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ACT group 1724

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A SUSTAINABLE FUTURE OF THE JUNIPERBOS:

Assessment of development scenarios and providing recommendations for the sustainable future of the Juniperbos

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Final version

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Executive summary

The Juniperbos is a forest in the Westrand of Apeldoorn, for which a number of development scenarios have been published by the municipality. The conflicting interests and incentives of stakeholders need to be addressed in order to facilitate a sustainable future of the Juniperbos area. The present report will assist in finding a feasible solution for development in the area in three ways.

1. Evaluation of the value of the Juniperbos

Firstly, the forests ecological, sociocultural and economic values are evaluated to close the knowledge gap regarding the importance of the Juniperbos. The ecological value of the Juniperbos consists of several rare habitats and protected species. Additionally, the Juniperbos has a wider function in assisting in the conservation of the Veluwe Natura 2000 areas a whole. The sociocultural value of the Juniperbos is its use for dog-walking, its benefits for relaxation and health, as well as its uniqueness in the area of Apeldoorn as 'a forest in the city'. The economic value of the Juniperbos area is of two forms. Firstly, considerable revenue is generated by the attraction parks. Secondly, the ecosystem services from the nature in the area also represent considerable economic value. Of these, a monetary value of groundwater infiltration is established. The Juniperbos itself therefore bears considerable value for both nature and society, which needs to be taken into concern during the planning process of any development in the area.

2. Legal Analysis

Secondly, the legal regulations that apply to the Juniperbos are reviewed in order to establish the relevant criteria for restrictions to development. It is found that European legislation of the Natura 2000 network, namely the Birds Directive and the Habitats Directive, take priority to Dutch national laws due to the hierarchy of laws. In this case, article 6 of the Habitats Directive is crucial in the context of the Juniperbos as it delineates general rules and restrictions. Furthermore, it states the necessary steps, which need to be taken into account when planning and undertaking development. Additionally, much national legislation applies to the area, namely the nitrogen deposition regulation (PAS), the groundwater protection area regulations, and the silence policy area regulations. The legal regulations of both European and national regulations in this context, which determine restrictions as to how development can occur in the area, should therefore be considered when planning. These regulations constitute the legal criteria, which need to be met in a final development plan.

3. Assessment of existing development scenarios

Thirdly, the existing development scenarios are assessed in terms of the legal criteria and their impact on the value of the Juniperbos. It is found that three out of the four existing development scenarios largely fail to conserve the values inherent to the Juniperbos and fail to comply with the relevant legal restrictions, while only one of them appears feasible for implementation, under the condition of some adjustments. Specific recommendations regarding the adjustment of each individual development scenario are given in order to meet the legal restrictions and to reduce the impact on the value of the Juniperbos. Additionally, general recommendations, which apply to all of the scenarios are given to assist stakeholders in the establishment of a final development plan. First and foremost, because none of the existing development scenarios fully comply with the applying legislation, it is crucial to assess the legal feasibility *prior* to the start of development. Second, the

compensation measures for natural areas are a crucial aspect to consider in order to maintain the ecological values of the area and to comply with nature conservation legislation. Thus, compensation measures need to be carefully planned *before* development is undertaken and habitats are compromised. The third general recommendation regards the inclusion of another stakeholder, namely the water utility company Vitens, which was not included in the initial process of development scenario creation. The fourth recommendation is to conduct research on the expected number of tourist arrivals and the expectations of potential visitors, in order to assess the potential profitability of development.

Concluding, this report assists the planning process in the Westrand of Apeldoorn through an evaluation of the values inherent to the Juniperbos, a legal analysis of the applicable legislation and an evaluation of existing scenarios which result in general recommendations.

Key words

Westrand | Apeldoorn |Veluwe | Juniperbos | Attraction parks | Spatial development | Forest | Natura 2000 | Landscape approach | Ecological value | Sociocultural value | Economic value

Managementsamenvatting

Het Juniperbos is een bos in de Westrand van Apeldoorn waarvoor verschillende ontwikkelingsscenario's zijn gepubliceerd door de gemeente Apeldoorn. Om een duurzame toekomst van het Juniperbos mogelijk te maken, moeten de tegenstrijdige belangen en beweegredenen van verschillende betrokkenen in acht worden genomen. Dit rapport zal op drie manieren bijdragen aan het vinden van een realiseerbare oplossing voor het ontwikkelen van het gebied.

