formation of policy takes shape through ‘pulling’ and ‘pushing’ interactions between different stakeholders (Aarts & van Woerkum, 2002). Bottlenecks between function combinations need to be detected and options for landscape development have to be visible, so the different stakeholders in particular areas can approach them through interactive planning. The conservation of nature is often pictured as an ecological problem, but it is also a social problem. Three types of knowledge are needed to solve societal problems according to van Woerkum (1999):

1. knowledge about a problem and its causes,
2. knowledge about technical solutions, and
3. knowledge about the change process is needed to lead the involved actors from a to b.

Knowledge is a shared set of believes that allow people to communicate, co-operate and coordinate their actions (Winder, 2003). Humans negotiate knowledge by communicating with each other (Winder, 2003). A common language that is shared across the various disciplines and sectors appears to be essential for dealing with the social issues at stake, as well as for developing new integrative concepts, theories and methodologies (de Groot, 2003).

The objective of this research is to provide knowledge about the dynamics of nature in interaction with recreation, so stakeholders can discuss and examine their planning in nature areas. In other words:

- the development of a method that shows the current status of nature and recreation and is able to analyse alternatives for the sustainable enhancement of both functions.

To find out if the method is truly beneficial for the stakeholders, it has to be examined in an everyday life. Function combination is a topical issue on the Veluwe where large regional projects, like Veluwe 2010 and the Reconstruction plans for the Veluwe, provide an excellent setting for exploration. In addition, the substantial amount of research already performed in the area contributes to a more profound study. A scientifically developed method is not complete without an evaluation by the people that are meant to use it in daily life, therefore the second objective is:

- an qualitative assessment of the applicability and potential benefits of a preliminary method by the stakeholders of a project on the Veluwe

This study attempts to synergise three disciplines (landscape ecology, leisure and communication) and three organisations: Alterra, Wageningen University and the province Gelderland. We use a design approach for the method that is multifunctional, interdisciplinary, as well as interactive in relation to involved societal groups, so the term integral design process is applicable according to van Woerkum (1999). This process requires a multi-functional mode of tackling problems, an interdisciplinary style of inquiry, an interactive style of management, and more attention for implicit social knowledge and identity issues (Aarts & van Woerkum, 1999).

## **1.2 The research area**

We have selected the Veluwe as a research area within this study. The Veluwe is the largest united forest area within the Western-European low lands and part of an ecological network that stretches from the French Jura until the German Harz. The international community appoints the Veluwe officially as category V: Protected Landscape, according to the IUCN (Evenhuis *et al.*, 2002). Human activities, such as pollution, desiccation, erosion, habitat fragmentation and disturbance or an accumulation of these effects still threaten this unique nature area despite the existing protection (e.g. the EU Bird and Habitat directive). The function of nature is formative on the Veluwe according to the province Gelderland, which means that conservation and development of nature and landscape shape the foundation of their policy (Veluwe, 2010). The province recognizes the Veluwe as a core area for biodiversity and recreation and works intensively together with other stakeholders to prevent further fragmentation and degradation (Veluwe, 2010).

We focus on an area that the province indicates as problematic: the southern Veluwe. To establish physical defragmentation and fewer disturbances for humans and animals in this area, the province initiated the Heart of the Veluwe-project.

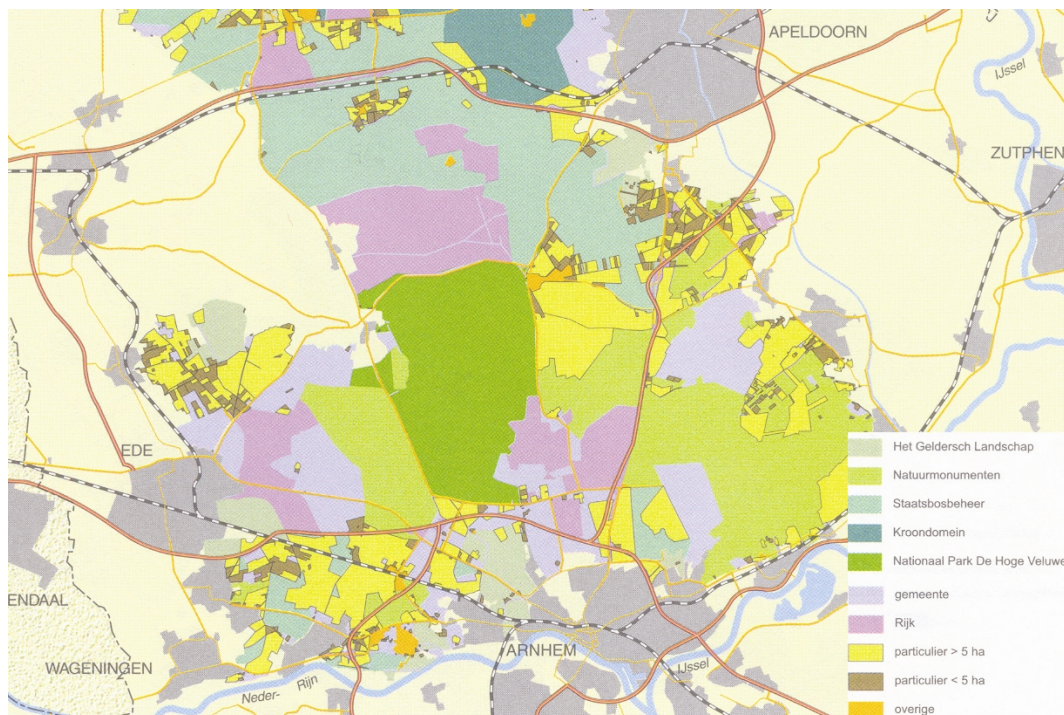


Figure 1 The stakeholders' network on the southern Veluwe (source Veluwe 2010)

The stakeholder network is extremely diverse and complex in this particular setting, as shown in Figure 1. An interim project leader is hired by the various stakeholders to realize the Heart of the Veluwe-project. They put a high value on the creation of support amongst the stakeholders, which shows in the starting points of their approach as written by de Bruijn (2003):

- solutions should not jeopardise the main condition for existence of privately owned National Park (NP) Hoge Veluwe: the paying visitor
- visitors of the Hoge Veluwe should at all time be able to keep on seeing big game
- the roads, which are obstructing to wildlife and recreational hikers and bicyclists, also form important connection routes

The stakeholders strive for an integral approach to the planning, because of the mutual coherence with other projects. They want to achieve as much synergy as possible with other planning processes, to maximize the chances for realisation. The objective is to create solid plans, with a signed intention declaration and support of the interested parties to truly carry out the proposals.

### 1.3 Report structure and restrictions

This study can be divided into two phases: first the method development, followed by an assessment of the method in a network of stakeholders. Networks are a reoccurring theme throughout this study and in the applied disciplines as the following chapters will show. The three main disciplines: nature, recreation and communication return in every chapter.

The theoretical framework in chapter 2 presents the results of the literature study and the research design. Based on the research questions, chapter 3 describes the preliminary method and its application on the Veluwe in detail. Chapter 4 shows the first results of the utilisation of the method for the Heart of the Veluwe-project. The conclusions are summarised in chapter 5 and a reflection on the overall project and areas for improvement are given in chapter 6. Bal *et al.* (2001) means to offer a common language on nature conservation policy and is used as a source for the definitions of the terms in Appendix 1. In this study the term ‘recreants’ is used, which generally applies to local residents spending their leisure time, but unless the term is specified the reader should consider both tourists (visitors from other areas) and local recreants.

The relation between the durability of populations and possible disturbance by recreation (dose-effect relations) will not be investigated in the context of this project. Also the tourist experiences and the economic aspects of nature areas will not be taken into account. The end results of this research serve only as an illustration for the preliminary method, and are not developed further for the interactive process on the Veluwe.

## 2 Theoretical framework

### 2.1 Nature

Between 1920 and 1988, the area of the Netherlands designated as 'nature' (forests and country estates included) fell from 790.000 to 450.000 hectares. Since 1999 this decline has come to a stand still, but the Netherlands is nevertheless experiencing a steady decline in plant and animal diversity, which is well recorded for certain species (Bal *et al.*, 2001). The fragmentation of Dutch nature is such that durable conservation of biodiversity is only possible in ecological networks (Opdam, 2002). Recreation can affect the quality of a network and the next paragraphs will show how this will influence the species abundance.

#### 2.1.1 Population dynamics

This research builds on the knowledge of ecological networks in the Landscape department of Alterra lead by prof. dr. Opdam, and on a study that looks at the impact of recreation by Pouwels & Vos (2001). Although their report mainly explores the effects on birds, Pouwels & Vos (2001) assert that most processes can be translated to other species groups.

##### ***Effects on an individual level***

The number of individuals of a particular species that the resources within in a habitat can support is called the carrying capacity. If the total number of individuals rises above the ecological carrying capacity, the lack of some conditions will cause the demise of some individuals, while others (dispersers) will try to find a more suitable habitat. Noise is the most critical factor in causing reduced densities of breeding birds close to the roads in woodland and open landscape (Reijen *et al.*, 1997). Pouwel & Vos (2001) explain that recreation can disturb the behaviour of individual species in three ways:

1. a residing individual spends more time alarming and fleeing, which will prevent it from foraging and can upset the breeding process. The distance that the bird flies is an indication of the sensitivity of the species for disturbance (Opdam, 2002).
2. this type of behaviour requires more energy: the individual needs to feed longer or in another area to meet its daily requirements, but it might not always succeed.
3. this can result in an individual leaving or avoiding a disturbed area. (Pouwels & Vos, 2001)

##### ***Effects in a local population***

A local population is the number of individuals that actually live in a habitat at a certain moment in time. The three disturbance processes mentioned earlier advance from an individual level to a (local) population level and a combination of processes can contribute to a reduced reproduction success. This will increase the chance of local extinction. (Pouwels & Vos, 2001)

Unfortunately it is not yet possible to determine a quantified dose-effect relation between a number of recreants (the dose) and a decrease in the abundance of breeding birds (the effect) (Opdam, 2002).

### ***Effects within a network population***

In fragmented landscapes populations of animal species do not live in a continuous habitat but in a network of habitat patches, which are mutually connected by inter-patch dispersal (Andrén, 1994, Opdam *et al.*, 2002). The spatially structured population in a habitat network, consisting of local populations connected by dispersal is called a network population, of which a metapopulation is a particular type (Opdam *et al.*, 2003). A metapopulation can contain one or more key populations with a very low chance of extinction that form the strongholds in a metapopulation (Verboom *et al.*, 2001). A population is considered viable when if it has the probability of at least 95% to survive 100 years (Verboom *et al.*, 2001). The minimal viable population (MVP) size is a standard that indicates the probability of exactly 95% for a population to survive 100 years under the assumption of zero immigration (van der Sluis *et al.*, 2003)

The disturbance processes advance from a local population to network population level and can reduce the dispersal and increase the chance of extinction of populations (Pouwels & Vos, 2001). Habitat fragmentation increases the risk of extinction due to demographic chance processes and it may reduce the chance that dispersers rescue small local populations from extinction (Reijnen *et al.*, 1997). Studies show that habitat fragmentation will eventually affect entire network populations (e.g. Opdam, 1991, Opdam *et al.*, 1993, 1995, Verboom *et al.*, 1993). The habitat destruction of one central key population might result in the extinction of numerous smaller populations that depend on the key populations for periodic colonisation (Primack, 1993). A reduction of the habitat quality will lead to an increased surface demand by the residual populations in the area (Pouwels *et al.*, 2002b). The effects of disturbance and fragmentation can reinforce each other and lead to an increased dispersal, which will leave the populations more vulnerable to treats.

### **2.1.2 Nature management based on spatial cohesion**

Dutch policy wants to reinforce nature areas with the establishment of a National Ecological Network (EHS): a coherent network of physically separated habitat patches suitable for a population of a particular species linked by ecological corridors for the exchange of individuals. Large united nature areas have a better ecologic potential and form the main factor in stopping the decrease in biodiversity (Bal *et al.*, 2001). Moreover the enhancement of environmental and water conditions in and around these ecological networks is much simpler then in a situation of many small nature areas (Bal *et al.*, 2001). The government aims to reinforce this network by connecting the Veluwe with the Utrechtse Heuvelrug, the rivers, the Oostervaardersplassen, and –via Twente- with the German forest areas (roughly 7.000 – 9.000 ha. in total) (LNV, 2000). The Advice committee Borderless Veluwe

(AGV) recently advised to assign the status of a National Landscape to the Veluwe (Evenhuis *et al.*, 2002). A National Landscape falls in a lower protection category than National Park and thus gives more freedom for a multifunctional approach, while nature conservation and recreation remain the key functions (Evenhuis *et al.*, 2002).

It is important to know whether a species can persist in a landscape in a sustainable manner. The spatial coherence of a landscape is often determined from the viewpoint of species. Species from forest, heather and moorland are generally more loyal to the area and therefore more sensitive to fragmentation (Pelk *et al.*, 2000). Pouwels *et al.* (2002b) found furthermore that reptiles are far more sensitive than mammals, butterflies and breeding birds. A very important step in the analysis is the selection of species, which shapes the final result. The data for a set of species is often incomplete or unreliable. To avoid discussion and clarify the reliability of the data, Pouwels *et al.* (2002b) developed the concept of an ecological profile. An ecological profile stands for the description of the spatial and qualitative habitat demands of a species, which represents a range of species with comparable demands. The large diversity of species that can appear in a landscape is thereby reduced to a comprehensible number of profiles. Each ecological profile consists of a habitat profile and a spatial profile. The use of ecological profiles is more consistent if the research looks at the analyses of several ecosystems or ecotope groups, like heather, forest or swamps. (Pouwels *et al.*, 2002b) Opdam *et al.* (2003) state that landscape cohesion will be the ultimate goal as a tool for landscape planning, but so far only network cohesion for species can be determined by using ecological process knowledge. A schematic representation of the relationships between network cohesion, spatial cohesion and landscape cohesion is shown in Table 1 (from Opdam *et al.*, 2003).

Table 1 Relationships in the landscape (Opdam *et al.*, 2003)

	Habitat network -single network	Landscape -multiple networks
Ecological profile -single species/ecological profile -single ecosystem Biodiversity - multiple species/ecological profiles - multiple ecosystems	Network cohesion -sustainability of habitat network	Spatial cohesion e.g. number of sustainable networks Landscape cohesion e.g. % of ecoprofiles with conditions for persistence

### 2.1.3 Balancing nature

Opdam *et al.* (2003) tell that biodiversity demands spatial coherence for its existence. Empirical and modelling studies of spatially structured populations at the landscape level showed that the spatial pattern of habitat determines the persistence of natural populations. Important conditions for the species persistence in an ecological network are habitat quality, the amount and configuration of habitat, and the permeability of the landscape matrix. Landscape planning for sustainable biodiversity requires simple images and indicators that can be understood by politicians and stakeholders. (Opdam *et al.*, 2003)

This research takes a first step towards assessing network cohesion by focusing on the population networks and the viability of those populations in habitat networks. We use the concept of ecological networks as the ecological base for the approach of the method. The concept is developed on a spatially explicit base to facilitate interactive planning processes in nature areas in which policy makers, terrain owners and recreational organisations participate. Nature management can influence the balance between nature and recreation, by changing the spatial heterogeneity of the area. The theory of networks learns that fragile ecological networks pressured by recreation can be compensated by a reinforcement of the network elsewhere (Opdam, 2002). Habitat development in the form of an enlargement or increase of areas or the connections between the habitats is a possibility, while those measurements can also improve the recreational quality of the landscape (Opdam, 2002). When choosing among different management strategies, it may be considered desirable for biodiversity to increase over time (Oliver *et al.*, 1998). Ecological networks benefit substantially from physical defragmentation on appropriate locations in nature areas. A network population with protected key populations can sustain itself better under pressure, then when the key populations are affected. A solid knowledge about the location of these networks can accommodate planners with flexible solutions for function combinations with nature.



*Figure 2 The wheatear is very sensitive for recreation*

## 2.2 Recreation

Elands (2002) informs that the combinations of temporal spatial related tourist product elements are called complexes. Knowledge about the tourist complexes in a particular region can provide insight in the coherent use of existing product elements and can also provide a good basis for future product development. The creation of a time-space specific regional identity and the guarantee of continuity and quality are of great importance. (Elands, 2002)

That is just what the marketing strategy of van Beek & van Beek (2001) emphasizes: the province should play a leading role in developing a holistic, long term, articulated and detailed vision of a competitive future product service portfolio for the Veluwe. They also state that the position of the Veluwe as a holiday destination is under siege due to outdated facilities (lodging, F&B, and recreational) that are poorly marketed. Annually an estimated 60 million recreants visit the Veluwe for a day trip and 1.9 million tourists spend their holiday there.

*Table 2 Recreational facilities in the CVN*

Type of facilities	Amount	Details
CVN	98.531 ha	categorized as a 'national landscape'
Day recreation areas	1.200 ha	10 areas and over 2 million visitors annually
Accommodation	2.800 ha	250.000 beds and 45.700 camping places
Bicycling routes	1.535 km	1000 km of signposted routes
Walking routes	5.541 km	

Elands (2002) tells that tourist behaviour can be explained by the spatial structure of an area (supply), by temporal aspects (season, week and day order), and by a search for tourist experiences. The temporal-spatial order and coherence within the context of the holiday are important. Modes of experience can be viewed as motives that give substance and direction to tourist behaviour. Elands & Lengkeek (2000) distinguish five modes of experience: amusement, change, interest, rapture, dedication. Boerwinkel & Philipsen (1999) explain that temporal spatial research is aimed at both the description and the explanation of behaviour in time and space. Concrete temporal spatial behaviour is determined by variables that describe the behaviour in temporal space, and variables that play a role in the decision-making process. Three types of constraints shape the implementation of a choice:

1. capability: physical and biological constraints of human beings, constraints of the environment or infrastructure,
2. authority constraints: which determine the accessibility of the areas,
3. coupling: social constraints (Boerwinkel & Philipsen, 1999).

The capability constraints (distance, available time, etc.) form the main interest of the recreation part of this study. Boerwinkel & Philipsen (1999) tell that temporal spatial behaviour finally is realised in the recreation phase. At that moment tourists carry out concrete visible activities that can be described in time and space. Variables of the space dimension tell something about the location of the activities and their associated movements. Variables linked to temporal aspects are the moment and the order of the visit to certain destinations or terrains, as well as the duration of the visit. (Boerwinkel & Philipsen, 1999)

## 2.3 Recreation dynamics

Both (1999) found that the developments in the mobility behaviour to forest and nature areas show a totally different picture as can be expected from general and recreation mobility developments. The use of the automobile has strongly declined. The car is still the main means of transportation towards forest and nature areas. The number of people that arrive on foot has remained constant during the period of 1962-1999. There seems to be a connection between the size of the area and the distance covered: large forests attract many people from distant areas. Smaller forests are usually visited by people from the direct environment. (Both, 1999) Daytrip research 2003 of the CBS shows that 68% of the Dutch population make a cycling trip for pleasure.

We will only look at the distribution of cyclists on the southern Veluwe, because the stakeholders of Heart of the Veluwe-project want to enhance the cycling possibilities. Research shows that 90% of the people visit the Veluwe for the serenity (Goosen *et al.*, 2003). A cooperation of tourism organisations tell in their flyer 'Agenda for the future' that cycling is one of the most important ways to actively experience nature as well as to visit the recreational purposes. They state that the number of cyclists on the Veluwe has risen substantially over the years, with a steady rate of 5 % per year. Apart from the increase in cyclists, a different type of use (e.g. ATB) results in different quality demands for the bicycle routes. Current bicycle routes have not been modernized in many years and are fragmented and disordered. The cooperation wants to modernize the route network, which requires an additional space of 50 ha (100 km). They want to formulate agreements on a quality improvement of the existing cycling routes and the creation of new routes in the 'Cycling plan Veluwe'. (RGV *et al.*, 2002)

### 2.3.1 Recreation management

Of all conflicting interests in nature areas recreation is often seen as the most difficult to regulate. In many nature areas recreation is often spatially regulated with quiet, intermediary burdened and busy zones, a technique called zoning. This does not always lead to satisfactory results. Sustainable forest management practice requires that attention should be given to both the demand and supply side of tourism (Hall & Higham, 2000). Berends (2002) notices that organisations include the demands of people in their vision on nature, but that most take either nature or recreation as their main ambition. Only the Kerngroep Veluwe and SBB (State forest management) seem to have a balanced view on the supply and demand of nature. She concludes that the current management of nature and terrain owners will lead to an increase in visitors, while most visitors look for serenity in simple forms of outdoor recreation. (Berends, 2002)

Possible solutions depend on the degree of conflicts, and whether a recreational planning cliché has been broached, namely: are visitors by their sheer weight of number destroying the beauty they have come to visit? (Beltram *et al.*, 1993).

According to Gilg (1996) conventional solutions for problems between nature and recreation are: ration access, for example by price or by a queuing or booking system.

Other measures are:

- to divert use away from the threatened site by encouraging the use of spoiled or already urbanized sites (honey pots)
- to create new and different attractions, for example: theme or country parks
- to provide a better home environment, and thus taking away some of the need to visit the countryside
- to encourage different tourism uses in different areas.

Boerwinkel & Philipsen (1999) distinguish two dimensions in wide variety of routing instruments for recreation: <sup>1)</sup> the extent to which the routing measure affect the feeling of freedom of the recreant, and <sup>2)</sup> the physical or social character of the routing measure. Effective zoning depends on a combination of physical and social routing measures. Social instruments that only slightly affect the freedom experience are most accepted by tourists. Those include participation, interpretation, education and exertion, and to a lesser extent promotion, concentration points (honey-pots) and natural guidance. Johnson and Clark (2000) show in their study that simple management changes, such as a redesign of facilities, access restrictions, and track resurfacing, can reduce ecological impact. If concentration strategies for recreation are used, then it is important to ensure that the honey-pot site is robust enough to cope with recreational pressures or of little or no conservational value. (Johnson & Clark, 2000).

### **2.3.2 Balancing recreation**

Pouwels and Vos (2001) explain that with the current state of knowledge it is hard for a nature manager to know whether opening the nature areas for the general public will endanger the quality of nature. The combination of quality objectives for recreation and nature demands a good balance. For the sustainable realisation of the ambitions that support recreation and nature, it is necessary to estimate how high the recreation pressure in an area can become, and how this needs to be spatially divided. (Pouwels & Vos, 2001). According to Gilg (1996) four types of carrying capacity can be defined for recreational use of nature areas:

1. ecological capacity, the amount of use before damage takes place,
2. physical capacity, the number of users capable of using the site,
3. perceptual capacity, the level in which rich enjoyment begins to fall,
4. economic capacity, the number of visitors which will yield the maximum economic benefit for the multiple land use site (Gilg, 1996).

This study will only look at a combination of the ecological and the physical capacity. The distribution of the visitors in an area can provide insight on potential bottlenecks in the recreational network. Recreation planning strategies can then be based on the determination of physical capacity by ascertaining the optimum visitor numbers in certain areas. The recreation can then be adjusted in physical or social manner,

without undermining the sense of freedom that people value. A well-informed choice between a wide range of routing instruments can enhance a project remarkably. This type of knowledge will assist nature managers to create and maintain a high quality balance between nature and recreation.

## **2.4 Communication**

The government wants to achieve the planning of landscape functions in the Netherlands through interactive processes (LNV, 2000). Existing and potential bottlenecks in an area are often addressed through interaction with the stakeholders. Van Woerkum *et al.* (1999b) recognize that from the perspective of improving the biodiversity of natural areas, tourism is an opportunity as well as a threat. Many people would, in principle, be willing to behave in an ecological sustainable manner, if only they were convinced that everybody would do so. In the absence of trustworthy institutional arrangements to this effect, everybody is waiting for the others to act first and nobody is doing anything. Professional communication can facilitate in various manners to attain a sustainable balance between nature and tourism functions. (van Woerkum *et al.*, 1999b) Van Woerkum *et al.* (1999a) advise rather than being concerned about government processes resulting in fixed policy, the government communicators should be concerned with problem solving without government intervention. The role of the government in this instance is no longer to regulate, but to stimulate, to facilitate or to mediate. We will have to adopt another perspective, in which communication is no longer considered as one of the products of policy, but rather the other way around: policy is a product of communication (Van Woerkum *et al.*, 1999a). The next paragraphs explain some of the elements that influence the negotiation process in small groups of stakeholders.

### **2.4.1 Interactive policy design and reframing**

Van Woerkum *et al.* (1999b) devised the term 'interactive policy design' for this process, wherein professional communication plays a role in the process of policy formation itself. The basis for interactive policymaking is the recognition of mutual dependency (Aarts, 1998). The stakeholders have to recognise that they need 'the others' to reach their goals. The actors need to take regional initiatives on board and feel responsible for them (Giddens, 1998). This will lead to involving these others in policy development. Interactive policy design must be seen as a negotiating process in which conflicting interests are explicated, recognised, and eventually translated into a constructive plan. (van Woerkum *et al.*, 1999b).

Aarts and Woerkum (2002) inform that the basic mechanism for learning in negotiation processes is discussion. By discussing people negotiate and come to compromises. Two (ideal) types of negotiation can be distinguished:

1. distributive negotiating style based on one cake that has to be divided, and
2. integrative negotiating style is based on the baking process, in which the cake's consumers are directly involved in producing the cake they want.

In integrative negotiations actors build on an interest or an idea about the desired future. Especially in case of complex problems in which actors are involved via complex relationships and interdependencies, an integrative negotiation process, characterized by social learning, is preferred. Social learning or re-framing refers to a process in which actors gradually extent their restricted view on the problem with the perspective of others in order to develop a new, common view that incorporates the problems of different actors.

In the process of re-framing actors learn to understand the paradigms, metaphors, mindsets, or mental models that underpin how they operate. A problem is put into a new, broader perspective ('frame'). This collective frame forms the basis for the search for integrated solutions or creative compromises (Aarts, 1998). The solutions or compromises have to do justice to the problems and interests of all the actors involved. Re-framing takes place in a process of communication and negotiation that is characterised by integrative aspects. In the Netherlands negotiations often result in (very provisional) compromises that are seldom experienced as satisfactory by all the parties involved. (Aarts & Woerkum, 2002).

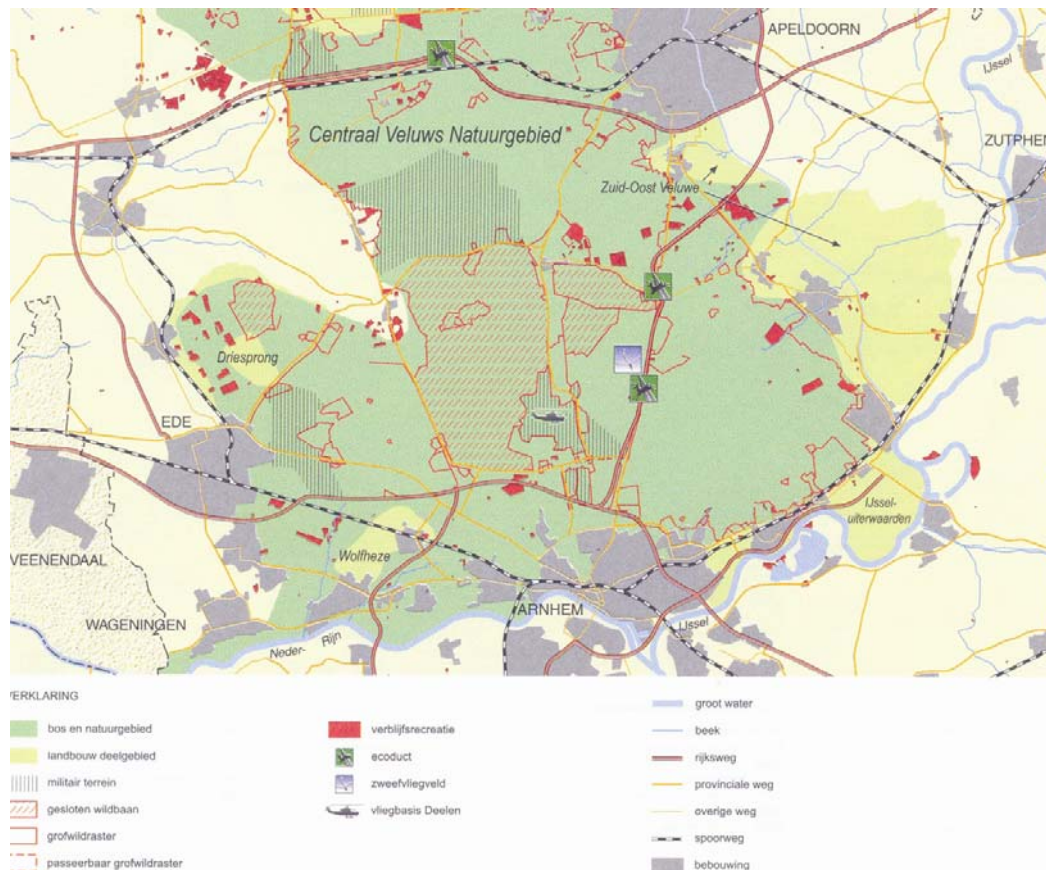


Figure 3 Spatial bottlenecks and fragmentation (Source: Veluwe 2010)

In a review of fifteen years of policy, Veluwe 2010 tries to bring various stakeholders together in projects for a real quality improvement on the Veluwe (see also Figure 3). Recently Evenhuis *et al.* (2002) discovered that commitment of the major stakeholders is very high, and that they all agree on the need to preserve and reinforce the Veluwe as a unique area. There is substantial consensus between the stakeholders about the desired future vision of the Veluwe, combined with a willingness to play a part in the realisation of that vision. Unfortunately Evenhuis *et al.* (2002) concludes that the current cooperation between stakeholders does not function so well in practice, because the participation holds no obligations.

The stakeholders on the Veluwe do meet the key prerequisite for integrative negotiation processes as found by Aarts & van Woerkum (1999): they have conflicting interests and an opportunity to communicate in the Veluwe2010-projects.

#### **2.4.2 Resistance to change brought on by uncertainties**

Various stakeholders can be brought together in order to negotiate integrated regional plans, in which nature values and other interests are combined and preserved in a creative and sustainable manner (van Woerkum *et al.*, 1999b). Aarts and van Woerkum (2002) inform that since solutions of complex problems are not clear and fixed, we may expect that uncertainties, and therefore the need of taking risks, are inherent in negotiations meant to solve the problem.

By nature, people have a tendency to avoid uncertainty and are not very willing to dive into the unknown depth, unless they are forced to. Aarts & van Woerkum (2002) distinguish three types of risks and uncertainties that people face while negotiating:

- uncertainties with regard to the outcome of the negotiation,
- uncertainties with regard to the interaction itself, and
- uncertainties with regard to learning.

Decisive factors for benevolent actor attitude towards abandoning their own goals primarily have to do with confidence (Aarts & van Woerkum, 2002). The participants of negotiation processes will each have their own knowledge and views on planning in nature areas. Different perceptions of nature are linked to different experiences, norms, practice us, goals and interests, in other words: to different cultures (Aarts & van Woerkum, 1999). Because of these different cultures, conflicts are inherent to this type of work (de Groot, 2003).

Ellis and Fisher (1994) believe that conflict should not be avoided, because conflict furthers group cohesiveness and increases productivity. Innovative defiant behaviour is essential for the process as the group grows and changes through time. Constructive conflict must be understood and managed in order to achieve its social benefits. Different types of conflict occur during the process of group decision making. Consequently, strategies for managing conflict and conflict styles can vary

considerably, but nevertheless, some general tactics are possible, such as clarifying issues and developing integration skills. (Ellis & Fisher, 1994)

Winder (2003) explains that information consists of observations that will change someone's knowledge and shape a person's beliefs. The Aha! moment that re-shapes our believe systems is seldom repeated in a simple way. Familiarity breeds contempt, so that yesterdays Aha! becomes tomorrow's So what? As our believe systems converge onto that of the community (communities) into which we are accepted, our knowledge becomes resistant to change. We begin to filter sensory experience and messages from others that does not resonate with beliefs.

Knowledge communities have shared culture, creed and theory sets that predispose them to similar interpretations of the same evidence:

- Cultural beliefs are so deeply engrained; we do not question them and are scarcely even aware of them. They define the knowledge communities to which we belong and are an actual part of our sense of personal identity.
- Creedal beliefs are deeply embedded but explicitly held. As for most biologists the so-called 'theory' of evolution is creedal.
- Theories are the weakest type of believe; created in provisional form and tested explicitly for coherence, consistency and utility. We often depend on theories in our daily work while recognizing that they are not secure.

When cultural beliefs are questioned, humans often respond defensively, even aggressively because our culture defines our sense of who and what we are. With sufficient motivation it is sometimes possible to convert cultural beliefs into creedal beliefs. (Winder, 2003) People have to become aware of their cultural beliefs, which might not rest on scientifically based knowledge. The rising awareness can lead to a 'culture shock', since these believes form the foundation of their behaviour. Integrative research requires people from different knowledge communities to negotiate a temporary suspension of beliefs (Winder, 2003).

### **2.4.3 Facilitators role in acceptance of change**

Decision-making involves selecting the alternative that provides the desired, or most acceptable, mixture of outcomes and tradeoffs (Oliver *et al.*, 1998). Van Woerkum *et al.* (1999b) assert that facilitators can play an important role in this process in organising constructive communication. The process manager's role in this social dilemma can make all the difference: the actors' lack of trust can prevent cooperation and consequently result in a sub-optimal outcome for all the actors. It is a very intensive and difficult process that needs time, patience, communication and negotiation skills, and interpersonal skills as well. (van Woerkum *et al.*, 1999b)

Specialists in integrative work need special training and a slightly unusual temperament, if they are to manage the symptoms of 'culture shock' effectively (Winder, 2003). A key competence of a process manager involves the building of mutual trust and respect in order to develop a learning environment that is conducive for researchers and other stakeholders to look beyond one's own (disciplinary or

sectoral) perspective (de Groot, 2003). The moment a safe learning environment starts to emerge, process managers bring in their ability to effectively assist team members in jointly defining the issue at stake from various perspectives (de Groot, 2003).

As for recreation van Woerkum *et al.* (1999b) state that acceptance is related to the policy motive: if tourists do not perceive ecological problems and reduction of biodiversity as serious and urgent threats, it is likely that they do not see the need for a nature policy. Even if tourists recognize that the problem exists, this does not automatically mean that they accept the intervention of particular authorities. It is important that tourists accept that certain measures are really effective in reaching a particular goal. The interactive approach and the broad communication it provokes can lay ground for wider public awareness and understanding. It may help in bringing about effective coordination within the communication network around tourism, and prevent tourists getting contradictory messages from different instrumental campaigns organised by a variety of stakeholders. (van Woerkum *et al.*, 1999b)

## **2.5 Nature, recreation and communication**

### **2.5.1 Integrative planning by means of modelled designs**

In today's planning practice the three different dimensions of the concept of integral design -i.e. multifunctional, interdisciplinary and interactive- are easily recognizable, but Hidding (1999) knows that this does not mean that it is an easy task. In spatial planning everything hinges on just while simple question at the end of the day: what do we want to achieve and where? (Hidding, 1999) Reliable data is vital to management planning, by helping to identify conflicts and make decisions about resource allocation and protective measures (Henderson, 2000). Dörner stated already in 1989 that the modern world is made up of innumerable interrelated subsystems, and we need to think in terms of these interrelations if we want to approach problems. Computer technology allows us to simulate almost any complex situation that we might wish to revise. (Dörner, 1989) Metapopulation models highlight the dynamic nature of population processes and show how the elimination of a few populations could lead to the local extinction of species over a much wider area (Primack, 1993). People need experience to avoid failure, and computer simulations can serve as a tool to give people an understanding of the complexity of the problem (Dörner, 1989). Scenarios that are assessed by computer models always have the quality of a game, and this can be used to its advantage (Dörner, 1989). They can enhance the commitment of the stakeholders to the project, by bringing some enjoyment in at times tedious interactive design processes.

### 2.5.2 Method development

During this study we wish to interact with the stakeholders in a form of participative technology development (PTD), in contrast to the traditional approach where the stakeholders are presented with a complete product. Rölöing & Groot (1999) explain that for PTD the emphasis lies on the performance of research through action to improve a situation together with local actors. It is probably the most comprehensive type of participative approaches, and contains not only the entire innovation course (problem definition, diagnosis, development and testing, monitoring and evaluation of alternatives), but also a conscious shift of the responsibilities from the outsider to the local actors. (Rölöing & Groot, 1999) The method will be developed according to these foundations, and can be defined as a type of integral design process. Integral design asks for a concept of flow-knowledge: in which knowledge can be seen as the particular vision of everybody of the reality around him/her; in contrary to scientific knowledge (van Woerkum, 1999). Therefore we want to include the practical knowledge of the main stakeholders into this study, by asking them to assess the developed methodology and the first results.

### 2.5.3 Foundation of the methodology

Opdam (2002a) tells there are several similarities between nature and recreation:

- both depend on spatial factors in the landscape for their functioning
- both species and types of recreants have specific spatial demands
- both function on various scale levels.

The carrying capacity of nature conservation and recreation plays an important role in finding a sustainable balance between the functions. A designing approach based on networks of both nature and recreation can provide new insights on problem areas. (Opdam, 2002a) The following method is based on this theory and aids the stakeholders in designing a sustainable network for both nature and recreation. The foundation for the development of the methodology is shown in Figure 4.

The figure depicts the various interrelations of nature and recreation, which influence the spatial planning process. Nature and recreation are functions of the landscape, while the ecosystems and the habitat of the recreants reveal how the available space is occupied on an equal level by both functions. The habitat of cyclists can be seen as the paved bicycle roads, surrounded with attractive scenery and the occasional picnic area. The habitat changes over time, and that is demonstrated in succession in the ecosystem or the implication of recreational trends in the area. This study mainly focuses on the behaviour of nature and recreation in that space (the red oval in Figure 4), which can be easily managed or regulated. The behaviour is expressed for nature by the population network of several ecoprofiles and for recreation by the distribution of the recreants over a defined area. The method does not take the perceptual and economic capacities into account, but is based on the carrying capacity of both networks.

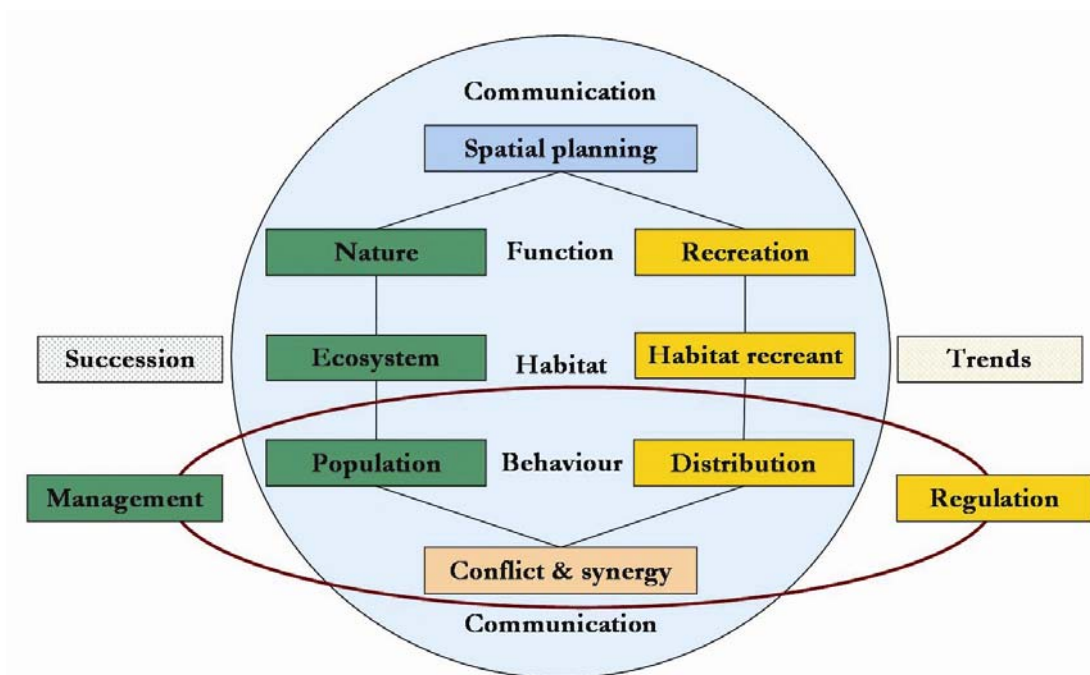


Figure 4 The foundation for the methodology

We want to assess the state of the carrying capacity for both functions, which will disclose potential bottleneck areas or synergy between nature and recreation. The networks can be joined by combining the recreational impact of the cyclists on the area with the ecological vitality of an ecoprofile. The carrying capacity of an ecoprofile in a network will be assessed by determining potential MVP's and their viability as described in Pouwels *et al.* (2002b). The carrying capacity for the cyclists will be assessed through the degree of quietness on the paths, because research by Goossen *et al.* (2003) shows that it is one of the main interests of cyclists (see Table 3). An exact description of the carrying capacities will follow in the methodology.

Table 3 Relative interest of the quality indicators for cyclists

Indicator	Interest (%)
Degree of quietness	15,4
Land use	10,1
Accessibility of nature areas	8,9
Cycling possibilities	6,3
Banks of waters	4,0
Relief	2,7
Distance to population concentration	2,6
Total	50,0

The very nature of ecological networks allows for alternative locations to solve overcapacity problems between nature and recreation. Communication will play a central role in the approach, because the stakeholders are involved during the entire designing process. They can decide on a different type of nature management or tourism regulation to improve the situation. In case a conflict can not be solved through measurements in a particular area, then the stakeholders could reconsider

the function allocation of that area. The benefits of the method lie in the scientific approach, which can prevent discussion amongst the stakeholders about bottleneck areas in the current situation. The method can also support the decision-making process given a founded impression of the effects of possible management scenarios, before they are implemented in the area. The choices and consequences that are made during interactive planning sessions will be clear to all the stakeholders. This communal frame of reference will prevent discussion at a later stage about the implementation of the chosen nature or recreational management.