1. Evaluatie van de waarde van het Juniperbos

Allereerst worden de ecologische, socioculturele en economische waarden geëvalueerd om het gebrek aan kennis over het belang van het Juniperbos op te vangen. De ecologische waarde van het Juniperbos is te vinden in het feit dat er verschillende beschermde diersoorten te vinden zijn evenals speciale habitattypen. Daarnaast heeft het Juniperbos ook een ecologische waarde en functie vanuit een wijder perspectief, namelijk in de bescherming van de Veluwe als een Natura 2000 gebied in zijn geheel. De mogelijkheid tot het uitlaten van de hond, haar baten bij ontspanning en gezondheid en de uniciteit van het Juniperbos zijn de socioculturele waarden die worden gehecht aan dit stuk bos. Tenslotte heeft het Juniperbos economische waarde. Deze economische waarde is tweeledig en bestaat uit zowel de omzet die wordt gegenereerd uit de attractieparken als de omzet uit ecosysteem diensten die het bos faciliteert, zoals grondwaterwinning. Hieruit kan worden opgemaakt dat het Juniperbos van maatschappelijke en natuurlijke waarde is. Het is belangrijk dat deze waarden worden meegenomen in het verdere proces van deze toekomstverkenning.

2. Analyse van wetgeving

Vervolgens is de wetgeving die van toepassing is op het Juniperbos besproken om op die manier de beperkingen te identificeren wat betreft bouwactivteiten. De voornaamste wetgeving waarnaar gekeken moet worden, is de Europese wetgeving omtrent Natura 2000. Het gaan dan met name om de Vogelrichtlijn en Habitatrichtlijn. Binnen dit rapport wordt aan deze Europese richtlijnen prioriteit gegeven aangezien ze gevolgd moeten worden in het Nederlandse beleid. In de huidige context van het Juniperbos is voornamelijk artikel 6 van de Habitatrichtlijn cruciaal aangezien dit artikel de algemene regels en beperkingen aanduidt. Daarnaast worden in dit artikel de verschillende stappen verwoord welke moeten worden genomen wanneer er ontwikkelingsactiviteiten worden ontplooid in Natura 2000 gebieden. Naast deze Europese wetgeving zijn er additionele Nederlandse wetten waar rekening mee gehouden dient te worden, namelijk de Programma Aanpak Stikstof, regelgeving in grondwaterbeschermingsgebieden en die in stiltebeleidsgebieden. Zowel de Europese als Nederlandse wetgeving is van belang bij het opstellen van toekomstige plannen. Deze regelgeving is vertaald naar verschillende wettelijke criteria welke in acht zullen moeten worden genomen in toekomstige gebiedsontwikkelingen.

3. Beoordeling van de bestaande scenario's

De derde manier waarop dit rapport bijdraagt, is door het beoordelen van de bestaande scenario's. De scenario's worden beoordeeld op basis van de criteria zoals opgesteld met behulp van de wettelijke analyse. Daarnaast wordt beoordeeld hoe de verschillende waarden van het Juniperbos beïnvloed worden door de scenario's. Wanneer men deze waarden en wettelijke criteria in acht neemt, is er slechts één scenario dat hieraan voldoet en dus geschikt is om verder uit te werken. Per

scenario worden enkele specifieke aanbevelingen gegeven die erop gericht zijn dit scenario te verbeteren en te zorgen dat het scenario voldoet aan de wettelijke criteria en bijdraagt aan de instandhouding van de waarden. Daarnaast zijn er enkele algemene aanbevelingen, die ondersteuning bieden bij het uitwerken van het uiteindelijke plan. Aangezien geen van de scenario's momenteel in zijn geheel voldoet aan de wettelijke criteria, is de eerste aanbeveling om deze wettelijke criteria grondig te onderzoeken vóór implementatie van één van de scenario's. Er moet worden gezorgd dat de toekomstige gebiedsontwikkeling voldoet aan alle criteria. Onder de wettelijke verplichtingen in beschermd gebied valt ook de verplichting tot compensatie. De maatregelen die moeten worden genomen om te compenseren zijn cruciaal om de ecologische waarden van het gebied te waarborgen. De maatregelen moeten daarnaast natuurlijk voldoen aan de wettelijke eisen die hieraan worden gesteld. Het is dus wederom belangrijk deze maatregelen voor compensatie voorafgaand aan de nieuwe ontwikkelingen te toetsen en habitatten te compenseren. Ondanks dat vele verschillende stakeholders betrokken zijn geweest bij de totstandkoming van de vier scenario's, was het waterbedrijf Vitens niet betrokken bij dit proces. De derde aanbeveling betreft daarom ook het in acht nemen van de strikte wetgeving omtrent waterwingebieden. Dit kan worden gedaan door de ontbrekende betrokkene, Vitens, te betrekken bij het uitwerken van het uiteindelijke plan. De laatste aanbeveling is gebaseerd op het feit dat weinig specifieke data beschikbaar was wat betreft bezoekers aan Apeldoorn en hun bezoekersprofielen. Met de wens van Apeldoorn om een toeristisch toplandschap te worden, zijn data over huidige bezoekersaantallen en verwachte bezoekersaantallen een cruciaal startpunt. Deze data is dan ook van belang in het achterhalen van de uitvoerbaarheid van de plannen.

Al met al draagt dit rapport op verschillende manieren bij een duurzame toekomstige gebiedsontwikkeling. Dit werd gedaan door het evalueren van de waarden van het Juniperbos, het verschaffen van wettelijke criteria toepasbaar op het gebied en tenslotte een evaluatie van de huidige scenario's en het geven van verschillende aanbevelingen.

Trefwoorden

Westrand | Apeldoorn |Veluwe | Juniperbos | Attractieparken | Ruimtelijke ontwikkeling | Bos | Natura 2000 | Landschapsbenadering | Ecologische waarde | Sociaalculture waarde | Economische waarde

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Terminology

Attraction parks: refers to the attraction parks present in the area of the Westrand, namely the Julianatoren, the Boschbad, the Apenheul and Paleis het Loo.

Birds Directive: refers to the European Directive adopted in 2009, which concerns the conservation of wild birds which occur within the EU.

Development plan: refers to the final plan for development in the area, which will be implemented.

Development scenario: refers to the scenarios as developed by the municipality of Apeldoorn; sometimes referred to as solely scenario.

Fauna manager: civil servant employed by the municipality of Apeldoorn who responsible for the maintenance of local forests.

Flora- en faunawet: Dutch legislation, which protects certain animal and plant species.

Groundwater extraction area: Designated vulnerable and protected area by the province and privatised by the water utility company (Vitens), in this cased fenced to ensure the quality of the water since the groundwater will reach the water pumping station within 1 year.

Groundwater infiltration site: Designated area by the province, in which water infiltrates into the soil.

Groundwater protection area: Designated vulnerable and protected area by the province with strict regulations, in which groundwater will reach the extraction site within 25 years.

Habitat Directive: refers to the European Directive adopted in 1992, which concerns the conservation of habitat types and wild flora and fauna which occur within the EU.

Juniperbos: forest at the westside of Apeldoorn, bordered by the Amersfoortseweg in the north, and the J.C. Wilslaan as well as the Soerenseweg in the south.

Legal criteria: refer to the criteria (as established through the legal analysis), which are used for the evaluation of the scenarios.

Municipality: refers to the municipality of Apeldoorn.

Nature tourism: refers to visitation to the Veluwe with the main purpose of experiencing nature.

Province: refers to the province of Gelderland.

Recreation: refers to any leisure activity conducted in natural areas.

Scenario: refers to the development scenarios when the word development or development scenario is used more often in the sentence.

Silence area: area designated by the province of Gelderland for, which limits are set to prevent noise pollution. For silence areas the standard is set at an average of 40 dB.

Silence policy area: are areas designated by the province of Gelderland in, which noise pollution should be stabilized or reduced. There is no average decibel limit.

Value: by this it is mainly meant that an indication of a value can be given.

Westrand: the area between Paleis Het Loo in the north, one of the attractions located at the westside of Apeldoorn, and the railway in the south.

1. Introduction

The Juniperbos is a small area of forest located at the western edge of Apeldoorn (Figure 1.1). The forest is bordered by the Amersfoortseweg in the north, the J.C. Wilslaan and the Soerenseweg in the south. The Juniperbos itself is part of the Veluwe - a larger forest and heathland region surrounded by the cities of Apeldoorn, Arnhem and Harderwijk (Figure 1.1). Due to the ecological values of the Veluwe, the forest, as part of the Veluwe, is subject to nature conservation legislation in the network of Natura 2000. The Natura 2000 network was established on a European level in order to prevent declines in biodiversity (Provincie Gelderland, 2009).

Figure 1.1: Location of the Veluwe (a; indicated by the brown outline), the Juniperbos (b; red outline) & Julianatoren (c; purple outline). Map a. and b., as adapted from Google, 2016, retrieved from https://www.google.nl/maps/. Map c., as adapted from DigitalGlobe/Aerodata international Surveys, 2016, retrieved from https://www.google.nl/maps/.

The Juniperbos area further contains enterprises offering leisure activities. Located in the north of the forest is the attraction park 'Julianatoren' (Figure 1.2). The area which is privately owned by the management of the attraction park has recently been significantly enlarged, and the park management has gone public with expansion plans (BRO, 2014; De Stentor, 2015; Looopings, 2015). However, the newly acquired territory is for most part not actively in use yet. The expansion plans of the Julianatoren have experienced opposition from other stakeholders, including local residents and environmental groups (Oppenhuizen, 2016; De Stentor, 2016). Therefore, there is a conflict of interests between groups representing the conservation of the Juniperbos and the economic, attraction park development of the area. One of the parties involved is the foundation 'Stichting Behoud Juniperbos', which aims to project flora and fauna within the Juniperbos and who have commissioned this research project. These conflicting interests of stakeholders in the region are often perceived to be contradictory, leading to complications in the decision-making process for a development plan. A compromise between the development of the attraction parks and nature conservation needs to be found, before the decision on the final development plan can be made. Apart from these conflicting interests, the area experiences parking and traffic problems that need to be addressed in a development plan. These parking and traffic problems are partly due to the presence of the different attraction parks.