#### 2.5.4 A fictional example of a method application

Based on Opdam (2002a) a fictional example of an approach to balance nature and recreation is shown in the following figures. Figure 5 depicts a fragmented ecological network of one species, separated by a path for recreation. Two recreational points (honey pots) lie within the area and put a substantial amount of pressure on the ecological network. The light green population contains no key habitat for its population and stands a fair chance of becoming extinct over the years. The dark green population is more viable, but both the key habitat areas are influenced by the road, which might lead to the species avoiding the area or a reduced reproduction success.

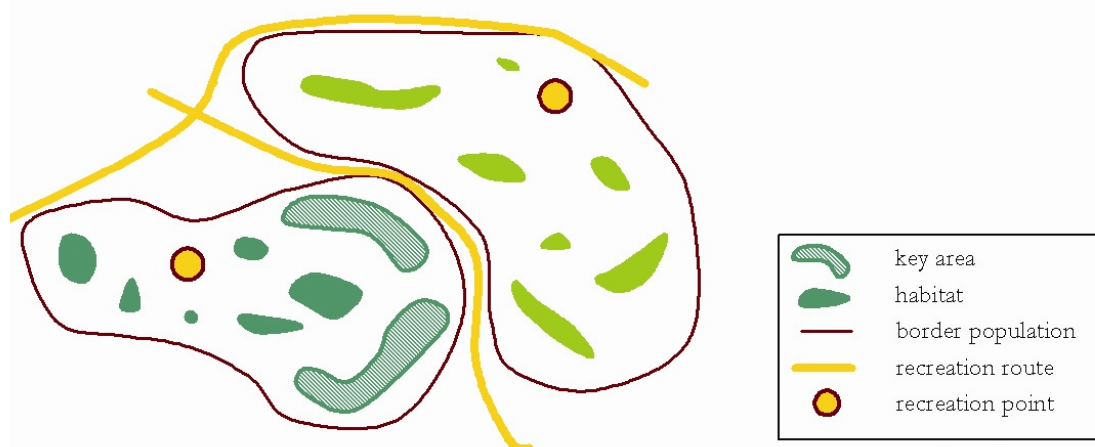
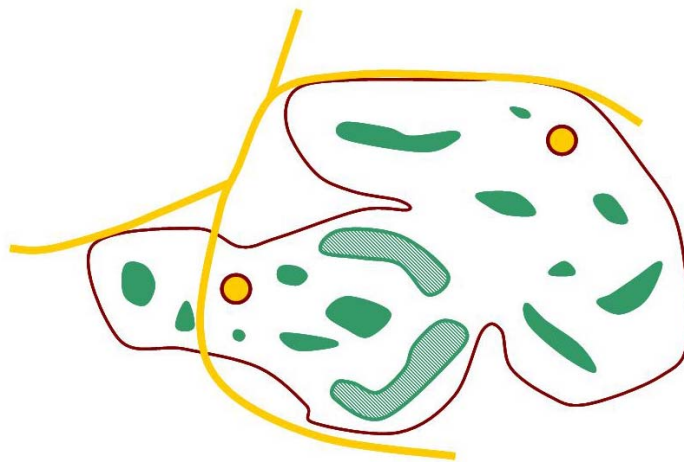


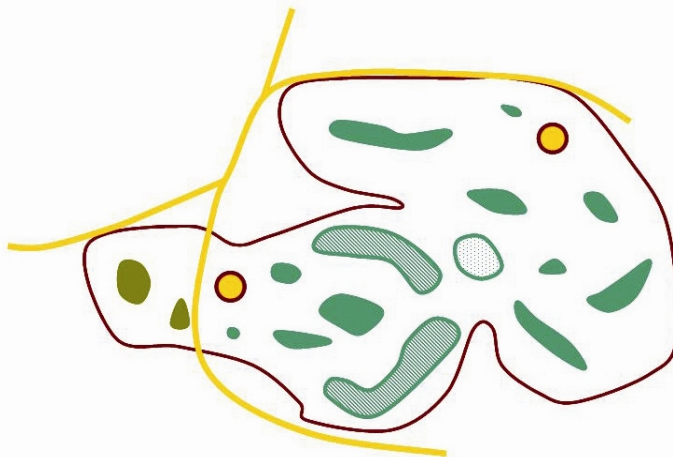
Figure 5 Situation at the start

Figure 6 shows that the two networks can be connected through a reroute of the path. The path is rerouted in such a manner that it provides better access to the actual recreation points. This rerouting joins the populations together and allows free dispersal to and fro the key habitat areas. This measurement increases both the recreational and the ecological quality and enhances the carrying capacity of the ecological network.



*Figure 6 Defragmentation on the right location*

In the new situation the persistence of the populations is more viable, and the ecological network uses even a smaller area. The intensity of the recreational use can rise and the management can even decide to open closed off areas. This might lead to the loss of some population habitat, but will not cause a decrease in the population, as long as a new habitat is created on the right location. The network can stand the loss of two small population habitats (shown in brown in Figure 7), due to the increased ecological carrying capacity.



*Figure 7 Surplus in capacity*

### 3 Methodology

The literature study and the choices made in the theoretical framework lead to the following research questions, based on the initial objectives:

- the development of a preliminary method that shows the current status of nature and recreation and is able to analyse alternatives for the sustainable enhancement of both functions
- an qualitative assessment of the applicability and potential benefits of the preliminary method by the stakeholders of a project on the Veluwe

#### *Research questions*

- How can the preliminary method depict the current situation from the Heart of the Veluwe-project in a network of representative species with the distribution of cyclists?
- Which models function well in this method?
- Which species of the Veluwe, defined in an ecological profile, are useful for the method?
- What is the distribution of cyclists on the Veluwe?
- What is a comprehensive manner to combine ecological networks (based on populations) with recreational networks (based on visitor numbers)?
- How can we indicate the quality of these ecological and recreational networks?
- Can this method depict possible planning scenarios for the Veluwe?
- Can the preliminary method support stakeholders to design a sustainable network for both nature and recreation?
- What is the value of the developed method according to the stakeholders?
- What is the opinion of the stakeholders on the method itself and the results?
- How willing are the stakeholders to accept the results of the method?
- What is the value of a scientific approach in the decision making process concerning nature and recreation?
- Is there room for creative initiatives in the Heart of the Veluwe-project?

#### 3.1 The method

This method needs one model to simulate the status of nature and one for the behaviour of recreants and both models should meet to following criteria:

- ready for use
- easy exchange of data between the models
- function on a regional scale, so the models can be applied to the Veluwe
- able to present results as maps in GIS

Based on these criteria the model LARCH is selected for modelling nature and MASOOR for simulating recreation.

### **LARCH**

The landscape-ecological model LARCH (Landscape ecological Analysis and Rules for the Configuration of Habitat) is designed as an expert system by Alterra, for scenario analysis and policy evaluation and can visualise the viability of metapopulations in a fragmented environment (Pouwels *et al.*, 2002a). Only a brief explanation of the decision support system will suffice here, since it is fully described in Foppen *et al.*, 1999a, Verboom *et al.*, 2001, Pouwels, 2000, and Pouwels *et al.*, 2002a. LARCH requires input in the form of habitat data (e.g. vegetation or land use map) and ecological parameters (e.g. home range, dispersal distance, carrying capacity for all habitat types). LARCH parameters are based on literature and empirical studies, and are thoroughly validated (Foppen *et al.*, 1999b, Verboom *et al.*, 1993,, 2001, Opdam *et al.*, 2002). Actual species distribution or abundance data are not required since the assessment is based on the potential for an ecological network of species. A detailed description the way LARCH models the habitat, evaluates the metapopulation, and the viability of the metapopulation, is given in Pouwels (2000) and Pouwels *et al.* (2002a).

### **MASOOR**

The model MASOOR (Multi Agent Simulation Of Outdoor Recreation) that simulates the spatial behaviour of recreants in a natural environment is described in Jochem & Grefte (in prep) and van der Grefte *et al.* (in prep). This density flow model allows stakeholders and researchers to explore the consequences of changes to any or more variables concerning recreation. The rush on a norm day, recreation on a macro level, can be assessed in MASOOR, in the form of the total number of recreants that enter the area on a simulation day. A qualitative assessment of visitor experiences is also one of the features, but that will not be used in this research. MASOOR requires input in the form of a spatial data (e.g. a map of the path network) and visitor parameters (gates, numbers of groups that will enter the area, and a frequency distribution of the access time). The model sends the visitors in the area from access points (entry and exit gates) at specific moments. Each intersection of the path network poses the choice for the recreant where to go, depending on the time that they have left. The choices are made on a random effect: 90% prefer to straight ahead, and 5% will choose to go either left or right. The choices of the recreants are not influenced by the surrounding landscape. MASOOR remembers the choices of the recreant and makes sure it does not return the same way. Towards the end of trip, after 1½ hour, the choices change and the recreant wants to get back to the starting point quickly. The results are shown in a map with the distribution of the recreants over the area or an animation of visitor behaviour during the norm day.

### 3.1.1 Application of the method

A global overview of the application of the method is given in Figure 8.

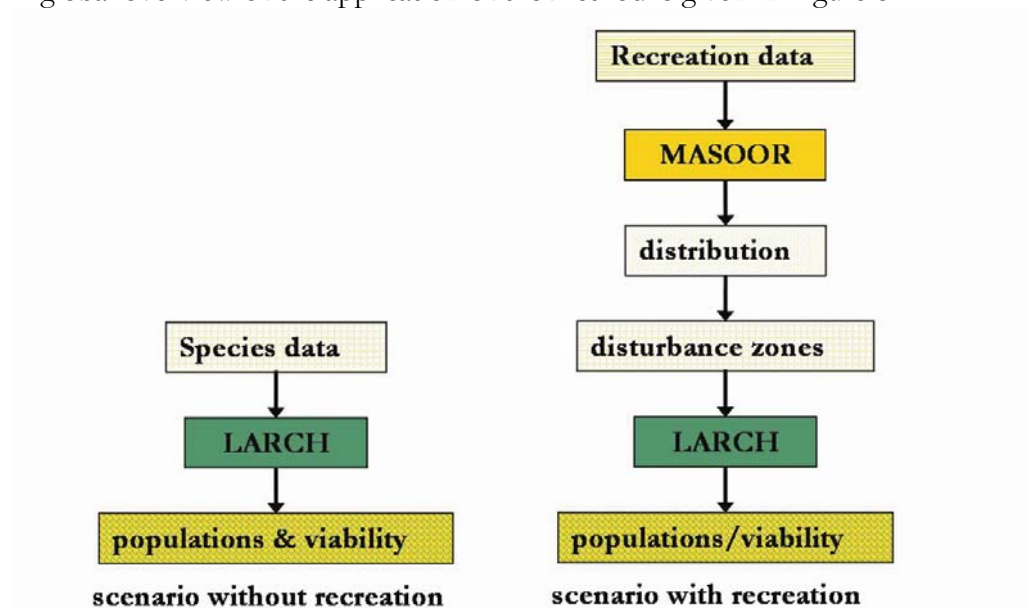


Figure 8 The model application

First step is the selection of the outline of the investigated region and a division of this area into sections based on the present fragmentation. Secondly an indicator species for the assessment of the natural areas is selected, representing a group of species (ecological profile) relevant for nature conservation. Thirdly the land-use map serves as a habitat map for LARCH to determine the carrying capacity of the landscape elements for the selected species in the first scenario. Pouwels *et al.* (2002a) inform that the size of a natural area (habitat patch) determines the potential number of individuals of a specific species that it can contain. Next in step four the habitat patches are fused into a cluster by LARCH and considered to represent a local population. The key component in considering population size is the effective population size, based on the number of individuals that are actually producing offspring, the reproductive units (RU) (Primack, 1993). The distance to neighbouring areas says whether the habitat patch belongs to a network for the species. The carrying capacity of the network indicates whether it can contain a viable population. If that is the case, the metapopulation of the species is viable. (Pouwels *et al.*, 2002a). In the fifth step the visitor data of the selected area is supplied to MASOOR, which simulates the behaviour of the recreants. The distribution map together with the disturbance distance of the recreants on the selected species is used for the determination of the effect of recreation on the carrying capacity in the sixth step. This forms the habitat map for the second scenario with the existing recreational pressure. The impact data is used to create disturbance-zones along the paths that represent the recreational pressure on the populations. Next LARCH uses this for a new identification of local populations and key-patches.

Depending on the rate of fragmentation and the LARCH determines whether a set of the local populations form a metapopulation, and its viability.

In the eighth step we use the results of LARCH to calculate the number of RU of each section in the area with and without recreational pressure. This data gives an indication of the possible quality improvement for both nature and recreation of every combination of sections. The information allows the stakeholders can make their own choice between the sections that they want to join together, in order to give the interactive process complete freedom in the design of their networks.

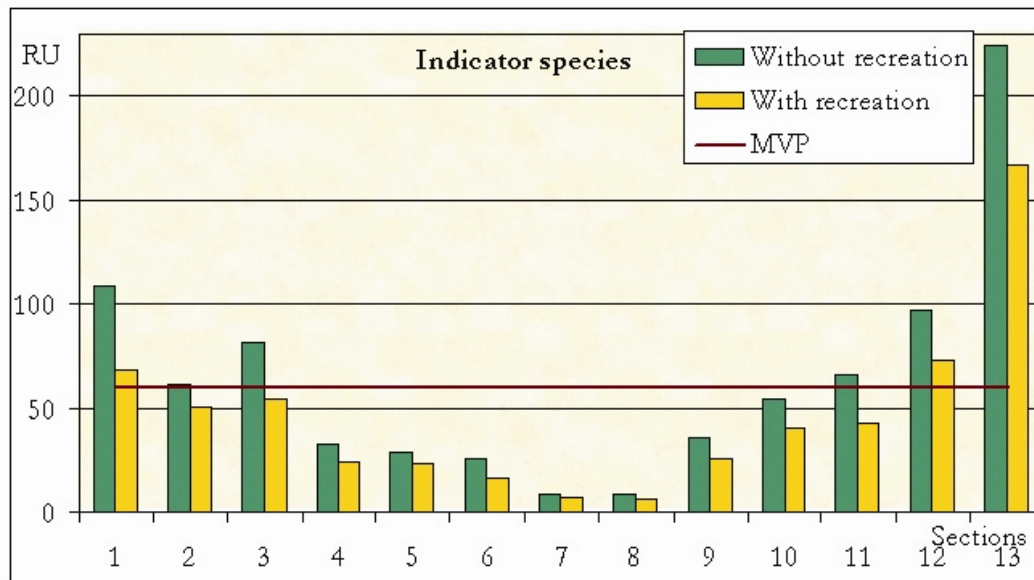


Figure 9 Example of qualitative norm for the potential number of indicator species in separate sections

In the example, based on the sections of Figure 10, it is visible that the size of the area will influence the height of a possible norm that indicates the viability of the indicator species. The combination of sections HV, PW, BB and DH or HK, KW and SH can lead to a strengthening of the area, while other measurements are necessary to let the other sections ever attain the minimum norm. In case the stakeholders opt for a change in the management of nature or recreation to create an optimal balance between nature and recreation, this preliminary method can also evaluate their adjustments. Those changes have to be applied in the data of LARCH or MASOOR and then a new assessment of the area can be made.

### 3.2 Application of the method on the Heart of the Veluwe-project

To review the theoretical functioning of the preliminary method, it is applied on the southern region of the Veluwe.

#### 3.2.1 Selection of the area

Figure 10 shows the southern-Veluwe region divided in several sections based on the current fragmentation by roads or fences.

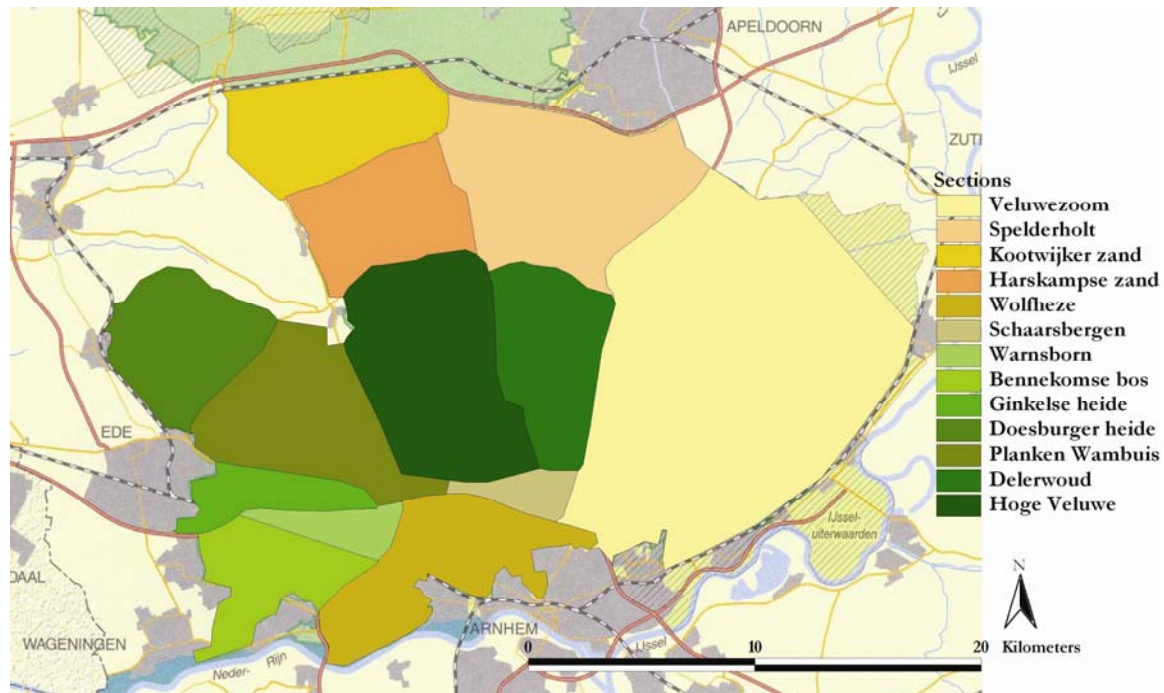


Figure 10 The sections of the research area (source background: Veluwe2010)

Table 4 describes the codes for the sections, which are used throughout the research.

Table 4 The sections

Nr	Code	Name	Nr	Code	Name
1	HV	Hoge Veluwe	8	SB	Schaarsbergen
2	DW	Delerwoud	9	WB	Warnsborn
3	PW	Planken Wambuis	10	HK	Harskampse zand
4	DH	Doesburger Heide	11	KW	Kootwijker zand
5	GH	Ginkelse Heide	12	SH	Spelderholt
6	BB	Bennekomse bos	13	VZ	Veluwezoom
7	WH	Wolfheze			

### 3.2.2 Selection of the indicator species

The selection of the species is very important for the extrapolation of the results, and the criteria for the indicator species are as follows:

- equal representation of species (mammal, bird and reptile)
- species should be ecologically relevant for the natural habitat of the Veluwe
- the scale of the species (home-range) should be relevant
- species should pose a complete ecological profile (habitat and spatial profile)
- species should have various sensitivity for barriers
- information on the impact of recreation on the species should be available

Main ecosystems found in the Veluwe are forest, heather and sand dunes. Based on these criteria three indicator species were selected for analyses with LARCH (see Table 5 and Appendix 2).

Table 5 Indicator species for the Veluwe

English name	Scientific name	Forest	Heather	Sand dunes
Red deer	<i>Cervus elaphus</i> L.	X	X	
Wheatear	<i>Oenanthe oenanthe</i> L.		X	X
Viper	<i>Vipera berus</i> L.		X	

Red deer serve as a symbol for the Veluwe and has a large dispersal range. The wheatear is very sensitive for recreation and the viper is predominantly affected when its habitat is fragmented.

### 3.2.3 Simulation of the ecological profiles with LARCH

Table 6 shows the habitat requirements of the species and its network distances based on the research of Pouwels *et al.* (2002b). These parameters greatly define the landscape ecological requirements for the species, and actually also define the functioning of the ecological network.

Table 6 Spatial profile of the selected species

	Key area surface (km <sup>2</sup> )	Network / local fusion distance (km)
Red deer	30 (10-50)	50 / 1
Wheatear	30	25 / 0.5
Viper	1 (1-5)	2 / 0.1

#### **Quality assessment for the species**

The habitat map together with the patch distances and the carrying capacity is used by LARCH to distinguish local populations and habitat networks based on the information from Pouwels *et al.* (2002a) (see Table 7).

Table 7 Norms for types of networks (in number of reproductive units, RU)

Species	Without KP/MVP	With key patch	With MVP
Red deer	240	160	60
Wheatear	200	150	150
Viper	500	300	150

(KP: key patch, MVP: minimum viable population)

LARCH makes a qualitative judgement of the populations and habitat networks and indicates the results on the maps (see Table 8 and Pouwels *et al.* (2002a)).