This is further complicated through the legal restrictions posed by the Natura 2000 network, which sets a legally binding array of rules to be applied and implemented in the Juniperbos area. Therefore, the central problem that this research report will address is a knowledge gap about the potential implications of possible development in the Juniperbos area regarding the inherent values of the Juniperbos itself as well as the legal restrictions set by Natura 2000. This report will assist the stakeholders in their decision-making process by addressing the identified knowledge gap.

The municipality of Apeldoorn used the input of different stakeholders to establish four different development scenarios for the Westrand, which were presented to the public in September 2015. The Westrand is defined as the area between Paleis Het Loo in the north, one of the attractions located at the westside of Apeldoorn, and the railway in the south (Figure 1.2) (Gemeente Apeldoorn, 2015). The goal of these development scenarios is to create a long-term future for the area, in which different stakeholders, inhabitants, enterprises and organisations as well as the locally specific assets of the Veluwe are represented (Gemeente Apeldoorn, 2015). The future development scenarios give a general impression of how nature, attraction parks and living could be represented in the area. However, these scenarios are not conclusive and provide opportunities for discussion. A decision on a final development plan has not been made yet and therefore this report will contribute to the discussion about the development scenarios in order to find a feasible development plan for a sustainable future of the Juniperbos.

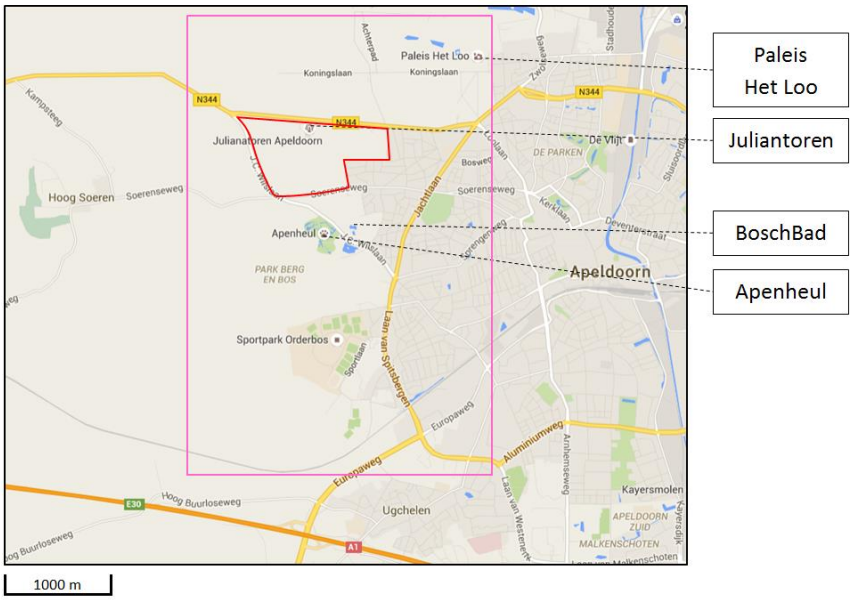

Figure 1.2: Location of the Westrand (indicated by the pink outline), Juniperbos (red line) and big attraction parks close to Apeldoorn. As adapted from Google, 2016, retrieved from https://www.google.nl/maps/.

Initially, a theoretical framework of the landscape approach will be outlined in order to explain the scope of this research. Subsequently, the ecological, sociocultural and economic values of the Juniperbos itself will be examined by conducting three short research studies, hereby addressing the first identified knowledge gap regarding the significance of the Juniperbos. Afterwards, the legal rules and restrictions of the Natura 2000 network and other relevant regulations are examined closer, and legal criteria relevant for the decision on a development plan are elaborated on. Subsequently, potential impacts of development in the area are assessed regarding the potential effects on ecological, sociocultural and economic values. Following, the development scenarios are examined with regards to the conservation of these values and the compliance with the legal criteria. Additionally, several suggestions will be given to adjust the development scenarios to the values as well as the criteria stipulated by legislation. Lastly, the findings of this project will be critically discussed, and a conclusion to the report will be drawn.

2. Theoretical perspective: the landscape approach

To provide a sound analysis of the previously mentioned values, it is necessary to explain some fundamental underlying theory to allow for interpretation of results. Crucial with regards to this project is the concept of a landscape approach in nature conservation. Therefore, a literature review on the theory of the landscape approach has been conducted in order to establish this theoretical framework. The landscape approach is developed out of an observed need to shift the focus of nature conservation away from small, locally protected areas to a broader scale of protecting natural landscapes as whole (Noss, 1983; Sayer et al., 2013). The term 'landscape' is hereby defined as "a land mosaic composed of spatial elements and ecological units defined by both structure and function, making up a matrix of patches" (Forman & Godron, as cited in Freeman, Duguma, & Minang, 2015, Section 2, Landscapes subsection) that are used for varying purposes. However, in practice all landscapes are social constructs and the definition of a landscape lies largely in the eye of the beholder (Maginnis, Jackson, & Dudley, 2004).