Table 8 *Quality assessment scale for the species*

Color	Population	Viability	Chance of extinction
Pink	Too small	Too small	
Red	-	Not viable	> 5% in 100 years
Light green	Small population	-	
Green	Key population	Weakly viable	< 5% in 100 years
Dark green	MVP	Robustly viable	< 1% in 100 years

We have chosen not to include the fences on the Veluwe in this study, because it gives more freedom for the design of integral networks of nature and recreation. The various sections give an indication of the present fragmentation. Since the wheatear is not hindered by fences and roads in its dispersion, we can make an assessment of its viability. This is not possible for the red deer and the viper, but the red deer is previously studied on a more detailed scale on the Veluwe by Pouwels *et al.* (2002c).

### 3.2.4 Simulation of bicycle distribution

The NP Hoge Veluwe has a bicycle network of 40 km and possesses 1700 white bicycles. NP Veluwezoom draws approximately 200.000 recreants annually, who pay in total about 2 million visits, which equals the annual number of visits to the Efteling (Zwart *et al.*, 1995). Based on the major cities in the area 15 entry and exit points (gates) are selected for the cyclists. MASOOR sends recreants into the area from these gates (see Figure 11). The NP Hoge Veluwe is shown as separate area (the green polygon), because recreants, that pay admission, will not venture outside the park on that same day. The arrows mark the flow of cyclists from the adjacent areas. The available bicycle routes in MASOOR are based on a digital 1:10.000 map from the Topographical service (the so-called top10 vector). The routes are adjusted in such a manner for MASOOR that all the small routes with many crossings (for example in a town) are excluded, so the recreants will not remain circling in the towns.

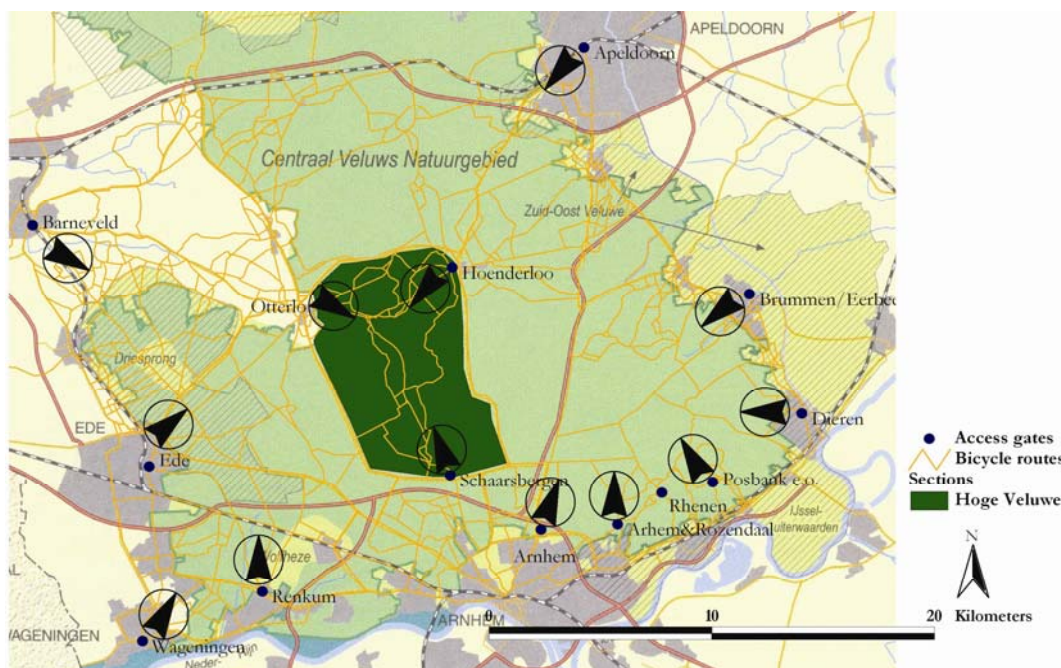


Figure 11 The gates and routes used in MASOOR to simulate recreation (source background: Veluwe2010).

MASOOR keeps account with the fact that most cyclist (60%) do not cycle for more than 1,5 hour (this corresponds with a distance of 7.5 km as the crow flies) (see also Goossen *et al.*, 2003). The frequency distribution of the time that the recreants start their trip from a gate during the norm day is given in Table 9.

Table 9 Frequency distribution

Time (h)	Percentage
8-9	2
9-10	18
10-11	18
11-12	19
12-13	17
13-14	12
14-15	9
15-16	3
16-17	2

### **Number of visitors**

The number of tourists that cycle from holiday accommodations of the Veluwe is deducted from the CBS-holiday research (CBS, 2003). The number of visitors in NP Hoge Veluwe on a modal-split of Sunday in high season is taken as the norm day (Jansen *et al.*, 1996). The tourist behaviour in the Veluwezoom region is sufficiently explored in Elands *et al.* (1992) and the 10th busiest day is selected as a norm day. No exact data about cyclists is available for the western and northern areas of the Veluwe. The number of cyclists is estimated from of the number of inhabitants of a city, based on the detailed research in the Veluwezoom region (Elands *et al.*, 1992).

MASOOR requires an input of visitor data in the form of groups (which consist of 2 or 3 persons), see Table 10 and Appendix 3.

Table 10 Gates and their quantity

Gate	Name	Quantity (groups)	Gate	Name	Quantity (groups)
1	Arnhem	724	9	Schaarsbergen	478
2	Wageningen	1021	10	Hoenderloo	461
3	Ede	3112	11	Not used	Not used
4	Rozendaalse veld	Joint with Arnhem	12	Brummen	324
5	Posbank	834	13	Renkum	968
6	Rhenen	316	14	Dieren	Not used
7	Apeldoorn	2307	15	Barneveld	736
8	Otterlo	564			

### Quality demands of recreants

We indicate the recreational quality through the amount of cyclists groups on the bicycle path (see Table 3). In the NP Hoge Veluwe they found that cyclists have a negative opinion about the quantity of other cyclists and the wideness of the paths. If the number of visitor rises over 6000 per day, more then 25% of the cyclists assume a negative opinion about the quantity of other cyclists (Jansen *et al.*, 1996). Since the park has 40 km of bicycle paths, one could say that with roughly one cyclist on every 6.7 meter, 25% of the visitors think that it too busy. Jansen *et al.* (1996) assumed that when the number of visitors rises to 7.500, 40% will think that it is too busy, which comes down meeting one cyclist every 5.3 meter. A simulation with of the cyclists with MASOOR results in the potential bicycle pressure in the form of the amount of groups on a certain section of the path (between two nodes) during an entire day. Since it is difficult to relate this to the quality judgement provided from the research on the Hoge Veluwe, we decided to divide the number of groups in a range with an increasing quantity (see Table 11).

Table 11 Increasing scale of disturbance experienced by cyclists

	Color	Amount (groups)	Quality
1	Light yellow	0-124	Very quiet
2	Yellow	125-242	Quiet
3	Light orange	243-399	Busy
4	Orange	400-599	Too busy
5	Light red	600-894	Crowded
6	Red	895-1700	Overcrowded

### 3.2.5 Assessment of species under pressure of recreation

The recreational pressure from MASOOR is used to recalculate the carrying capacity in the habitat map, depending on the distance to and the number of recreants. The disturbance distance in Table 15, Table 16, and Table 17, shows until which distance the carrying capacity will decrease with 50%. This study looks only at the disturbance distance of cyclists, but that distance will duplicate for hikers and increase threefold for hikers with a dog (Pouwels & Vos, 2001).

The new habitat map will be imported into LARCH, to distinguish local populations and habitat networks for this second scenario, and to make a qualitative judgement of them. Table 12 represents the disturbance distance of bicyclers for red deer as

estimated by Groot-Bruinderink (2003), which depends more on the habitat than the number of bicyclers.

*Table 12 Disturbance distance of bicyclers for red deer*

Number of bicyclers	Habitat type	Disturbance distance (m)
>0	Forest	0 - 200
>0	Heather	0 - 1000

Well-founded information about the effect of disturbance by recreation on species is generally only available for (breeding) birds. We base our data on a study by Henkens (1998) as shown in Table 13.

*Table 13 Disturbance distance of bicyclers for wheatear*

Number of bicyclers	Disturbance distance (m)
1	0 – 30
2 – 5	31 – 60
6 – 15	61 – 100
16 – 30	101 – 200
31 – 60	201 – 300
61 - 100	301 – 400
>100	401 – 600

Table 14 demonstrates the estimated disturbance distance for vipers depending on the number of bicyclers by Bugter (2003).

*Table 14 Disturbance distance of bicyclers for viper*

Number of bicyclers	Disturbance distance (m)
1 - 5	0 - 30
6 - 30	31 - 60
31- >100	61 - 100

### **3.2.6 Impact of recreation on nature in fragmented areas**

The final step is the calculation of the number of reproductive units per section and an introduction of the results in the interactive process. Then the stakeholders can decide on the best course of action, and test this with the method, but this was not done within the context of this research.

### **3.3 Assessment of the method through in-depth interviews**

The method intends to provide a scientific instrument that can underpin and stimulate the development of innovative policy plans for nature areas. We want to include the implicit and social knowledge of the stakeholders in an equal exchange on issues concerning nature and recreation. Therefore we decided to have in-depth interviews with the major stakeholders of the Heart of the Veluwe-project. In the initial phase of the method development, the facilitator supplied the necessary information for important choices, like the type of recreants etc, but the validity of the preliminary method also has to be assessed by the stakeholders for whom it is intended. It is important to understand which underlying factors play a role in the planning process, because they might influence the stakeholders' opinion on the method. The interview is seen as a powerful tool to find out how people perceive their situation, and is even considered the best method for pursuing a subject in-depth, operating in a discovery mode, and creating interaction with an individual (Leistra, 2001). The in-depth interview does not set out to answer questions, test hypothesis, and evaluate them, but at the root it is an interest in understanding the experience of people and the meaning that they make of that experience (Leistra, 2001). In qualitative research you can not see the role of the interviewer as separate of the person that is interviewed, because there is an interaction, which is influenced by the interviewer. The theoretical framework provides the necessary background for the in-depth interviews. We will look at the opinion of the stakeholders on nature and recreation, the developed method, their situation in the negotiation process, and their interactions with other stakeholders. The decision-making process in the Heart of the Veluwe-project is explored in the interview to place their comments into context.

#### **3.3.1 Methodology for the in-depth interviews**

During the interview the proposed method for balancing nature and recreation is explained, and the stakeholders are asked to take a critical look at the method. This can result in all types of recommendations for a better approach, depending on the background of the stakeholder. Next we ask about the decision process within the project to find out whether the stakeholders are open for such a new approach. The following criteria are used to select the stakeholders for the in-depth interviews:

- adequate knowledge of nature and recreation issues
- presence of potential bottlenecks in the stakeholders region
- balanced representation of all the stakeholders

Based on these criteria six stakeholders are chosen for the interviews:

- The NP Hoge Veluwe (HV) holds one of the major bottlenecks in the area
- Natuurmonumenten (NM) is one of the largest landowners in the area
- The county of Ede will decide on the byroads near Otterlo.
- The county of Apeldoorn will decide on the byroads near Hoenderloo.
- The province of Gelderland is the main policy maker.
- NL-RNT plays a main role as facilitator and facilitator.

A further insight into the background of the stakeholders is given in Appendix 4.

The questions in Table 15 serve as the main guideline for the in-depth interview.

*Table 15 Interview questions about the method*

Nr	Questions about the method
1	What is your role in the Heart of the Veluwe-project?
2	How do you get informed about the progress in this project (via meetings, bilateral conversations)?
3	Where are the most important bottlenecks between nature and recreation according to your organisation?
4	Can you point out some problem areas?
5	Do you think that the other stakeholders perceive this in the same manner?
6	Are the bottlenecks that result from the method correct?
7	Clarifies the method the bottleneck areas for you (make them more visible)?
8	Is this method a good or a bad way to approach the problem areas?
9	How would this method be more useful for you?
10	Do you see advantages or disadvantages to the method?
11	Would you consider using this method in future projects?
	Questions about the decision process
12	Is there sufficient knowledge in your organisation about bottlenecks between nature and recreation?
13	Who analyses the possible bottlenecks between nature and recreation in your organisation?
14	Does this person also participate in the planning process?
15	Are there regular meetings between the people in your organisation that are involved in the Heart of the Veluwe-project?
16	Who is responsible for the final decision concerning the planning of nature and recreation?
17	Does this person participate in the planning process?
18	Do you have the impression that the province is handling the problems well?
19	How would you describe the decision process on bottlenecks between nature and recreation?
20	Is it a joint decision that is taken in the interactive planning process?
21	Is it a compromise based on the decisions made in the interactive planning process?
22	Is the final decision also influenced by political processes?
23	Would the results of this method influence your decision?
24	How would you handle the bottlenecks if you could determine everything?
25	Do you think that the other stakeholders will agree with that approach?
26	Can you think of any alternative solutions?
27	Would you consider the scenario 'east-west route' <sup>1</sup> or 'open' <sup>2</sup> as a possibility?
28	How would you improve the traffic towards the NP Hoge Veluwe?
29	What is your opinion about the development of the planning process so far?
1.	the 'east-west route': a realistic scenario that is at the moment of this study considered by the stakeholders, and concerns the creation of an east-west bicycle route from Oud Reemst to Delerwoud through the NP Hoge Veluwe.
2.	the 'open' scenario: a imaginative rather controversial scenario, which involves the removal of all the fences from the area and an alternative for the entrance fees of NP Hoge Veluwe.

All of the stakeholders speak as an anonymous spokesperson for their organisation. During the interview the stakeholders are also asked to give their view two scenarios, which are described in detail in Appendix 5. The interviews are conducted within 1½ hour and recorded on tape. The remarks of the stakeholders are largely transcribed in paragraph 4.4, based on the main topics as shown in Table 16. The results are then compared with criteria to derive conclusions from the statements of the stakeholders. The facilitator is asked to approve the final draft, because of the potential influence on the Heart of the Veluwe-project.

### 3.3.2 Criteria and analysis of the interviews

The answers that are given during the interviews are assessed based on criteria that are already established in literature on the intended subject. Figure 12 shows a fusion of the different fields of interest during this study and provides a handle for analysis. Natural science and social science find each other in the balancing method for nature and recreation, while the entire context is influenced by the communication processes in the Heart of the Veluwe-project.

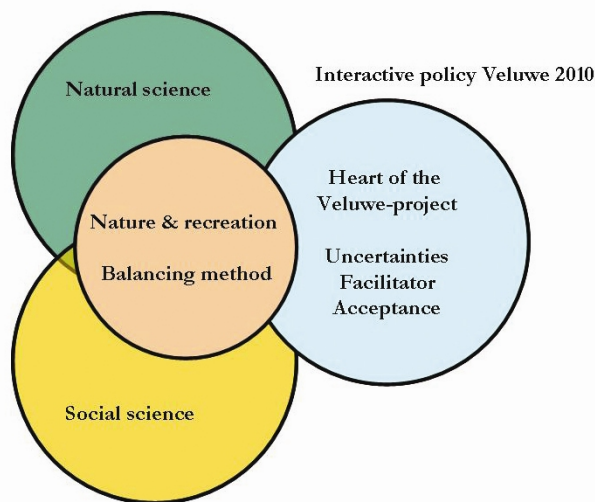


Figure 12 The fusion of fields for analysis

#### ***Integral design processes***

Aarts and van Woerkum (1999) tell that an integral design processes requires:

- an interactive style of management,
- a multifunctional mode of tackling regional problems,
- an interdisciplinary style of exchange and inquiry,
- a reinforcement of the regional cultural identity, and
- more attention for the use of implicit and social knowledge.

#### ***Acceptance***

The acceptance of a new approach, in the form of an assessment method, depends on various issues. A conceptual model of Aarts & van Woerkum (1999) centers on several dimensions of the concept acceptance:

- acceptance of the policy problem
- acceptance of activities of the government with respect to the problem
- acceptance of the measures to solve the problem. The question is whether these are considered as realistic, applicable and fair (compared to what is asked from other people).

### ***Dealing with given uncertainties in negotiation***

Taking into account (the consequences of) the strategies people use to avoid uncertainty Aarts & van Woerkum (2002) present five fields of attention that might be valuable when solving complex problems in real life situations:

- Select participants that are 'uncertainty-oriented'
- Re-value informal conversations for sustaining formal negotiations
- Incorporate relationships with constituencies as part of the negotiation process
- Distinguish between long-term visions and short-time goals
- Invest in effective mediators

### ***Facilitating in a communicative approach***

Van Woerkum *et al.* (1999a) have developed criteria for the facilitators that want to develop policy as a product of communication. To fulfil his role in this perspective, a government communicator must be able to take into account four important principles, which are essential for an effective communicative approach.

- The information that is delivered from the government must be easily understood. This obvious criterion is difficult to meet in practice, if we look at the existing information habits. Policy makers are often incapable of talking about a problem in terms that people can put into their own words. They are limited to speaking according to their own rationality, which can differ considerably from the rationality of non-policy makers. This holds true certainly in the field of spatial and environmental policy, where experts are dominating the discussion.
- The policy process must be organised to be interactive in a continuous manner, from the very beginning to the end of the process. Only in this way people can be involved and a sufficient level of understanding and commitment can be created. Comprehensibility and interaction have to compensate for the uncertainties that inevitably arise from greater flexibility. Only in this way can a government learn to think in terms of the rationality of target groups.
- Special effort has to be made to realise social learning processes between different groups in society. Such learning processes should be directed in such a way that people: <sup>1)</sup> understand their own problem, <sup>2)</sup> understand the problem of other people involved, and <sup>3)</sup> recognise that problem solution is only possible in conjunction with all groups involved, because of given interdependencies. For example, facilitating learning processes between farmers, nature conservationists and policy makers turns out to be fruitful, at least with respect to the acceptance of the (jointly developed) policy by all groups involved (Woerkum & Aarts, 1995). This approach is an answer to failure in conflict resolution in government as well as in society. By involving different parties in social learning processes, through which they can gain an appreciation of why the other actor is talking a certain way, and through which they can look together for new solutions. (van Woerkum *et al.*, 1999a)
- The policy in question must be open, at least during the initial stages of the process of policy development. With fixed problem definitions and solutions, the general public cannot be seriously involved. There has to be room for alternatives, for completely new ways of creating results.

### ***Main criteria***

The main criteria follow from a combination of the previous paragraphs and the background information on facilitating integrative negotiations in Appendix 6:

1. the method is accepted as a measure to solve the problem: realistic, applicable and fair
2. the method supports the analysis of the problems and their interrelations, and helps to identify gaps in knowledge and insight
3. the method aids the preliminary identification of alternative solutions and ‘win-win’ situations
4. the Heart of the Veluwe-project meets the requirements of an integral design process
5. the facilitator is able to realise social learning processes in the stakeholders meetings by reducing the feeling of uncertainty
6. the policy in question is open, so the stakeholders can develop their own scenarios freely.

### ***Analyses of the interview***

Table 16 shows how the questions and the criteria are used for the actual analysis as described in various topics in the next chapter.

*Table 16 Combining interview questions and criteria*

Topic	Question	Criteria
Stakeholders view on nature and recreation	3, 4	1
The preliminary method	7, 8	1
The initial results	6	1, 2
Usefulness of the method	10, 11	1, 2, 3
Possible improvements of the method	9	1, 2, 3
Organisation of the project	1, 2, 16, 17	4, 5
Current state of affairs in the project	12, 13, 14, 15, 29	4, 5, 6
Issues for discussion	3, 5, 19, 21, 25	5, 6
The influence of politics	18, 20, 22	4, 6
Creative integrated solutions	24, 26, 27, 28	6



## 4 Results

### 4.1 Recreational distribution

Figure 13 shows the potential bicycle distribution in the area. Pressure from a high number of cyclists can be experienced in the NP Hoge Veluwe, and around the major cities: Apeldoorn, Arnhem, Ede, and Wageningen.