The perceived need for this shift in scale at which nature conservation acted resulted from the recognition of fundamental ecological concepts, namely the principles of meta-populations, island biogeography and edge effects. The concept of meta-populations was first described in the 1960s as 'populations within populations' (Levins, 1969). It describes a situation in which plant and animal populations, rather than being homogeneously distributed across a landscape, consist of separate sub-populations within themselves (Figure 2.1). Populations of a wide range of flora and fauna exist as meta-populations - particularly those found in areas of fragmented natural habitat (Hanski & Gilpin, 1991). At any given time, some sub-populations forming the meta-population as a whole will be extinct. However, as long as at least some of the sub-populations persist than the extinct sub-populations can be repopulated in the future.

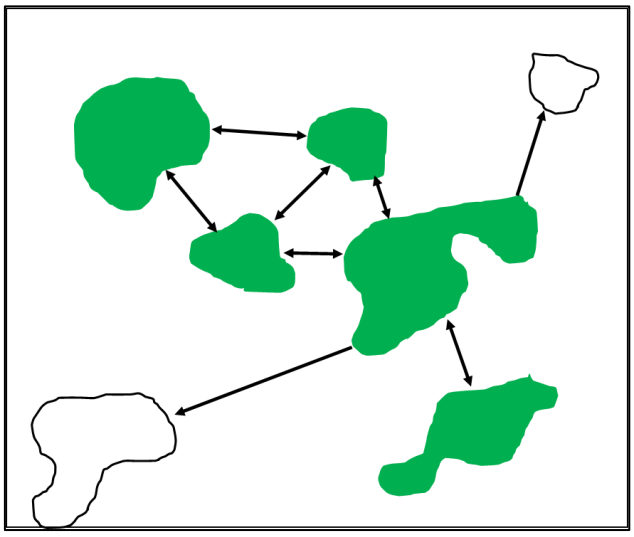

Figure 2.1: Schematic depicting the meta-population theory of ecological systems (original). The total area inhabited by a species consists of smaller sub-population 'patches'. A few individuals may move between sub-populations (double-sided arrows) maintaining connectivity within the population as a whole. Furthermore, at any given time some of the sub-populations may be extinct (white) whilst others will persist (green). However, extinct population can be recolonised at a later date from persisting populations (single-sided arrows) meaning the population as a whole will persist into the future.

Another fundamental ecological principle necessary to understand the need for the landscape approach is island biogeography. Island biogeography does not merely relate to oceanic islands in a literal sense, but to the concept of an 'island' as an area of habitat surrounded by another habitat type. For example, a patch of forest surrounded by agricultural field could be considered an island. Decades of research on island biogeography have demonstrated that the larger an island is and the better it is connected to other islands than the greater the number of species that will be found on that island (Figure 2.2) (Jean, Burnside, Carlson, Smith, & Guégan, 2016; MacArthur & Wilson, 1967; Simberloff, 1974).

Similar principles of island biogeography can also be applied to the sub-populations found within a meta-population, which inhabit patches of habitat that can be considered as 'islands' (Hanski & Gilpin, 1991). The larger the patch of habitat and the closer it is to other habitat patches than the more likely it will be that this habitat patch is inhabited by the said species at any given time and the less likely that the sub-population will be extinct (Hanski, 1998). Larger habitat patches that are closer to other habitat patches will be recolonised faster following the extinction of the sub-population inhabiting that patch (Hanski, 1998).

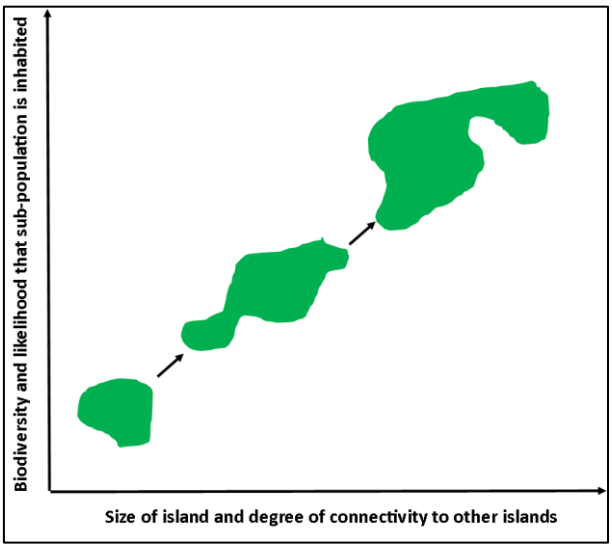

Figure 2.2: Graph demonstrating the island biogeography (original). The larger and better connected an island is than the greater the number of species inhabiting it and the greater the likelihood that a sub-population will be present there as part of a meta-population and the quicker it will be recolonised following an extinction event.