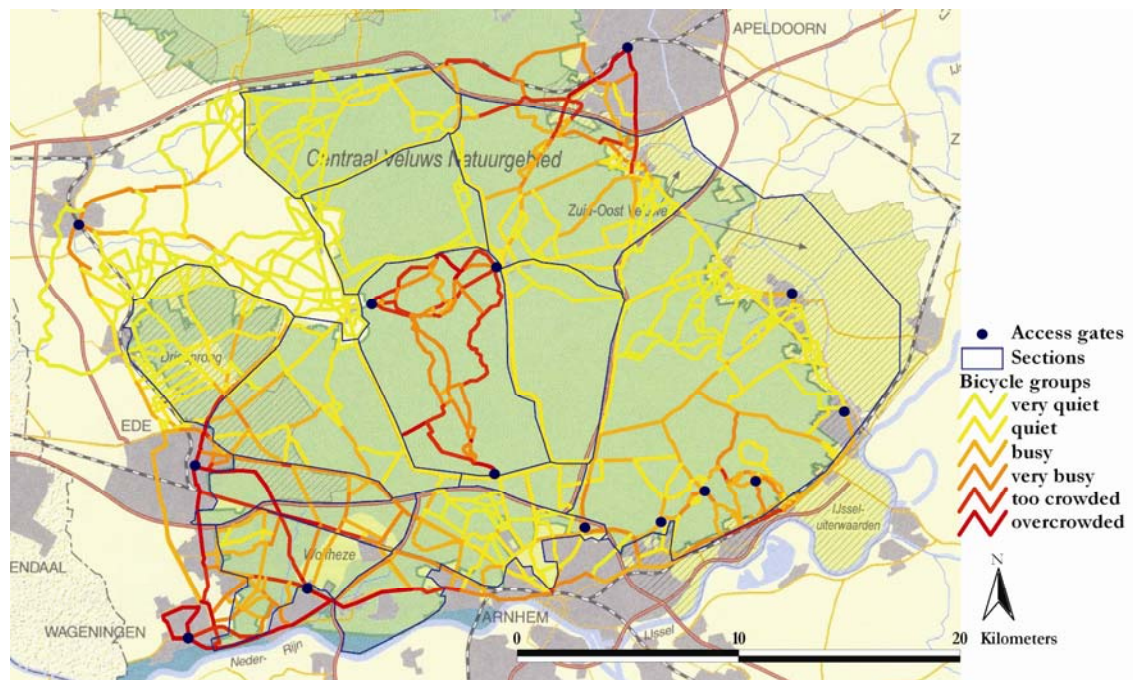


Figure 13 Potential bicycle pressure in the southern Veluwe. (source background: Veluwe2010)

### 4.2 Assessment of species under pressure of recreation

The following maps show an assessment of the current situation for the various species on the Veluwe. First a map with the potentially available habitat for species is presented based on a vegetation chart. The next map illustrates the recreational influence on the area that is potentially available for the species. The red line around the bicycle paths demonstrates the impact of the disturbance caused by recreation.

#### 4.2.1 Red deer

The maps on population network of the red deer show that it hardly experiences any negative influence from recreation, except in some small areas near the cities.

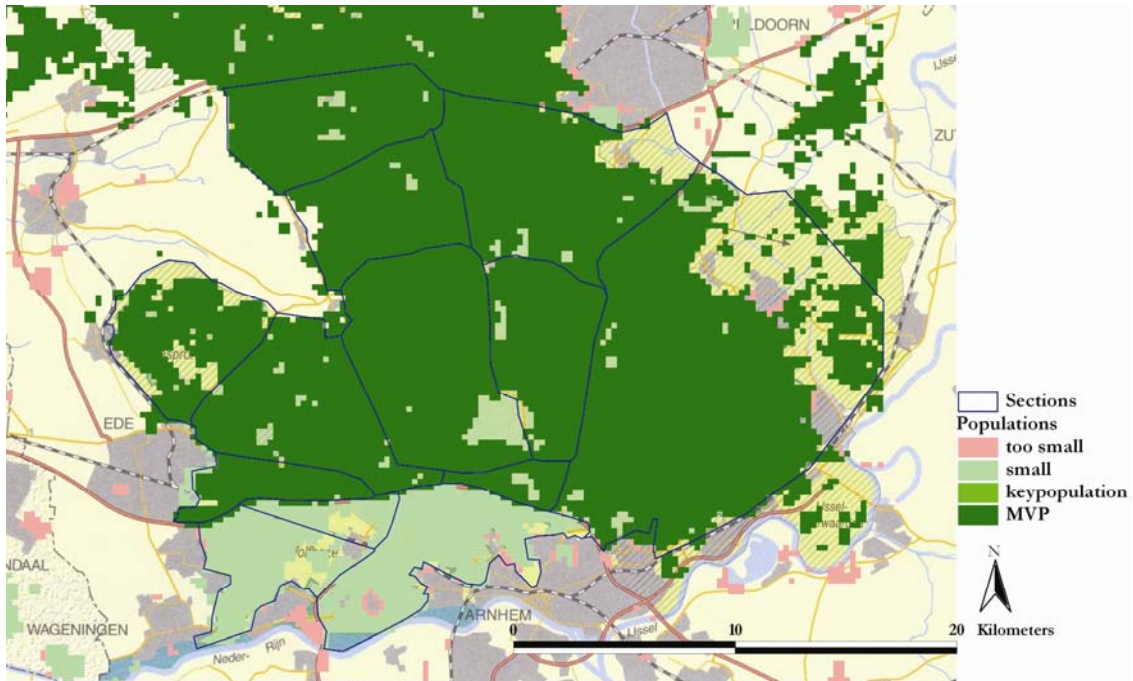


Figure 14 Population network of red deer without any pressure (source background: Veluwe2010)

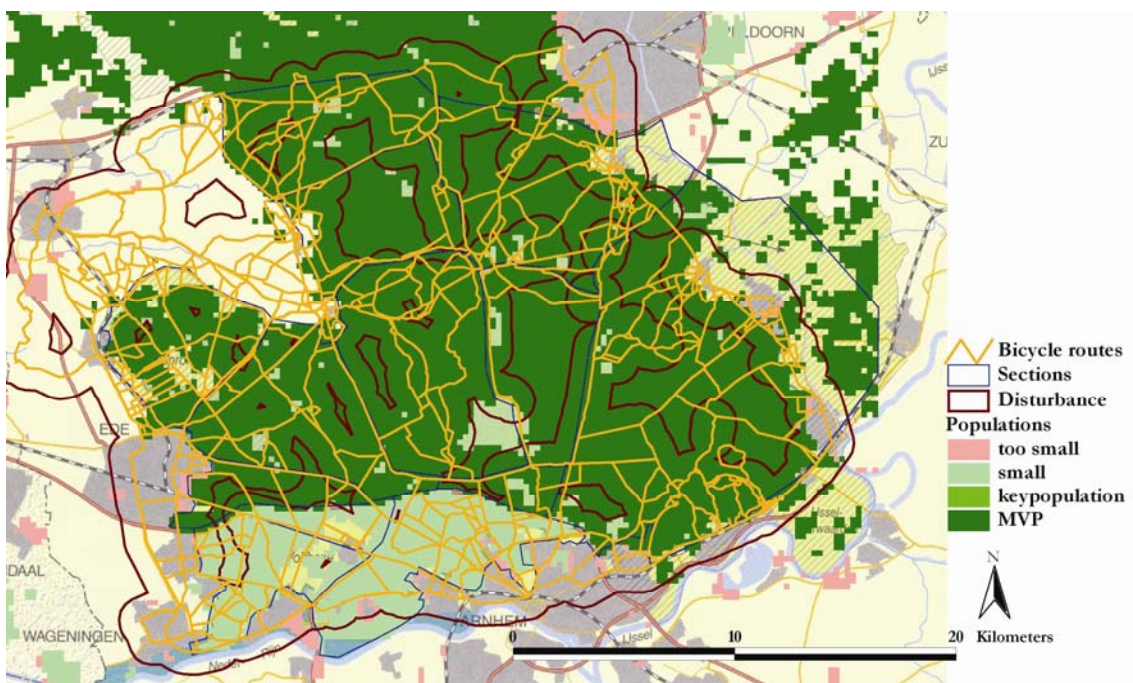


Figure 15 Population network of red deer with recreational pressure (source background: Veluwe2010)

#### 4.2.2 Wheatear

The complete network analysis of the wheatear demonstrates that the current recreation has definite impact on its potential viability.

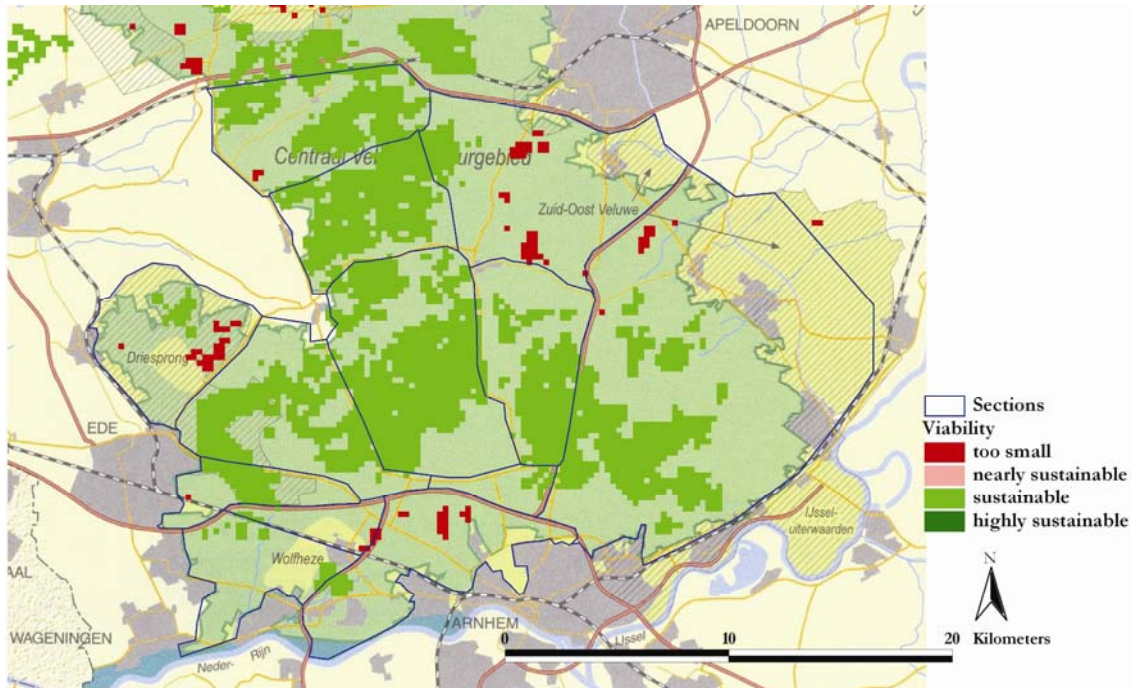


Figure 16 Potential viability of wheatear without any pressure (source background: Veluwe2010)

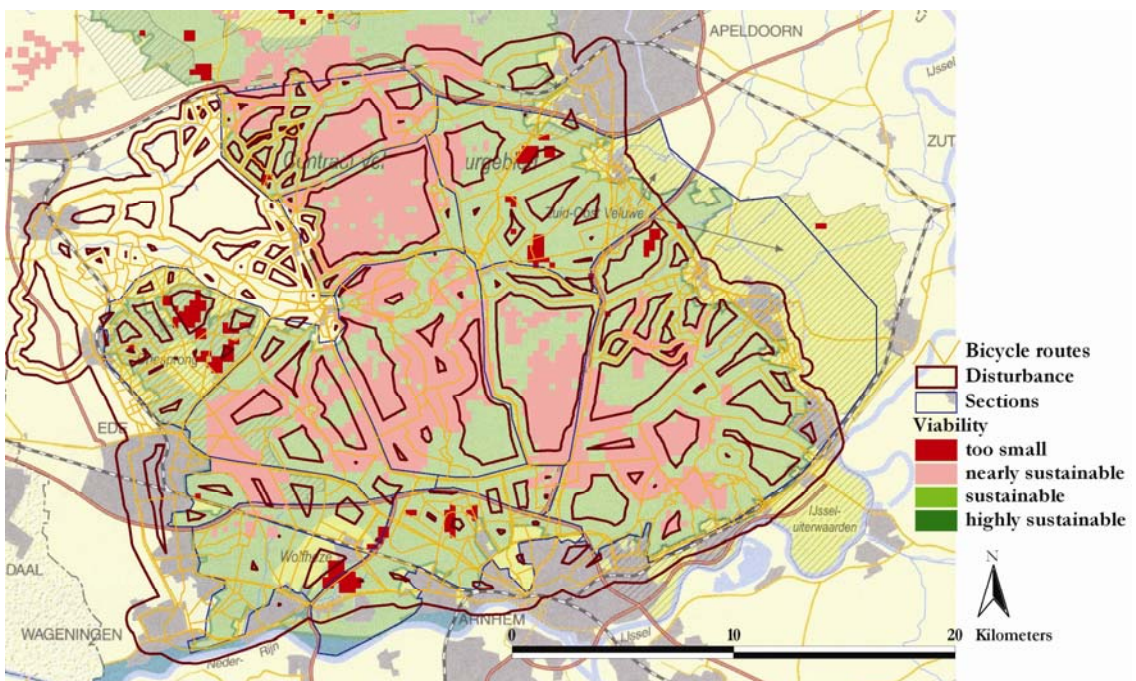


Figure 17 Potential viability of wheatear with recreational pressure (source background: Veluwe2010)

### 4.2.3 Viper

The following maps reveal that the viper is hardly influenced by recreation, except for some areas where its habitat is crossed by several bicycle paths.

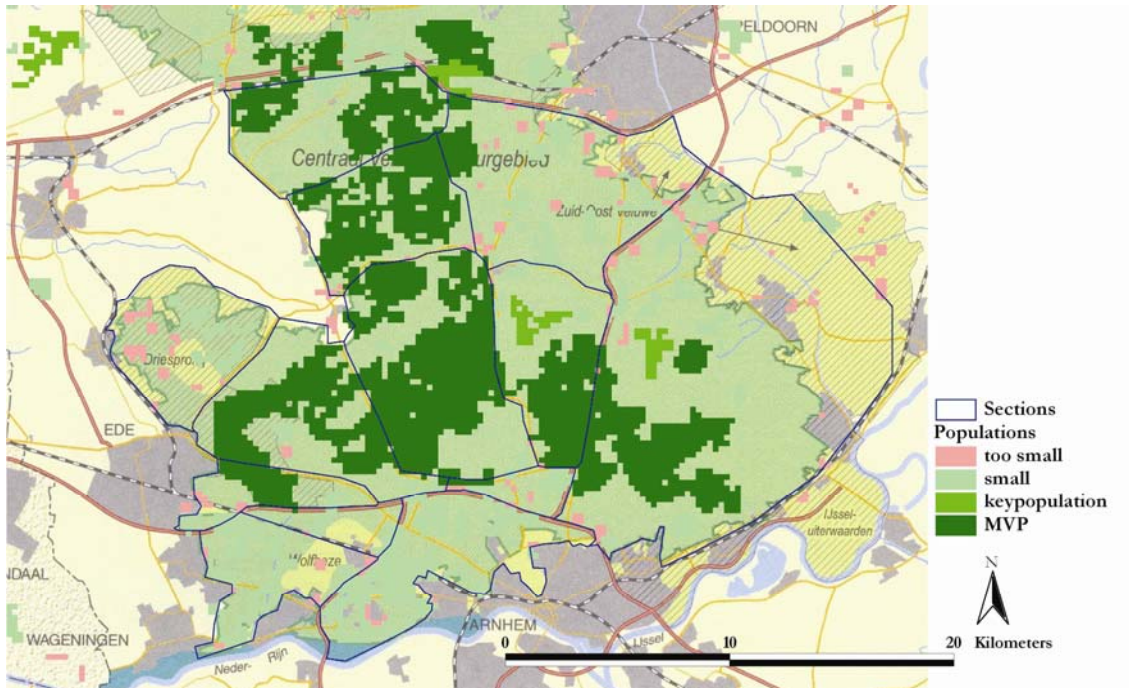


Figure 18 Population network of viper without any pressure (source background: Veluwe2010)

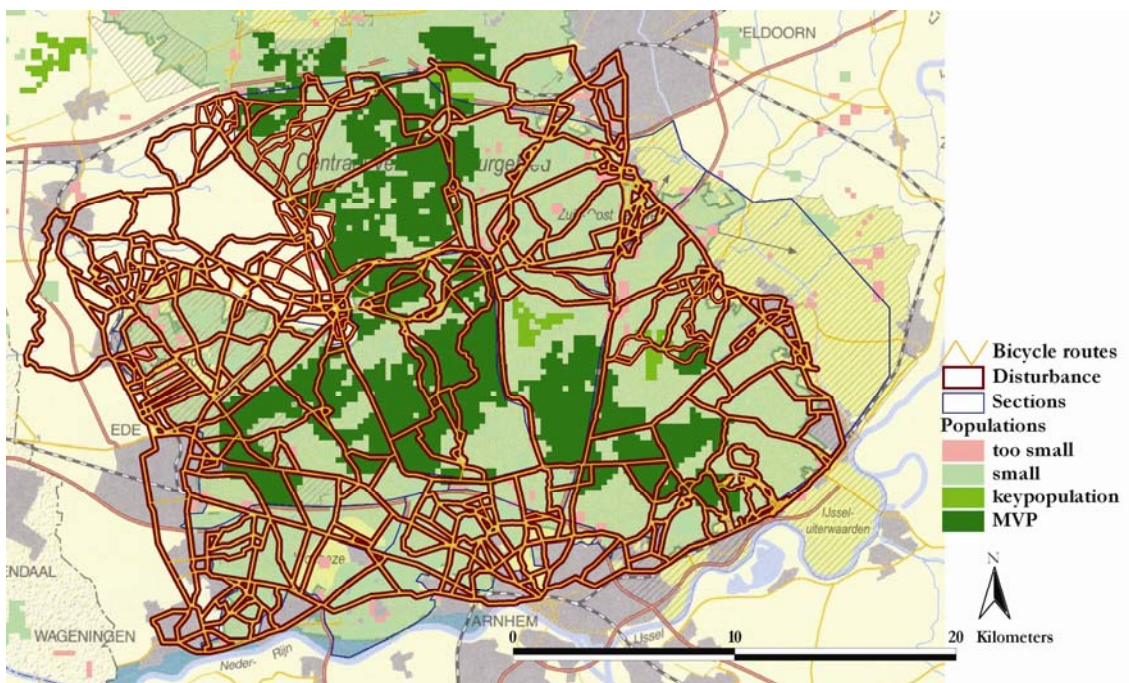


Figure 19 Population network of viper with recreational pressure (source background: Veluwe2010)

### 4.3 Impact of recreation on nature in fragmented areas

The next graphs show the number of reproductive units (RU) of the ecological profiles in the sections. There is a definite reduction in the number of RU in all the sections due to the recreational pressure. The norm for a network that contains a MVP (minimal viable population) is added in the graphs to provide a first qualitative indication. Further analysis is necessary to determine whether the habitat can support a MVP.

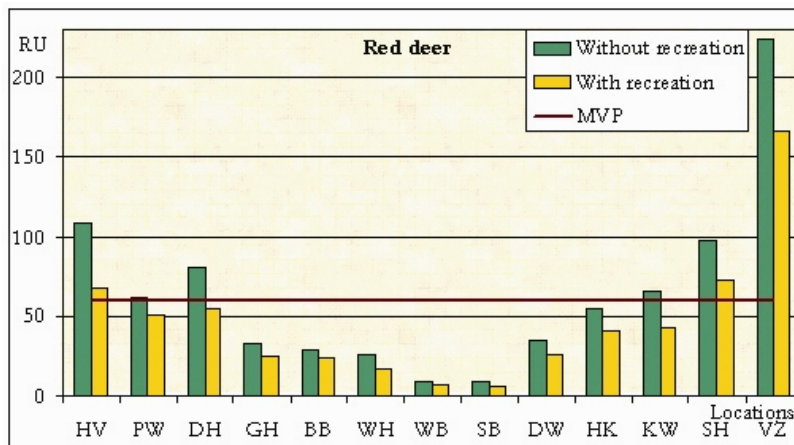


Figure 20 Potential number of red deer in RU per section

According to this scenario only the Veluwezoom (VZ) can easily sustain a very stable population of red deer, while the Spelderholt (SH) and the Hoge Veluwe (HV) are just above the norm. The low numbers are probably caused by a lack of exchange with the other populations in the current analysis.



Figure 21 Potential number of wheatear in RU per section

For the wheatear all the sections are added together, since the bird is not hindered by roads and fences. Without recreation the region is just large enough to sustain a viable population of wheatears, but their chance of survival will decrease substantially, as soon as recreation will affect the population.

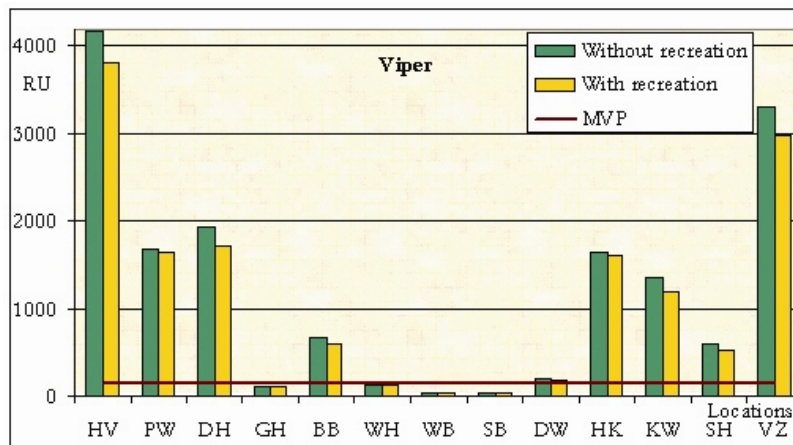


Figure 22. Potential number of vipers in RU per section

The Hoge Veluwe (HV), Planken Wambuis (PW), Doesburger heide (DH), Bennekomse bos (BB), Harskampse zand (HK), Kootwijker zand (KZ), Spelderholt (SH) and Veluwezoom (VZ) are all large enough sections to sustain a viable population of vipers.

#### 4.4 Assessment of the preliminary method by the stakeholders

The following paragraphs are based on in-depth interviews with the stakeholders, which were held in June, July and August of 2003.

##### 4.4.1 Stakeholders view on balancing nature and recreation

HV combined with the volunteer groups has sufficient expertise on nature and recreation. The technical group of HV accompanied by the chairmen of the flora and fauna workgroup analyse the bottlenecks between nature and recreation during a three-monthly meeting. The park is a museum of landscapes and a living representation of balancing nature conservation and recreation. Their foundation statements possess a potential controversy between nature and recreation and they have to determine what is sensible and what not. HV would like to increase the number of visitors, if they were able to distribute them better throughout the entire year (without an increase in the main season). Traffic (in the form of cars) is viewed as the main bottleneck for nature and recreation by HV; on the potential passageways for wildlife and the roads around the park. Currently the park is entirely fenced off and this is an undesired situation, because they want a free exchange for the animal populations. They also understand that the cyclists are hampered in their movement by this large fenced off area. HV tells that there is little conflict between cyclists and nature, but there is a problem with reptiles. Reptiles (mainly slowworms, *Anguis fragilis*) like to warm up on the bicycle paths, and are often killed by the cyclists. HV have recently enlarged most of their bicycle paths and covered them with a different layer, which is unattractive for reptiles. The park has 1700 white bicycles available for

the visitors and the respondent estimates that an equal number of private bicyclers use the park on a busy day.

NM primarily has practical experience with balancing nature and recreation. The bottlenecks are analysed on different levels: by the terrain manager up to project organisations. NM keeps the responsibility as low as possible within the organisation: in fact down to their three terrain managers on the Veluwe. NM states that the presence of a route and the location of the route is a very important factor in determining the impact of recreation on nature. Also the opening hours (from sunrise till sunset) are seen as very important, so the animals can feel safe when they come out of hiding to feed. The respondent of NM compares ATB-ers with scramblers, who both have a large action-radius. They state that it is very difficult to implement a zoning model that is based on distance. NM sees the disturbance by recreation as unavoidable, because as the respondent says: “You can not do without it”. On this moment they see fragmentation as the main problem of the recreation, in that areas are not connected with each other.

Ede has sufficient knowledge about nature and recreation within their organisation and the bottleneck areas are analysed by their policy maker. The respondent of Ede locates the most important bottlenecks in the forests close to the cities, such as the Edese bos and near Otterlo.

Apeldoorn tells that they do not have a detailed knowledge about nature and recreation issues and refers to the RGV for an interview. The respondent comments that in general from an ecological point of view many of the bicycle paths are set on the wrong location.

The respondent of RGV was consulted by the facilitator earlier about the desired bicycle paths through HV connecting Deelerwoud and Planken Wambuis (referred to as the east-west route). In some places cyclists now have to make a large detour due to the HV enclosure. The RGV used to work together with the counties in the past, but is privatized now and has the task to maintain all the recreational bicycle paths.

The respondent of PG has 20 years of working experience on the topic of the Veluwe. After an evaluation of 15 years of policy on the Veluwe, the respondent felt that things had hardly changed for the better. In 1996 PG called all the terrain managers of the Veluwe together to discuss the future of the Veluwe for the first time. The respondent talked with several organisations on the Veluwe during one and a half year which resulted in the policy of Veluwe 2010. Before the Veluwe 2010 was established, all the stakeholders signed an intention declaration for a ‘quality impulse’ on the Veluwe. The respondent analyses the bottlenecks between nature and recreation, but confers with other experts in case of uncertainties. PG does not see many bottlenecks between nature and recreation, but instead mainly between barriers and nature. Recreation in itself is not a barrier, although the bicycle path can form a barrier for some species.

NL-RNT possesses adequate knowledge about nature and recreation issues. The respondent sees no major bottlenecks between nature and recreation, and thinks that most of the problems can be managed. Bottlenecks can be found in places where large numbers of recreants gather, or where they show excessive behaviour resulting in disturbance and erosion.

Overall we can say that there are different views on nature, depending on the background of the respondent. It is important to notice that all the respondents do perceive nature and recreation as intertwined, although they do not necessarily agree that one function could undermine the other. Not many bottleneck areas are defined at first, although Ede does indicate the forests close to the city as a problem area. Especially Natuur Monumenten and RGV do not believe that cyclists will have a negative impact on nature. This study shows that the impact of cyclists is much lower compared with hikers, but there is definitely an impact as shown in Table 12, Table 13, and Table 14.

#### **4.4.2 The preliminary method**

HV sees the manner of culling of red deer as the main influence on their behaviour towards recreation. They have proven this for years, because despite the 650.000 annual visitors their red deer are still active during daytime. They hunt in a relative short period and do this in such a manner that red deer does not associate humans with death. This reduces their fear of humans and lessens the impact of recreation on the red deer.

Suitable hunting methods will decrease the negative effect of recreation, and the respondent gives an example of red deer that hardly react on cyclists in HV, but flee in Hoenderloo. According to the respondent the same applies for the wheatear, which is very sensitive for recreation now, but might get used to the presence of humans over time. The carrying capacity in the method is based on the vegetation in the area, but the respondent comments that the size of the feeding grounds will be smaller in real life, because the animals will be afraid to use the entire area due to disturbance of recreation. The method should calculate the carrying capacity based on the ground that the animals do use: dense forest with little vegetation, which will result in a lower carrying capacity.

NM sees no connection between a negative impact on nature and the degree of use of bicycle routes. As long as the cyclists remain on the bicycle route, there is no negative impact, according to their practical knowledge. NM assumes that the wildlife will get used to the reoccurring pattern of the recreation, and will go into hiding when the crowds appear. The presence and the location of a path and the opening hours for recreation are very important, but the extent of the use is not. The connection between the number of cyclists and the impact on the wildlife is a new phenomenon for NM. The respondent believes that the scale of method might be too large and questions the capability of the ecological profiles to represent a number of species. They are very interested in the foundation for this reasoning. After a more detailed explanation they agree that red deer will exhibit more reaction to humans in

the open field then in the forest. NM noticed that the behaviour of red deer in Planken Wambuis has changed, since large areas are no longer used for hunting. The red deer disperse more over a larger area and stopped using the resting areas for the entire day.

Ede sees the method a good way to approach the combination of nature and recreation.

RGV does not see so many bottlenecks between nature and recreation, as with recreation and wildlife fences, and recreation and highways. Especially not with cyclists who in their view combine well with nature. The method can be used for combining areas, but RGV sees a positive effect this combination anyway. The respondent from RGV thinks that both nature and recreation benefit substantially from defragmentation, resulting in large units of nature. Less accessible nature areas hold more charm for the nature-oriented recreant.

PG tells that the method shows that the disturbance affects nature, but the respondent states that the main pressure from recreation occurs within a limited amount of time: between eleven and five o'clock. The influence of cycling and hiking is not that large, compared with the disturbance from the holiday accommodations on the Veluwe.

NL-RNT regards the method as good. There is a need for such a systematic method to show the recreational behaviour and even so to make a well-balanced choice between different types of spatial use. If issues are only approached from the viewpoint of flora or fauna an important function is forgotten. NL-RNT remarks that the visitors of Hoenderloo are hardly included in the current simulation. Furthermore cyclists want to be able to change their direction every 500 m and this should be included in the method.

Mr. M. Goossen, a recreational planner of Alterra, verified the recreational part of the method in detail and approves of the chosen approach.

Hoge Veluwe and Natuur Monumenten think that the method of culling has a large impact on the behaviour of red deer towards recreants. Most of the respondents do agree with the principals of the method, although Natuur Monumenten and RGV see no negative impact of cyclists on nature. Both of them question the scientific foundation for the method, but the respondent of NM is also very interested in scientifically founded data on the relation between recreation and nature. The verification of the method by the recreational scientist of Alterra, who was not connected with the project, gives extra value to our scientific approach.

#### **4.4.3 The initial results**

HV agree with the bicycle distribution which as depicted with the method. Because of the intensity of the use and the accidents that occurred, they have widened their

major paths from 1.8 m to 2.5 m in the fall and winter of 2002. Since then the number of accidents has reduced significantly. HV agrees that the number of wheatears is reducing, but emphasizes that the typical habitat (semi-natural landscape) of the wheatear has reduced as well. They concur with the preliminary results for the viper. HV does not yet know if the method clarifies the bottlenecks.

NM can not judge the correctness of the bottleneck areas for the bicyclers, because they see no connection between bicyclers and impact on nature. NM says that the method might clarify the recreational aspect, but the natural aspect is very complicated and is influenced by several other factors.

Ede affirms the bottlenecks that arise from the bicycle distribution by the method, except for the contribution of tourist cyclists. The number of tourists that cycle in the area is underestimated, and the respondent includes Otterlo and the Edese bos as bottleneck areas for the cyclists. The graphs do clarify the bottleneck areas, which are more appealing to the respondent than the maps.

RGV does not believe that bicyclists influence nature in a negative manner, but agrees with the bicycle distribution. RGV does not find that the method clarifies the bottlenecks, since they do not see it as bottlenecks. But if they look at the method onto itself, and accept all the assumptions, then the graphs clarify that the numbers of wildlife are reducing. In that sense makes the method clear what is happening, but with two remarks: <sup>1)</sup> Are the assumptions correct? (do cyclists have durable negative effects on the reproduction?) <sup>2)</sup> Where will this information be used for?

PG agrees with the bicycle distribution, and is interested in the division of recreation in the areas. The respondent finds the method very insightful.

NL-RNT regards the bottlenecks that arise from the method as logical. The method shows the range of cyclists, based on the distance behaviour of cyclists and other recreants. One critical note is that the results do not support the need for an east-west bicycle route. The respondent agrees that this route would be used by a smaller group of long distance cyclists, but adds that they have no idea how large this group really is and what the overall cycling behaviour of visitors in the region is. There is a need for the east-west route by the visitors, who easily cycle up to 40 to 50 km per day. About the scale of the maps the respondent states "The smaller the scale the better". The method clarifies the bottlenecks areas, because it takes the behaviour of the recreants as a starting point, which the respondent sees as important and valuable. One conclusion could be that more cycle paths are needed to take care of the excess of cyclists on a busy day.

Most of the respondents do agree with the results of the preliminary method, but some have additional remarks. Some respondents think that the scale might be too large (currently 1:250.000), but this can easily be adjusted according to the wishes of the stakeholders, providing that they have a well-scaled base map. The respondents of Ede and NL-RNT tell that the amount of tourists is underestimated, and this might well be true, due to the lack of exact regional information.

#### 4.4.4 Usefulness of the method

HV sees the method as useful, certainly to show the implications of passageways to people, who do not deal with this type of problems on a daily base. HV asserts that the limitations of the method should be clarified to the users. The respondent likes the approach with an ecological profile as indicator species, but considers the assessment of the impact of recreation on nature as very ambitious.

HV would absolutely consider the use of this method in future projects. HV does not need the information on key patches of populations, because their terrain managers are familiar with those areas. The method is more useful to clarify the situation for laymen and politicians.

NM would in part consider the use of the method. The organisation is looking for information on the relation between nature and recreation, and the disturbance factors, so they can have an indication of the effect of a path or a passageway on a particular group of species. The method could be a useful tool for the design of passageways for recreation.

Ede would definitely consider the use of this method in the future, because they have an integrated management of their forests, which is based on three equally important functions: nature conservation, recreation and forestry. They want to know exactly whether all the functions will remain equally sustainable in the future and want to prevent the domination of one function. The respondent states that method is very useful for an integrated type of management.

RGV thinks that the method would be more useful when the effects of recreation on nature are more founded. Furthermore the method should contain all the important influences, because otherwise it will give a very narrow view.

PG likes the approach in the method very much and deems it as very thought-out. The timing for the development of this method is excellent, now that they are working on the overall bicycle plan for the Veluwe. PG states that “Before you start making bicycle connections, you have to think them through, and the method can help with this.” The respondent definitely would like to use this method in future projects and will assert this in the core team of the Veluwe and the Veluwe-committee.

NL-RNT says that the final development of the method is very valuable. The respondent could not say if the method would be used in the future, but found it important. The respondent mentions that the results show a strong resemblance with the Alterra research into silence on the Veluwe. That particular research only investigates the noise disturbance by cars, but the respondent sees the military exercises on the Veluwe as the greatest sources of disturbance. The results of this method can influence the outcome of the Heart of the Veluwe-project, because they show once more that nature and recreation have a connection and a coalition, which influences each other. The method shows in clear and insightful manner where the

corridors and the passageways need to be made, so that there are no disturbance influences from recreants.

The method is useful for all the stakeholders, except for the respondent of RGV, who would like to see an extension of the method with all the major influences. Unfortunately this will make the method very complex.

#### **4.4.5 Possible improvements of the method**

HV tells that the maximum number of animals that can live in the area is very useful information and Alterra now calculates this with the model FORSPACE. For years HV maintained a herd 200 red deer on an area of 5000 ha, but they assume that the herd could increase to 400.

NM thinks that a comparison of the potential habitat with the actual habitat of the species will be a valuable asset.

Ede deems that the method would be more valuable if an indication of other influences on nature and recreation, such as environmental pollution were included. This would improve their insight in the exact foundation of the method.

RGV considers the method interesting to examine possibilities, but says it will be hard to derive conclusions from the method, because of the many other factors that influence nature. They believe for instance that roads do have a profound negative impact on nature.

PG thinks that the buffer that is used to depict the impact of recreation on nature should be better founded, since it is so crucial. Currently the impact red deer and viper is only based on the expert-judgement of one specialist in their field, while the judgement from a range of specialists will make the method more reliable. The species spectrum could be extended with insects. The respondent comments that some maps could be a bit more insightful

NL-RNT advises that the method should be adjusted for the tourists, who take the entire south-Veluwe as their territory. The distance that they will cover on one day is far greater than the distance that recreants from a nearby city will cycle. It would be handy if the method could predict recreational potential in the future, so improvements on the recreational infrastructure could be made beforehand. Currently the routes have little variety and the addition of a quality index to the paths would give an extra dimension. The appreciation of the cyclists for the paths should be taken into account. Mr. Marcel Jansen studied this aspect on the Hoge Veluwe eight years ago.

The method lacks an ecological view on the habitat of the recreants. The respondent recently finished a study of the habitat of the hiker. The overall approach towards nature and recreation lacks that type of thinking.

The stakeholders gave useful advice on possible improvements (more founded expert-judgement and tourist data) and extensions (impact of roads and environmental population) of the method. It is possible to calculate trends in recreation with MASOOR to predict the recreational pressure at some point in the future. The maps used in the interview are improved according to the suggestions of the stakeholders.

## **4.5 Concise assessment of the Heart of the Veluwe-project**

### **4.5.1 Organisation of the project**

The project leader is the facilitator for the participative process in the Heart of the Veluwe, while in a larger context the province can be seen as a facilitator for the development of the policy from Veluwe2010. The stakeholders are united in a project group that gathers once every one and a half or two months. The former director of HV is selected as the representative of all the stakeholders towards the facilitator. There are also several sub-groups: one for roads, one for heather and sand drifts, and one for passages. All the stakeholders finance the project, but the province contributes the larger part of the finance. HV presents itself as the organiser of the project and the people within the organisation are well-informed. The former director is also the chairman of all the meetings, so HV plays a crucial role in the project.

As for the decision-making process: all the interests are brought forward and the facilitator tries to bring them closer within the margins of their organisation (in a compromise style). The final decision about the project will be made by the directors, who manage the organisations of the stakeholders. These are for instance the director of HV, who is kept up to date in monthly meetings, the region-director of NM, and the policymaker from Ede, who partakes in the project.

PG tells that it is difficult to say where the final decision on nature and recreation will be made, depending on the project. For instance if they would agree on a new bicycle plan, then all the landowners would have to give their permission and this can take a lot of time. Also the decision about finances has to be made. The RGV will create and maintain the bicycle paths, but can not finance this, so LNV might be asked to contribute, and maybe the recreation organisations. Decisions about finances have to be made on many different places.

The project is well-organised; however we noted that the final decision is often not made by the stakeholders themselves, but on a higher lever in their organisation.

### **4.5.2 Current state of affairs in the project**

HV is certain that the final decision in the project will be a compromise. All the terrain owners have their own goals and responsibilities and each will decide in their own way. This is visible on the southern Veluwe: the province and NM agree on a

policy that leads to large units of nature, but other terrain owners see this very differently. HV realises that any different approach will require the support of the other stakeholders. HV tells that the planning process within the project is going well, but they are not optimistic, because they are very worried for 'paper' solutions. This means that a solution will be worked out on paper, presented with a map, which does not function in daily life.

NM thinks that it is important to find the biggest common demeanour and solve that with a decision that everybody agrees on. Problems can be solved by allowing everybody to keep their own identity. The respondent states that every stakeholder has their right of existence as long as they do not disturb each other. The respondent from NM is not familiar with the details of the project, but knows that things are moving along, which the respondent sees as positive. The respondent expresses his trust in the facilitator, who will make sure that things will turn out all right.

Ede informs their terrain managers thoroughly about the developments within the project. Their representative in the Heart of the Veluwe-project meets one per week with terrain managers of the county in a group called 'managers of North and South Veluwe'. The respondent of Ede thinks that the planning process should speed up a little.

The RGV considers the east-west route a good alternative.

The respondent of PG is not directly involved with the execution of the project, but the project moves into a phase now, where his participation will slowly increase. The respondent does not know exactly how things are going, but has a good impression from what he has heard so far.

NL-RNT tells the planning process of the project is going well, so far in the preliminary phase, but that an evaluation of the project should be made after five years, when all the decision are implemented.

All the stakeholders think that the final outcome of the project will be a compromise, but only the respondent of HV is worried about the results. Most of the stakeholders express their trust in the facilitator, which is indeed a very good point!

#### **4.5.3 Issues for discussion**

HV considers the most obvious outline (based on efficiency for the cyclists) for the east-west bicycle route not or barely acceptable, due to the potential hazard for the reptiles. A much better track both for cyclists and wildlife passageways could be selected if a small portion of land from the airport Delen is released.

Another issue was an old-style rye and grain acre developed by HV near oud-Reemst. Some land nearby will be taken out of production and NM would like to develop a meadow for wildlife grazing there.

The stakeholders of HV and NM did not come to an agreement during the project meeting, and both organisations said that they would discuss it separately. HV gave a good representation of the conversation between the terrain managers of both organisations. After some negotiation about the land near oud-Reemst, they found an appropriate solution.

A different issue is a newly created corridor for wildlife in the north-west corner of the park Hoge Veluwe. The respondent of HV indicates this as an example of a 'paper' solution, which does not work in practice. It is visible in the increased mobility of wildlife: Otterloo complains about the wild boars and Hoog-buren about the red deer in their garden. The respondent of HV states that the wildlife corridor serves the comfort of the car drivers, who will have to pay less attention on other parts of the road. Neither do HV, NM and Ede want that passageways will be created that lead the red deer straight to the butcher, because they get killed on the road. Since March 2003, 18 red deer died in this wild life corridor and the HV will close its part of the corridor if this continuous.

The respondent of PG comments that the wildlife corridor was promoted by the HV. Together with their fauna-expert he advised against it, but the former director of the HV pressured the province to cooperate on that particular fauna passage.

NL-RNT tells that HV is very clear in their terms for the continuation of the national park, so passageways should not become free entrances for the public. The choice was made to create the passageways without fences, but article 4.6.1. (silence areas) offers some legal protection from people entering the park through the passageways.

All these issues add up to the puzzle to find a good solution for the entire situation. In general, there is a difference in the manner in the individual terrain management organisations view and approach towards the recreational function of their area. However, this will probably not cause any problems within the Heart of the Veluwe-project, since all the stakeholders agreed beforehand on the project description, and are willing to find a solution together.

#### **4.5.4 The influence of politics**

HV thinks that the province is not handling the project well. HV does not agree with the area planning of the province, who designated the nature south of the A1 as a large unit of nature with a minimum of human influences, whereas the HV takes human influences as a starting point. HV thinks that regional plan for nature and landscape policy is launched too early by the province. It is published by the department of Rural Areas on June 4th 2002 and directs the execution of their policy. The province should have waited with the publication, until the Heart of the Veluwe-project (and other projects) finished their planning. HV perceives this as that the policy is first affirmed and now the province tries to get everybody in line. HV does not have much trust in the value of their participation. When they expressed this to the province, the province reacted by saying that they can comply on a voluntary

base. HV concludes that support from participants is not important for the province and that the projects are not well coordinated. This creates some irritation by the HV. In general people should look at the achievability of cases (like the projects robust connections, and deer on the Rhine), and be realistic.

There is no support for the exchange of wildlife with Germany, who –according to the respondent- do not want our red deer, because they are afraid of disease. The respondent from HV states furthermore that people who keep on telling that the Veluwe is the largest nature area of Europe, make themselves ridicules. Politicians will influence the outcome of the project, through the finance that is made available for this project.