The final concept crucial to the landscape approach is that of edge effects. This concept demonstrates that the environment at the edge of a habitat area is different to that of the core of a habitat area, which therefore results in different biological communities (Figure 2.3). For example, consider the patch of forest in agricultural fields again. The effects of the agricultural fields surrounding the forest will occur along a gradient and deep into the forest itself. Therefore, the core of the patch of forest will have a different environment and different communities than the edge of the forest patch. Research indicates that, with regards to forests in particular, edge effects can be seen far from the actual boundary between habitat types with increased disturbance from wind being felt up to 400 m from the forest boundary (Laurance et al., 2002).

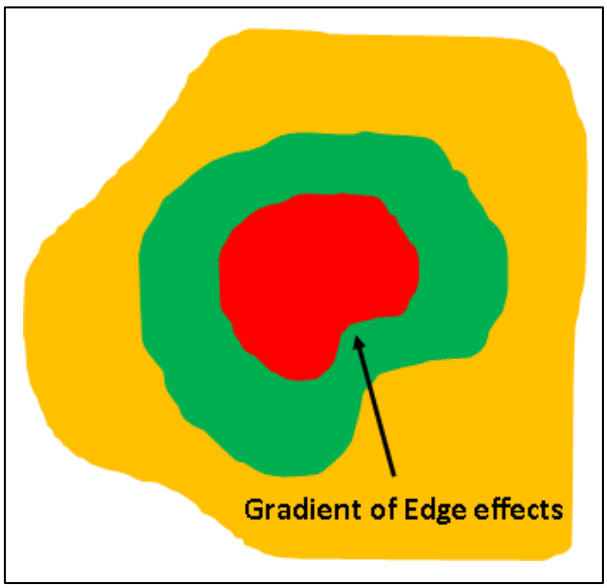

Figure 2.3: Schematic diagram demonstrating edge effects (original). The environmental effect of the agricultural field (yellow) occur deep into a habitat fragment as indicated by the arrow. The periphery of the forest patch (green) will experience edge effects along a gradient of intensity with the highest being found at the edge of the agricultural field moving towards the centre where no edge effects are experienced (red). Only the core area will remain unaffected by the surrounding agricultural fields.

After gaining an understanding of these fundamental ecological concepts, it becomes clear why it is necessary to conserve natural landscapes as a whole, rather than focussing on small local reserves. Most importantly, the final concept crucial to the landscape approach is that of edge effects. This concept demonstrates that the environment at the edge of a habitat area is different to that of the core of a habitat area, which therefore results in different biological communities (Figure 2.3). For example, consider the patch of forest in agricultural fields again. The effects of the agricultural fields surrounding the forest will occur along a gradient and deep into the forest itself. Therefore, the core of the patch of forest will have a different environment and different communities than the edge of the forest patch. Research indicates that, with regards to forests in particular, edge effects can be seen far from the actual boundary between habitat types with increased disturbance from wind being felt up to 400 m from the forest boundary (Laurance et al., 2002).

These concepts demonstrate that the size of a habitat is crucial if species biodiversity (the number of different species as well as the relative numbers of each of those species) is to be maintained and that it is of the utmost importance to reduce impacts that will threaten the size of natural areas. Maintaining the size of natural areas is also important in terms of conserving species that are specialised to the core areas. If patches of habitat are reduced in size by removing habitat from the edges than the edge effects will extend deeper into the remaining habitat. If the habitat is reduced in size to the extent that the edge effects are operating throughout the habitat than species that can only survive in core of the habitat will disappear (Laurance & Yensen, 1991). Furthermore, it is important to conserve all of the habitat patches forming the meta-population in order to conserve wildlife populations as a whole. Focussing on conservation at the local sub-population level at the expense of the remaining populations means, that there may not be a sub-population to help repopulating organisms in the event of an extinction. Conserving populations of organisms at the sub-population level is unlikely to be sustainable in the future. Additionally, it is crucial to maintain connectivity between sub-populations, for instance by promoting low-impact land use between areas accommodating sub-populations. Therefore, it is important to consider the broader area through a

landscape approach to adequately conserve natural areas in order to account for these ecological effects.

Considering nature conservation at the landscape level also necessitates the consideration of the sociological and economic impact and value of a particular landscape, as a landscape will almost invariably be inhabited or utilised by multiple stakeholders (Freeman et al., 2015). For instance, when conserving a large area at the landscape level, some areas can be strictly assigned for the purpose of nature conservation, whilst other areas can allow commercial activity such as low-impact agriculture in order to maintain connectivity between the strict natural areas. Furthermore, the ecological and social value of landscapes are closely intertwined, which has prompted a shift in conservation perceiving community involvement as essential to the conservation of natural areas rather than a force acting against it (Agrawal & Gibson, 1999; Saunders, 1990). The landscape approach therefore emphasises the multifunctionality of these landscapes for the benefit of people and nature (Sayer et al., 2013). Conservation strategies should therefore also address the needs of people living and working within these landscapes (Sayer et al., 2013). The landscape approach promotes a large-scale perspective of the landscape as a whole which will be more valuable than any particular part of that landscape individually. Therefore, the landscape approach will affect this project in terms of the scale at which the value of the Juniperbos is considered as well as the potential threats to this wider value taking into account the multifunctionality of the landscape as a whole. Concluding, the Juniperbos should be regarded as part of the larger conservation area of the Veluwe, instead of a smaller and separately protected area.

3. Valuation of the Juniperbos

3.1 Introduction to the values

In order to effectively determine what the impact of future development scenarios of the Juniperbos might be, it is important to gain some insight into the ecological, sociocultural and economic values of the Juniperbos. Developing a thorough valuation of a natural area is a difficult task because values are often interconnected, which can make it difficult to distinguish between them (Turner et al., 2003). Many values are of indirect nature, so the exact contribution of the particular natural area being considered is even more difficult to determine (Turner et al., 2003). Additionally, the values of an area may also be unquantifiable or intangible, thus adding to the difficulty in assessing the overall value of an area. Furthermore, values of natural areas are often scale dependent (Turner et al., 2003). At the most local level, stakeholders will likely be focussed on more immediate short-term values whilst at larger scales stakeholders will likely be more concerned with longer term values. Whilst several effective valuations of ecosystems have been conducted at a global or regional level valuation at a more local level has remained elusive creating a dearth of information for local decision makers (Costanza et al., 1997; Turner, Adger, & Brouwer, 1998; Turner et al., 2003).

Due to these complications, providing a complete valuation of the Juniperbos area is beyond the scope of this report. Instead, this report will provide an indication of the value of the Juniperbos, so that an indication of the potential impact of the proposed development scenarios for the area can be provided. In line with the landscape approach, this report will consider the values of the Juniperbos both at the local scale as well part of the landscape as a whole. The indication of the values will also account for the multifunctionality of the Juniperbos area to ensure that all types of values have been considered. Additionally to the ecological value of an area, the Habitats Directive suggests to "take account of economic, social and cultural requirements, ... regional and local characteristics" (Habitats Directive, 1992, art 6). As a result, this section of the report will consist of three parts, each discussing one of the categories of value as follows:

1. Ecological value
2. Sociocultural value
3. Economic value

3.2 Ecological values of the Juniperbos

This section will discuss the ecological value of the Juniperbos in terms of the species that are present there as well as the ecologically important habitat types that can be found in the immediate area. Additionally, in line with the theoretical perspective previously explained, the value of the Juniperbos in terms of preserving the ecological value of the Juniperbos as a whole will be discussed.

3.2.1 Species present in the Juniperbos

Personal communication with the fauna manager indicated the presence of several mammal and bird species, including some of national conservation priority such the European badger (*Meles meles*) or the stag beetle (*Lucanus cervus*), which are mentioned in the European Habitats Directive and Birds Directive (Local fauna manager, personal communication, 30 May 2016). Additionally, reports published by two ecological consultants as well as recorded sightings from volunteers indicate the

likely presence of several protected species including 37 species protected under the Flora and Fauna Law (Dutch: Flora- en Faunawet; BWBR0009640), 4 species protected under the Habitats Directive and 6 species protected under the Birds Directive (Appendix 1).

3.2.2 Habitat types present in the Westrand

Data provided by the fauna manager of the municipality, whom is responsible for managing the nature of the Juniperbos area, indicated that approximately 9 hectares, about 7%, of the forest are particularly old for the Netherlands (being planted between 1878 and 1895) including areas that are immediately adjacent to the Julianatoren (Local fauna manager, personal communication, 30 May 2016). This makes these areas of forest particularly valuable from a conservation perspective as old growth forest, which has been planted between 1860-1899, represents less than 4.1% of the total forest cover of the Netherlands (Schelhaas et al., 2014). This includes an area of Scots pine (*Pinus sylvestris*) of approximately 5 hectares that was planted in 1878, only 1.4% of the forest cover in the Netherlands is of this age or older. Old growth forests such as these are widely acknowledged to be of considerable ecological value. Older and larger trees promote greater biodiversity by providing more habitat for various species including insects, fungi, birds and mammals (Carey & Johnson, 1995; Martikainen, Siitonen, Punttila, Kaila, & Rauh, 2000; Peterken, Ausherman, Buchenau, & Forman, 1992; Rosenvald, Lõhmus, Kraut, & Remm, 2011). Some species are particularly dependent on mature forest so they are often associated with this habitat type. For instance, the black woodpecker (*Dryocopus martius* L.) requires areas of mature forest for feeding and nesting (Garmendia, Cárcamo, & Schwendtner, 2006; Virkkala, 2006).