NM believes that the province handles the project excellent, and notices that people are interested in the developments on the Veluwe. They see the province as a good party to act facilitating and stimulating in this project, because they are unsuspicious and harmless. NM thinks that many projects which are ready to be implemented. They appreciate the organisation of the project, and see it as a large step forwards. NM considers the current policy on the Veluwe as very good. NM is a societal organisation, which depends on the support of the general public. The organisation takes this into account when they make a decision. Politicians do this as well, and often take the same direction as NM, with some minor differences. So NM is indirectly influenced by politics, but they do not follow all the policy without consideration. NM can be convinced if the politicians back up their policy with a financial stimulus.

Ede thinks that the province handles the project in a good manner.

RGV thinks that Veluwe2010 is a very good project in which people deal with concrete concerns instead of just writing diplomatic notes. The network organisation around Veluwe2010 is very well structured. Only they run into numerous limitations with their own projects. The quality of the recreational provisions is poorly according to the RGV, and a great deal needs to be done to enhance the quality. Many parties are involved and needed to upgrade the recreational provisions, but it proves very difficult to attain the finances for the enhancement. The most important issues are summarised in their flyer 'Agenda for the future'. One issue is the maintenance and quality improvement of the bicycle network. The paths need to be renewed and widened, and the recreations areas and accommodation for visitors need to be improved.

PG has tried for years to talk with HV about their fences, but during a presentation three years ago PG asked for the right of passageway for animals and recreants. This led to some commotion, but resulted in the HV agreeing start a project to three days later. The respondent of PG knows that HV wants to be recognisable with culture-historic landscapes and sees that this collides with the planning for large nature units, with minimal human influences. The respondent thinks that one does not need to exclude the other, because the entire Veluwe is a one large culture landscape (with heather and drift sands). The planning was made this way to keep the old forest relicts, like the Kroondomeinen, that you have to maintain them rather intensively, while less valuable forest would need less management. PG realises that HV is not

happy with the current planning, but they can ignore it, because the plan was written for the subsidies. Since the park is self-maintaining and does not receive any subsidies, so they do not need to worry about it. PG hopes that the Heart of the Veluwe-process will lead to some good exchange points for wildlife along that road. PG puts the framework for the policy in place with Veluwe 2010, and will decide on the availability of money. It is difficult to say where the final decision will be made, because many decisions have to be made along the entire trajectory.

To illustrate this, the respondent tells about the Renkumse beekdal. First several decisions had to be made about the availability of money, and the county of Renkum had to agree on a change in their regional planning. Now everything is arranged, but the negotiations with the nineteen industries in that area just have to start. They hold the key for the final decision, and are capable to prevent the entire plan. The respondent tells that he has learned over the years that communication plays a very important role.

NL-RNT tells that the relation with the province has enhanced because of a good feedback by the provincial officials. The province does carry out a lot of good things, like the Veluwe 2010-plan and the fact that the Veluwe has a protected status for twenty years, which makes the area special, but there is always room for improvement. NL-RNT says that good and beautiful things are happening, but in some cases one could speak of 'wishful thinking'. The respondent is aware of the tension between the province and HV, but tells that the situation is always difficult for independent foundation, when a 'higher power' tries to say something about their management. Another issue is the margins of the forests, which they encounter when they want to develop a corridor for heather terrains. But on terrain-managers level there is no great problem, while on provincial level there is a difference between policy of Veluwe2010 and the view of planners or cultural-historians for that matter. This makes it difficult and shows contradicting standpoints from the province towards the public, but is a result from our polder-model. NL-RNT tells that the province does influence the outcome of the project, because the project is a part of Veluwe 2010 and the main finances will have to come from the government.

The Veluwe as a nature area holds a great deal of allure, which is not always fully reflected in the decisions that are made. There are different perceptions and therefore differences in policy between the province of Gelderland and the terrain managing organisations. These exist among others on the field of nature management, but those will not hamper the execution of the Heart of the Veluwe-project. Most of the stakeholders think that the province is doing a good job, although some provincial plans cause miscommunication. This might limit the view of stakeholders within the project on creative opportunities unnecessarily.

#### **4.5.5 Creative integrated solutions**

HV tells about the 'open' scenario that there was a time when the government was willing to donate the finance needed to maintain the park. HV never went along with

it, because they had no guarantee for the finances on the long run, after government has changed. HV offered to manage the Delerwoud, and the Edese and Ginkelse hei. They are willing and know exactly how to do it. HV sees the 'open scenario' as a realistic option. They think that everybody should pay for the use of the area, not only the visitors. They think that the terrain managers will agree on a harmonious management of the area. If the terrain managers talk man to man on a lower level, they will find each other and perhaps creative alternatives.

HV sees possibilities for the traffic situation at Hoenderloo in the form of the creation of one good connection with the A50.

Hoenderloo will no longer need the other roads, which are now often used by traffic that tries to sneak past the congested highway, and can transform them into bicycle roads. Other nature managers proposed to declare the Veluwe a nature 'estate' and to restrict access to the roads that are connected with the surrounding highways. These byroads are only intended to serve as an entrance to area and will not cross the Veluwe all the way through. This generates a substantial defragmentation and benefits both nature and recreation. The State department on roads and waterways (RWS) does not want this to happen until the surrounding highways are widened for the excess traffic.

If the HV would be appointed for the nature management of the airport Delen, they would take current culture influences and the culture history of the area into account (an archaeological organisation strive for a monument status of the airport). HV thinks that a semi-agricultural land use is an obvious choice for the management of the area.

NM has heard the 'open scenario' before, but thinks that it is difficult to realise the benefit tax. In daily life is it complicated to calculate the cost and profit of nature management, which are divided over several budgets. NM states it will be hard to determine who will or will not contribute to this tax. They see HV as a remainder of the wildlife parks that existed in the area in former times and think that the HV is still proud that their visitors pay for entry.

The respondent from Ede would like to base his approach towards nature and recreation on European context. The treat of local extinction of a species can seem less important if the species is abundant in surrounding countries. In his opinion it is not wise that an immense nature area as the Veluwe does not have the title of a National Park. The respondent thinks that the current entitlement of National landscape is a result from a political lobby. It would be much easier to manage the nature areas and to generate revenue when the entire area is acknowledged as a National Park. A portion of this revenue can be given to HV. Ede sees the approach in scenario 'open' as a much more integral solution then the current policy about a fence here or there. The respondent thinks that the time is right for this type of integral approaches.

Transferia are a good solution to the traffic problems that occur now. The train station in Ede centre, close to the nature areas, is a perfect location for a transferium. The area is currently occupied with military bases, but those will disappear in the future. Another good location for a transferia is in Arnhem, between Burgers bush

and the Open air museum. A major consequence of this is that the connecting roads on the Veluwe will be closed.

RGV thinks that it would be interesting to look at the 'open' scenario, since most people come to the HV for the museum. All the other fences could be removed then. There have been many suggestions for a visitor-pay-back system. RGV suggests that the parking management could be approached very differently, and that they (the province) could take foreign national parks as an example. In other countries you will have to pay parking money before you can leave your car anywhere. The number of parking places could be reduced, small parking places might be removed, and a parking fee can be introduced for the remaining parking spaces. In exchange for this fee, terrain managers can sustain nature, and the RGV would be able to create new bicycles paths.

In the past it was very logical that the RGV would create the new bicycle paths, since they were closely linked with the counties. The province promoted that they became an independent organisation, but inadvertently this created an unclear situation concerning the creation of new paths. Now the RGV takes less initiative in the creation of new bicycle paths, because their task is the maintenance of the existing paths. Currently people are drawing up a new bicycle plan for the entire Veluwe. This plan will also talk about the execution and organisation of the bicycle routes, because the management is divided over many organisations: such as the ANWB, several counties, and tourist organisations. The RGV wants more uniformity and direction in the control over these bicycle paths.

RGV also mentions that the creation of a Veluwe-brand for regional products could help the area.

PG thinks that a complete circular bicycle route of five days combined with a network of nature camping's on the Veluwe would make it really attractive. PG hoped that a Veluwe-fund could be created by all the involved parties, and the EU. Then the Veluwe-counsel could decide which plans and projects would be financed. Unfortunately it does not work that way, but now it is divided over many organisations, which delays and frustrates the decision process. This is the same idea as the AGV-committee advised. There are so many interests, just because there are so many organisations.

PG sees the 'open' scenario as a very good idea. The respondent is surprised when he learns that HV likes the idea. PG finds the idea very good, and thinks that it would be the best solution. The PG would applaud the 'open' scenario. There are ideas to manage the entire southern-Veluwe as a national park. The respondent tells that if you enter a organisation as a researcher you can talk much easier about certain subjects, that can be very sensitive for the province. PG has a suggestion for the replacement of the fences by two walls, planted with prickly plants, so the people will not cross them, but the animals can roam freely. It is necessary to do this with two walls, because they can be alternately cut every ten years.

NL-RNT tells in context to the 'open' scenario that the HV considers various directions to give themselves a vital and strong position in the over-all view for the future. In the past they suggested that if a national park was created, they were willing

to manage the total area. The name NP 'Hoge Veluwe' would stay the same, but it would encompass the entire southern Veluwe. This would not be received well by some of the other terrain owners. In context of the closing of roads over the Veluwe, NL-RNT commented: "Yes, but someone should explain this to the inhabitants of Otterlo and Hoenderloo". The facilitator suspects that there will be a fair amount of social resistance from the community. Although the respondent continues, if all the highways are finished, then it will be faster to take the highway around then to drive through the southern Veluwe.

The drastic approach in the 'open scenario' is surprisingly well accepted by most of the stakeholders. The idea was considered by other organisations earlier, but the implementation might be very difficult. NM and NL-RNT see most of the obstructions for that scenario. The initial scenario did not consider a closing of the roads for through traffic, and some stakeholders mention that this could only happen under certain conditions.

## 5 Conclusions

### 5.1 Application of the preliminary method on the Veluwe

This study presents a preliminary method for the design of a sustainable network for both nature and recreation, which should be developed further to provide a more solid method.

- The selected models LARCH and MASOOR function very well in the method, while their full potential is not even used.
- The ecological profiles of red deer, wheatear and viper are good representatives for the Veluwe and function well in the assessment.
- LARCH provides a first qualitative assessment with the habitat maps and the potential viability of the ecoprofiles, while MASOOR offers assessment of the recreational quality through the classified number of cyclists.
- The population networks combined with the recreational distribution give a good impression of the potential problem areas. The maps and the graphs truly show the effect of recreation on the ecological profiles in the different areas.
- The method is able to provide the stakeholders with a network of the current state of nature and recreation on the southern-Veluwe. The stakeholders can design a balanced network; but we restricted our study to the development of an assessment of the current situation.
- The selected species all show a reduction in numbers to a more or lesser extent, due to the recreational pressure.
  - Red deer will not suffer drastically from the impact of present recreation due to the large amount of suitable habitat, as long as there is enough exchange with other populations.
  - The wheatear is most affected by recreation and the results show that it has a chance of 95% to become extinct on the southern-Veluwe during the next 100 years.
  - The viper is not as much affected by recreation over all, except in areas where bicycle paths cross its habitat.
- The method can depict planning scenarios for the southern-Veluwe in a relative short amount of time, but the alterations first have to be implemented in the basis data of LARCH and MASOOR. This denotes that the stakeholders can not design a sustainable network by themselves completely, but will need the assistance of modeling experts.

## 5.2 Assessment of the method by the stakeholders

The method itself is seen as a good way to approach the combination of nature and recreation by most of the stakeholders, although they do not view the influences of cyclists as the main problem. NM sees the fragmentation as the main problem for nature, Ede the environmental pollution, RGV the barriers in the form of fences and roads, and the PG the holiday accommodation on the Veluwe.

- In general there is a need amongst the stakeholders for a scientifically based method to provide insight in the balance between nature and recreation in nature areas.
- The Heart of the Veluwe-project selected different indicator species: the nightjar (*Caprimulgus europaeus*), the tree grayling, (*Hipparchia statilinus*), and the blue-winged grasshopper (*Oedipoda caerulea*). The nightjar was considered at first, but was dismissed because it resides mostly in forest (see Appendix 2). Limited information about the recreational impact on butterflies and insects makes an assessment of the tree grayling and blue-winged grasshopper impossible.
- Nearly all the stakeholders agree with the simulated distribution of the cyclists in the area, although Ede and NL-NRT say that the impact of the tourists is underestimated. We agree with this comment, because the impact is based only on data of the CBS about the entire Veluwe region, including the Randmeren.
- The results of the potential bicycle pressure of MASOOR show a strong resemblance with the results of Goossen & Langers (2003) (as noticed by NL-NRT). The only difference is the high pressure in the NP Hoge Veluwe in our results, but the increased scale in our approach accounts for that. Mr. Goossen confirms that the method uses an accurate recreational approach.
- The development process founds upon a network of knowledge that consists of scientists from a variety of disciplines and several stakeholders in the Heart of the Veluwe-project. The practical knowledge from the stakeholders enriches the methodological development substantially.
- Nearly all the stakeholders accept the method as an approach to analyse the situation and assess scenarios for win-win situations. Some stakeholders even consider using the method in future projects for their own purposes. The method is viewed as realistic and applicable, although most of the stakeholders would like to include more factors, before they will accept it as a fair judgement on the quality of nature and recreation
- The combination of maps and charts clarifies the ecological and recreational network to all the stakeholders. The stakeholders find the qualitative judgement on nature and recreation rather limited, and made several recommendations for improvement of the method, which are summarised in the next chapter.

### 5.3 Analysis of the Heart of the Veluwe-project

At the moment of this study the Heart of the Veluwe-project just passed the initial stages of integrative negotiations: a selected group of stakeholders meet on a regular basis to discuss possible win-win situations. All the stakeholders accept the policy problem, as agreed upon in the project description and have a feeling of mutual dependency. The project has a relation with a wider political environment, and the facilitator confers regularly with the ministry and the province.

- The Heart of the Veluwe-project meets all the requirements of an integral design process: it has an interdisciplinary style of exchange, a multifunctional mode of tackling regional problems, attention for the use of implicit and social knowledge, and the results can be used to reinforcement of the regional cultural identity. The facilitator uses an interactive style of management. So, it was the correct project to put our method to the test.
- The trust that the stakeholders express in the facilitator is remarkable. The stakeholders did take an important step to avoid uncertainty by investing in an effective facilitator, who is not connected with any of the stakeholders. His personal approach accounts for the comprehensibility and interaction that is necessary to compensate for the uncertainties that arise in the planning process.
- The main uncertainties that arise during the in-depth interviews are not scientifically based but political. The final decision about nature and recreation is often made by directors who are not directly involved in the project. The method can serve as a foundation of the problem analysis and demonstrate the choices of the stakeholders to politicians and the general public.
- The stakeholders started to identify the bottlenecks and alternative solutions to address them. A preliminary identification of alternative solutions and 'win-win' situations is made with the 'east-west route' scenario. Therefore we can conclude that the stakeholders are open to the possible contributions of our method and that the method was introduced at the right moment.
- It is preliminary, but we believe that the method can aid the preliminary identification of alternative solutions and 'win-win' situations when the method is fully incorporated into the integrative process.



## 6 Discussion and recommendations

### 6.1 Assessment of the method

In every method choices are made due to a lack of information or time, and the results are only as good as the data which is supplied for the model. Some choices are made on an arbitrary base, so we could implement the method. The foundation is there, but there is room for improvement. This chapter contains recommendations that can be used for further exploration into the field of nature, recreation and communication.

- The analysis of LARCH builds on a land-use or vegetation map for its analyses. It would be a valuable feature to include a soil map into the assessment, because it is more reliable for long-term projections.
- The number of vipers (in RU) seems to be rather high, but we double checked the calculations and could not find a logical explanation for the high numbers.
- More research is needed to provide details on the interaction of leisure activities and the impact on nature! There is a significant lack of knowledge on the impact of recreation on other species groups, besides breeding birds. Extensive research is required to assess the effects of disturbance from different aspects of recreation, like the type of recreation, size of the group, moment in the season, time of the day etc.
- The explicit results of the wheatear are concurrent with the present decline of the wheatear in the Netherlands (Sovon & CBS, 1998). A critical note is that this study only looks at the southern-Veluwe. The wheatear requires a rather large territory and the addition of the northern-Veluwe to the assessment area might give a more accurate depiction of the effects of recreation on the wheatear.
- The distribution of cyclists on the Veluwe is based on two different parameters: the 10th busiest day on the Veluwezoom and the modal-split of a Sunday on NP the Hoge Veluwe in high season. This does not impede the overall result because the parameters are used in separated areas, but it is better to use only one parameter. A recent study into the distribution of cyclists of the county of Wageningen can provide useful information.
- A balanced assessment on the combination of nature and recreation is not complete without an assessment of the perceptual capacity (visitors experience) and the economic capacity in the area. In this study we can only give a first indication with the maps and the graphs, but we recommend additional research to provide a more solid judgment

- The stakeholders made several useful recommendations for the improvement of the method, which we propose for future research:
  - HV (and NM) think that the method of culling has a large impact on the behaviour of red deer towards recreants. During the time when recreation was forbidden on the Veluwe due to the foot and mouth disease, all the animals came out of hiding. In Banff NP (Canada) where hunting is forbidden for at least one hundred years, elk roam freely in and around the city. The method of culling might play an important role in the behaviour of red deer towards recreants, and should be studied.
  - NM believes that a comparison of the potential habitat with the actual habitat will be a valuable asset.
  - Ede would like to include the function of forestry into the method, so they can assess the durability of their integrated management.
  - RGV suggests that the negative impact of the roads on nature needs to be added to this method.
  - PG advises to base the expert-judgement for the impact of recreation on red deer and viper on a range of experts, instead of the two species experts that advised us in this study.
  - NL-NRT thinks that sound pollution can have a large impact on both nature and tourists. The respondent tells that the method should be adjusted for the tourists, who will start from their lodging and cycle far greater distances. NL-NRT also states that the method lacks an ecological view on the habitat of the recreants.
- The representation of quality demands of cyclists should be improved in the method. Currently it only reckons with the number of cyclists, but it should include other factors, as devised by Goosen *et al.* (2003) in Table 3. It is possible to assess most of these quality indicators with MASOOR, and that will provide to a more solid judgment on the recreational quality.
- Additional features of MASOOR can be used to provide more accurate distribution of the cyclists, such as a preference for certain routes or attraction areas. The experiences of the visitors, which have an important affect on their recreational behaviour, can also be implemented in MASOOR.
- The value of the method would increase if it is equipped with an assessment of the habitats that will attract a specific type of recreant (as described by Elands & Lengkeek in 2000). Human behaviour can be described in ecologic terms about the dynamics of specific group of recreants, their distribution and their preferences. This will lead to an ecological view on the habitat of the recreants and can aid the regulation of recreation in nature areas.

## 6.2 Analysis of the Heart of the Veluwe-project

The Heart of the Veluwe-project was only analysed in a concise manner, to place the assessment of the stakeholders within context. The link between the research questions and the analysis is discussed in this paragraph and gives rise to recommendations for future research.

- During this study we wished to interact with the stakeholders in a form of participative technology development (PTD), but we did not manage to include them in the entire innovation course. Although the project leader provided the essential input for the development, we recommend repeated contact with various stakeholders for a complete implementation of the method.
- The Evenhuis *et al.* (2002) spoke about the substantial consensus between the stakeholders about the desired future vision of the Veluwe. That may be true, but each stakeholder can have a very different view on the actual implementation of that vision. Early depiction of the suggested scenarios may induce an open discussion about these differences of opinion between the stakeholders.
- The in-depth interviews were not held directly with the stakeholders that attend the stakeholder meetings in the Heart of the Veluwe-project. After a first introduction we were referred for the necessary expert view on nature and recreation. Although the first reaction of the participants in the project was positive, we can not tell if the stakeholders are 'uncertainty-oriented'. Insight into this orientation is necessary to indicate whether they would accept a new method as part of their interactive process.
- The scientific approach of the method can support the stakeholders, although most of the stakeholders tell that they have sufficient knowledge about the area. Since the expert knowledge of several respondents was impressive, we can not determine if the method helps to identify gaps in knowledge and insight.
- The facilitator did seem to use strategies to avoid uncertainties, because he values informal conversations for sustaining formal negotiations and incorporates relationships with constituencies as part of the negotiation process. Further research into those strategies and other personality traits is necessary to determine which type of facilitator will assist the integral design processes more.
- The realisation of social learning processes during the stakeholders meetings could not be determined. The explanation of the method did reveal new knowledge for some of the stakeholders, but an in-depth interview of one hour is too short to start a proper discussion that can lead to a social learning process.
- In case of political uncertainties, a scientific method can probably only underpin the scientific value of the solutions that the stakeholders devised, and portray their scenarios. Additional study is necessary to assess the impact of modelled scenarios in political situations.

- The openness of the policy in question is sometimes hindered by issues that stem from miscommunication. Some of the stakeholders have difficulties accepting the activities of the province, and express their doubts about the final results of the project.
- The question about the innovative scenario did seem to evoke the stakeholders to freely give their opinion about the situation on the southern-Veluwe. The stakeholders, who deal with the bottlenecks on a daily basis, might have considered some solutions, but rejected those due to the difficulties to implement it on their own. An introduction of those scenarios by an impartial facilitator may lead to some unexpected developments in the interactive process.
- The most striking finding is that nearly all the stakeholders are open to an innovative scenario which will lead to a synthesis of nature and recreation. This will involve the removal of the main fences and a major adjustment of the roadways on the Veluwe. Some stakeholders have their own opinion about the implementation of that scenario, but the initial willingness to consider such an approach is there, and should be explored further.



*Figure 23 The Edese heide*

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## Appendix 1 Definitions

*Table 17 Definitions and abbreviations*

Name/abbreviation	Definition
AGV	Adviescollege Grenzenloze Veluwe
ATB	All terrain bike
Barrier	Element that blocks the dispersion of a particular species strongly or completely
Biodiversity	The total number of species within an ecosystem and the resulting complexity of interactions between them
Biotope	Place of existence of a living community +
Carrying capacity	The maximum population of a species that a specific ecosystem can support indefinitely without deterioration of the character and quality of the resource, i.e. vegetation or soil**
Concentration points	The creation of attractive landscape or space with a possibility for a short stay, for instance: landmarks &
Constraints	capability constraints: physical and biological constraints of the human body coupling constraints: social constraints connected with the fact that individuals have to be at the same place during certain periods authority constraints: constraints arising from control and authority of others over defined space&
Corridor	Linear shaped landscape element of a connection.
Corridor connection	Connection built from dispersion corridors, stepping stones and core areas. +
Dispersion	None-aimed movement of an organism to a (possible) habitat +
Dispersal capacity	Capacity of most individuals of a species (80%) to bridge distances to new, potential habitat
Diversity	Species richness, the number of species found in a community, but most definitions also include some measure of how evenly the total number (or abundance) of individuals is divided among species. (Primack, 1993)
Ecology	The study of the interrelationships of organisms with each other and within their nonliving environment
Ecological network	Network constituted of physically separated habitat patches, for a population of a particular species or a set of species with similar requirements, that exchanges individuals by dispersal**
Ecological profile	A set of characteristics based on three components: ecosystem type, extinction related characteristics (e.g. area requirements), and recolonisation related characteristics (dispersal distance etc.).^ or A fictional species that represents a group of species that have a strong resemblance in their demands on spatial coherence and on the type of ecosystem in which they occur +
Ecosystem	All the organisms and their nonliving environment within a defined area.
Ecosystem type	One or more types of living communities or nature types, in a functional relation with, and connected with specific abiotic circumstances +
Ecotope	A recognisable, more or less homogeneous landscape unit. A spatially bounded ecological unit, of which the composition and the development are determined by the local a-biotic, biotic and anthropogenic conditions.
Exertion	Routing by distance effect: the recreant should make an effort to reach the target area. Distribution is depended on the action-radius of the means of transport and the resistance of the area (e.g. sand path) &
Fragmentation	Fragmentation as a condition indicates that the habitat of a (group of) species is spatially separated in such a manner that it influences the functioning of the population and is measured by 'the spatial coherence.' + The term is also applicable in a more general manner for ecosystems. A fragmented landscape is a landscape in which the original dominant ecosystem has disintegrated.

Name/abbreviation	Definition
Habitat	Collection of characteristics that determine the growth (by reproduction and decease) of a local population of a species. The quality of the habitat determines the chance on decease and on offspring, and is dependent from food sources, hiding areas and nesting opportunity. +
Habitat area	A concrete spatially defined place, that fulfills the conditions for living and reproduction for (a individual of) a species +
Habitat network	An association of habitat patches in a landscape that potentially can be connected by a fair amount of dispersal, so that dispersal between patches in the network allows for recolonisation and diminishes local extinction^
Habitat patch	Spatially defined area of habitat for a species**
Habitat quality	Measure in which a habitat complies with the physiological constraints of a species (Primack, 1993)
Hikers	Pedestrians
Interdisciplinary	Forms off corporation whereby scientists from different disciplines work together in a team that aims at solving certain problems. In the team, his researchers stick to their own disciplinary perspective. However, they deliberately coordinated research questions that each discipline addresses at various points in time, and carefully analyzed implications of particular insights and research findings for questions posed in other disciplines. This type of corporation goes further than multidisciplinary corporation, whereby disciplines remain more autonomous; the results from different disciplines are merely added up. (Leeuwis, 1999)
Interpretation	The supply of all types of information about recreational and tourist destination areas, through personal contact or impersonal media &
Isolation	The combined effect of resistance and distance between habitats
IUCN	International Union for Conservation of Nature
Key area	Habitat area in which a key population can occur +
Key patch	A patch with a carrying capacity large enough to sustain a key population, and close enough to other patches to receive, on average, one immigrant per generation.**
Key population	A relatively large, local population in a network, which is persistent under the condition of one immigrant per generation.**
Local population	Small population of at least one pair, in one habitat patch, or more habitat patches within the home range of a species. A local population on its own is not large enough to be sustainable.**
Landscape cohesion	An index for the ecological quality of a landscape, based on the integrated potential for sustainability of a series of ecological profiles. These profiles differ in habitat and spatial scale. ^
Landscape ecology	Investigates patterns of habitat types on a regional scale and their influence on species distribution and ecosystem processes (Primack, 1993)
Matrix	The landscape between the habitat patches. The matrix of species A can be the habitat of species B and vice versa ^ Part of the landscape that is no fragment of the habitat network, and surrounds the network. Individuals of a network population that disperse, will have to cross the matrix +
Metapopulation	A set of local populations in an ecological network, connected by inter-patch dispersal.** A metapopulation can contain one or more key populations and several satellite areas with fluctuating populations that may go extinct, but are recolonized by migrants from the key population when conditions improve (Primack, 1993).
Migration	Seasonally regulated movement between fragments of the habitat area +
Minimum key patch size	Patch size just large enough to allow a key population
Minimum key population size	Population size with a probability of exactly 95% to survive 100 years under the assumption of one immigrant per generation^
MVP	Minimum Viable Population: a population with a probability of exactly 95% to

Name/abbreviation	Definition
Natura2000	survive 100 years under the assumption of zero immigration** A European network of protected areas, comparable with the Dutch EHS. The areas that are part of this network are defined by two complementary European directives: the bird directive and the habitat directive. These directives are binding and have to be integrated into the national legislation of each member if the EU
Natural guidance	Design with the use of natural resources, in such a manner that the visitor is guided unconsciously in the desired direction. A disadvantage is the border effect: the phenomenon that recreants concentrate on the transition zone between homogeneous areas &
National Landscape	An area that represent a large wealth of natural and landscape qualities and cultural historical values. It exists of nature terrains, waters and/or forests, cultural lands and settlements and forms one united and harmonic part, through which it is of exceptional meaning in the viewpoint of tourism/recreational experience value (Adviescollege Veluwe 2002)
National Park	United areas of at least 1000 ha, consisting of nature terrain, water and/or forests, with special landscape features and flora and fauna. There are good possibilities for recreational use. In NP nature management and development are intensified, nature- and environmental education strongly stimulated and types of nature-aimed recreation as well as research promoted. NP can consist of agricultural areas as long as those are appointed as relation policy areas or nature development areas (min LNV)
Network cohesion	An index for the sustainability of a habitat network for a particular species or a ecological profile, based upon the size, quality and configuration of habitat elements of the network as well as on the permeability of the matrix. The minimum required network cohesion is the point above which the conditions allow the persistence of the metapopulation.^
Network population	The spatially structured population in a habitat network, consisting of local populations connected by dispersal. A metapopulation is a particular type of a network population.^ A network population is characterised by one or more core populations with fairly stable number and several satellite areas that form one unit because local extinction in the satellite areas are recolonized by migrants from the core population when conditions are more favourable. (Primack, 1993)
Patch	A spatially continuous piece of habitat of a species, limited by non-habitat^
Participation	The creative and active participation on the process of planning, design, organisation and management by direct interested parties &
Promotion	The same as information, but with a more imposing character &
Resistance	(of the landscape or matrix) Measure for the deceleration of the dispersion speed through parts of the matrix between a habitat network. The dispersion can stop completely when the resistance is extremely high (at a absolute barrier) +
RU	Reproduction unit: breeding pair, couple, often half of the population size, provided the sex ratio is equal** Number of individuals that are actually producing offspring. (Primack, 1993).
Routing measures	Physical of social measures in or outside an area, aimed on influencing the (spatial) behaviour of recreants and tourists &
Scenario	Image of a desirable or possible future situation**
Scramblers	Hikers that walk cross-country away from the regular walking paths
Spatial cohesion	An index for the sustainability of a landscape area for a particular species or ecological profile. The spatial cohesion is composed of the network cohesion values for a region.^
Spatial ecology	Population dynamics, resource exploitation, ecosystem stability, and many other fundamental properties of natural systems are predicted to be qualitatively different by spatially explicit models as compared to non-spatial, classical models.

Name/abbreviation	Definition
Sustainable	A habitat network or landscape is sustainable for a species (or ecological profile) if the metapopulation of the species that inhabits it (or could inhabit it) is viable, i.e. has a high probability to survive for a long time (e.g. over 95% in a period of 100 years)^
Sustainable network	Habitat network with a carrying capacity allowing a viable metapopulation^
Temporal spatial	Term used in recreation sciences for the description of space in time, landscape ecology uses the term space
Transdisciplinary corporation	Researchers with different backgrounds develop a common conceptual framework and language (e.g. systems theory), thus transcending their original disciplines. (Leeuwis, 1999)
Viable population	A population with at probability of at least 95% to survive 100 years^
Zoning	Applying of a spatial sections so that areas come into existence that each can be set apart for several recreational activities and/or for different intensity of activities with the purpose of reducing the negative effect of the natural environment by the presence of recreants and/or limiting the mutual hindrance of that can occur between types of recreation (min LNV, 1983)

<sup>+</sup> (Bal *et al.*, 2001)

<sup>\*</sup> Report Pouwels *et al.* (2002a)

<sup>\*\*</sup> Van der Sluis *et al.* (2003)

<sup>^</sup> Article Opdam *et.al.* (2003)

<sup>&</sup> Boerwinkel &. Philipsen (1999)

## Appendix 2      Reference set ecoprofiles

The following species form a reference set that represents a wide scale of species from ecosystems on the Veluwe (Pouwels *et al.*, 2002b).

Table 18 Reference set of typical forest, heather and dune species

Ecosystem	Sensitivity for barriers	Dispersion distance (km)			
		1-2	3-9	10-25	>25
Heather, dune, sand	Flying	Idas Blue <i>Plebeius idas</i>	Grayling <i>Hipparchia semele</i>	Wheatear <i>Oenanthe oenanthe</i>	Woodlark <i>Lullula arborea</i>
	Non-flying	Viper <i>Vipera berus</i> Sand lizard <i>Lacerta agilis</i>			
Forest	Flying		Crested tit <i>Parus cristatus</i>	Green woodpecker <i>Picus viridis</i>	
	Non-flying	Bank vole <i>Clethrionomys glareolus</i>		Pine marten <i>Martes martes</i>	Red deer <i>Cervus elaphus</i>

Table 19 Values for a spatial profile of species (Pouwels *et al.*, 2002b)

Surface demand* (km <sup>2</sup> )	Dispersion	capacity ( $\alpha$ )	(1/km)		
	2.5 (1 km)	0.45 (5km)	0.2 (10 km)	0.09 (25 km)	0.04 (50 km)
0.005	Idas Blue <i>Plebeius idas</i> <b>Blue-winged grasshopper</b> <i>Oedipoda caerulescens</i>				
0.5	<b>Tree grayling</b> <i>Hipparchia statilinus</i> Sand lizard <i>Lacerta agilis</i>			Woodlark <i>Lullula arborea</i>	
3	Viper <i>Vipera berus</i>			<b>Nightjar</b> <i>Caprimulgus europaeus</i>	
7.5				Green woodpecker <i>Picus viridis</i>	
30				Wheatear <i>Oenanthe oenanthe</i> Pine marten <i>Martes martes</i>	Red deer <i>Cervus elaphus</i>
200					Otter <i>Lutra lutra</i>

(x): the network distance, a parameter often used in LARCH

\* Surface demand of an optimum habitat for the formation of a key area.



## Appendix 3 Cyclists on the Veluwe

### Hoge Veluwe

Table 20 Numbers of incoming visitors per hour, day, and in high season in 1995

hours from- until	weekday	Visitors Saturday	Sunday	Cyclists Saturday	%	Sunday	%
10-11	937	612	695	233	16	265	18
11-12	1048	675	712	257	18	271	18
12-13	668	704	761	268	18	290	19
13-14	508	692	668	264	18	254	17
14-15	515	533	487	203	14	186	12
15-16	373	277	358	106	7	136	9
16-17	178	199	119	76	5	45	3
17-18	175	159	145	61	4	55	4
18-19							
Total	4402	3851	3945	1467	100	1503	100

Table 21 Number of cyclists per entrance in high season

		all visitors Saturday	Sunday	Cyclists Saturday	Sunday	GATE
	%					
Otterlo	26	1272	1480	243	741	8
Hoenderloo	28	1266	1211	5263	606	10
Schaarsbergen	11	1313	1254	5459	628	9
Total		3851	3945	1467	1503	

### Veluwezoom

Table 22 Cyclists in 1991

Access to counter	counternr	10e busiest day
Arnhem, Rozendaal, Velp	780	190
Arnhem, Rozendaal, Velp	781	440
Arnhem, Rozendaal, Velp	782	380
Arnhem, Rozendaal, Velp	784	481
Arnhem, Rozendaal, Velp	785	144
Arnhem, Rozendaal, Velp	786	526
Rheden & Laag Soeren	787	703
De Steeg	789	246

## Entire area

Table 23 Number of cyclists used in the simulation

County	Number of inhabitants	surface area (km <sup>2</sup> )	cyclists	groups	Incl. tourists	GATE
Rozendaalse veld			1445	723	724	1
Wageningen*	33996	32.34	2040	1020	1021	2
Ede*	103704	320.9	6222	3111	3112	3
Posbank & environs			1666	833	834	5
Rheden			630	315	316	6
Apeldoorn (half)*	153751	341.14	4613	2306	2307	7
Otterlo			485	564		8
Schaarsbergen			500	478		9
Hoenderloo			482	461		10
Brummen (half)*	21500		645	323	324	12
Renkum*	32245	47.12	1935	967	968	13
Barneveld (half)*	48976	176.7	1469	735	736	15

\* estimated number of cyclists based on the amount of inhabitants in a county

(half): half of the total number of cyclists; other half will cycle in a different direction then the Veluwe

## Appendix 4      Background of the stakeholders

The next paragraph is derived from published mission statements on websites of the organisations.

The independent foundation Hoge Veluwe (**HV**) is the second-oldest national park in the Netherlands and contains 5000 hectares in an enclosed area (fencing) and 500 hectares in the immediate vicinity. Their main value for nature lies in the management of semi-natural landscapes, like woodland, heath, sand drifts and lakes. The main objectives are to maintain the park as a nature reserve and enable their visitors to enjoy nature and culture (e.g. museum and art). This union of nature, culture, human influence and recreation is subject to the condition that the management and operation takes place autonomously and with financial independence. The guiding principles for the future are defined by the objective of maintaining the exceptional nature of the Park. De Hoge Veluwe is a preserved landscape, a 'museum of landscapes'. De Hoge Veluwe is striving to attract an additional 50,000 visitors (compared to 597,354 visitors in 2000). An increase of 50,000 visitors is important, because the Park's income comes primarily from admission charges and they receive no subsidy from the State.

The Foundation Natuurmonumenten (**NM**) owns and manages a substantial area of the southern Veluwe. They preserve nature, the landscape and the connected cultural history by purchasing land and managing these areas professionally. The independent foundation strives for a continuous expansion of the protected area in constructive cooperation with many other organisations. They show repeatedly that nature and landscape protection is crucial for liveability of the Netherlands. NM offer various ways for people to actively get in contact with nature and landscape and want to raise the consciousness and support of the public.

Nature covers one third of the 32.000 ha that belong to the county of Ede (**Ede**). Well known areas are the Edese bos Planken Wambuis, and the NP Hoge Veluwe. The Harskampse Zand and the Ginkelse & Eder Heide are owned and managed by National Defence. Ede realises that they are the spatial 'caretaker' of an immense and important nature area together with several other counties. The Reconstruction plans, flora & fauna regulation, and the EU Bird & Habitat directive will largely influence the municipal plans. They strive for more untouched and dense nature for the Veluwe region, with less fences and roads. Recreation and tourism form a significant pillar of their municipal and regional economy.

The (strategic) visions of county of Apeldoorn (**Apeldoorn**) follow several actual policy statements that plead for a powerful quality impulse for the Veluwe (e.g. Development program 2000-2004, Economy 2000-2002 and development vision Recreation). They associate with the policy from Veluwe 2010 and the signed intention declaration Quality impulse based on Veluwe 2010. Apeldoorn states that the possibilities for (culture) tourism and recreation should be utilised optimally. A balanced development of ecology and economy (two kinds of quality impulses) is possible and also necessary. It will keep the Veluwe competitive as a recreation and

holiday destination in the future. The city Hoenderloo close to the NP Hoge Veluwe is part of the county of Apeldoorn.

Recreatiegemeenschap Veluwe (**RGV**) is a coherent group of partnerships, who engage in the (letting of) exploitation of day recreation areas and bicycle paths for a broad public and a number of supporting activities. They strive to optimize and expand their main activity and a qualitative and quantitative way. The supporting activities should generate the finances necessary to realise this ambition. The role that they perform is supporting, initiating and facilitating for recreation and tourism. Currently the RGV maintains 542 km of bicycle paths on the Veluwe. RGV is not directly involved in the Heart of the Veluwe-project, but is part of the core team of Veluwe2010.

The province of Gelderland (**PG**) strives for a sustainable balanced development of economy and ecology as described in policy of Veluwe2010. They want to develop the CVN (Central Veluwe Nature area) into one coherent nature, culture and forest landscape, with as little barriers for people and animals as possible. The province desires to conserve the biodiversity, serenity, space and high quality of environment and water, together with excellent modern recreational provisions. They intend to decrease the traffic on the byroads and achieve all the goals through an optimal cooperation of all stakeholders.

**NL-RNT** is an agency of the facilitator, who has a great deal of with of experience with issues concerning nature and recreation. The mediator has worked for the NP Hoge Veluwe before and is very familiar with the situation in the area.

The recreation expert (Mr. Goossen) from **Alterra** is asked to verify the recreational approach in the method.

## Appendix 5      Scenario descriptions

Scenario 1, east-west route: at the moment of this study the stakeholders of Heart of the Veluwe-project consider the creation of an east-west bicycle route from Oud Reerst to Delerwoud through the NP Hoge Veluwe. They discuss a possible closure of the road between Delen and Hoederloo, 'the Deelenseweg' for cars. This road could be changed to a bicycle and invalid route with passageways for the east-west bicycle route into NP Hoge Veluwe. Automatic ticket selling machines on these entrances can provide admission tickets for the park. Along the Deelenseweg they are planning to create corridors for the exchange of wildlife. The wildlife from HV can then roam freely towards the east, and cross the A50 on wildlife exchange point 'Terlet' into the NP Veluwezoom.

Scenario 2, 'open': a fantasy scenario in which all fences will be removed from the area and the stakeholders will have to find an alternative for the entrance fees. The fences will only enclose the main attractions (museum, museonder, St. Hubertus) in the National park. The Deelenseweg will be close and the speed on the surrounding roads: N310 N304, N224, and all smaller roads in the area will be reduced to 60 km/h. An agreement will be made with the Ministry of Defence to leave the Harskampse zand. One option to finance this scenario is a tax system that applies to all the people that profit from the area (e.g. 5 euro pp/pd for people who stay in holiday homes, campsites, diners, and cafés). The revenue can be divided between the landowners (National parks, counties and foundations) for nature management purposes.



## **Appendix 6            Tasks for facilitating integrative negotiations**

Van Meegeren & Leeuwis (1999) have identified the following tasks that need to be addressed when facilitating integrative negotiations:

### **Task 1: Preparation**

- exploratory analyses of conflicts, problems, relations practices, etc. in a historical perspective (conflict assessment)
- selecting participants who feel interdependent (possible package deals)
- securing participation by stakeholders (depending on BATNA: Best Alternative To a Negotiated Deal and the sense of urgency)
- establishing relations with the wider political environment

### **Task 2: Preliminary protocol**

- Creating a code of conduct and a provisional agenda (the role of the process manager)

### **Task 3: Joint exploration and situation analysis**

- group formation
- exchange perspectives, interests and goals
- analysing problems and interrelations
- integration of visions into new problem definitions
- preliminary identification of alternative solutions and 'win-win' situations
- identify gaps in knowledge and insight

### **Task 4: Joint fact finding**

- developing and implementing an action plan to fill the knowledge gaps

### **Task 5: Forging agreements**

- spelling: clarifying positions, making claims, use of pressure to secure concessions, create and resolve impasses
- securing an agreement on a coherent package of measurements and action plans

### **Task 6: Communication of representatives with constituencies**

- transferring the learning process
- 'ratification' of the agreements by the constituencies

### **Task 7: Implementation**

- implementing the agreements made
- monitoring implementation
- creating contexts of re-negotiation