Within the Veluwe, certain plots have been assigned as special habitat types (recognized by the Habitats Directive) by the province of Gelderland, emphasizing the ecological value of the area. One of these special habitat types, beech and oak forest with holly is found in the Juniperbos approximately 450-500m west of the Julianatoren (Figure 3.1) (Provincie Gelderland, n.d.-a).

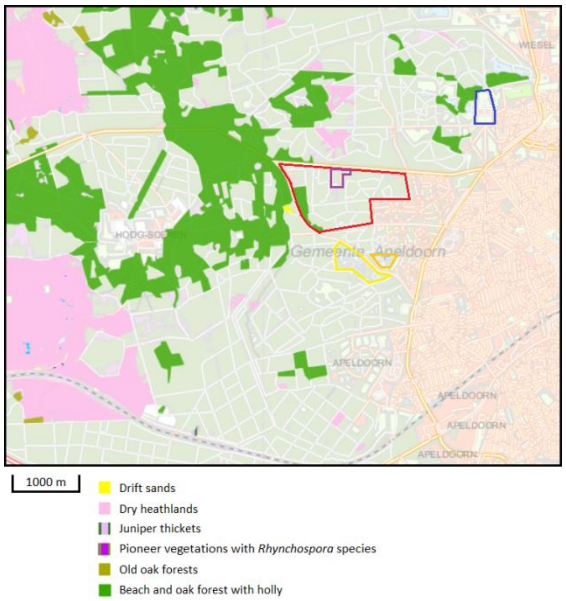

Figure 3.1: Location of the habitat types in and around the Juniperbos (indicated by red outline). The location of the local attractions parks have been indicated as well: Paleis Het Loo (blue), Juliantoren (purple), Boschbad (orange) and Apenheul (yellow) As adapted from Natura 2000, Provincie Gelderland, n.d-a, retrieved from http://flamingo.prvgld.nl/viewer/app/Natura2000.

This habitat is identified as being particularly threatened to loss of area and fragmentation (Alterra, n.d). Around 50% of the total surface of this habitat type is located in the Veluwe (Table 3.1). Besides beech and oak forest with holly, other special habitat types are located in the Westrand including dry heathlands, drift sands and juniper thickets (Table 3.1). Again, the Veluwe contains a large proportion of these habitat types within the Netherlands (Janssen et al., 2014).

Table 3.1. Surface of the habitat types present in and around the Juniperbos (Janssen et al., 2014; Provincie Gelderland, n.d.-a).

Habitat type	Location	Area within the Veluwe (ha)	Area within the Netherlands (ha)
Drift sands	Westrand (Apeldoorn)	2,406	4,258
Dry heathlands		11,200	22,700
Juniper thickets		139	520
Pioneer vegetation with *Rhynchospora* species		11	321
Mature oak forests		1,996	2,900
Beech and oak forests with holly	Juniperbos/ Westrand (Apeldoorn)	6,331 (9 ha located in the Juniperbos)	12,300

3.2.3 Juniperbos: the wider landscape value

In light of the landscape approach, it is crucial to discuss the ecological importance of the Juniperbos in terms of the wider landscape in which it is placed. The Juniperbos is located on the periphery of the eastern side of the Veluwe (Figure 3.2).

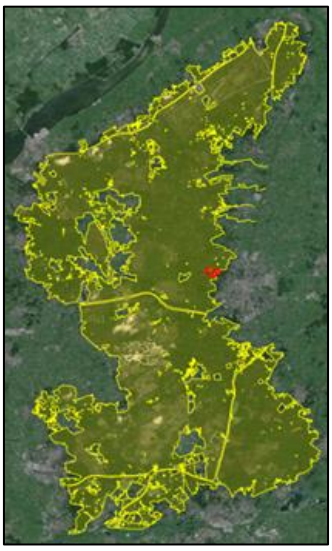

Figure 3.2: Satellite image showing the Veluwe (yellow) with the approximate location of the Juniperbos indicated (red). As adapted from Alterra, 2016.

The Veluwe consists of a variety of semi-natural landscapes such as heathlands, drift sand and agricultural land as well as containing the largest lowland forested area in north-western Europe (Jongman & Kamphorst, 2002; van der Heide et al., 2008). The area is of high conservation value due to its size and ecological importance. The Veluwe consists of a great diversity of landscapes

containing high levels of flora and fauna. Approximately 500 plant species have been documented in the area as well as a large diversity of fauna including a large number of nationally red listed species such wryneck (*Jynx torquilla* L.), raven (*Corvus corax* L.) and several reptile species (van der Heide et al., 2008). There are also two national parks inside the Veluwe area, 'De Hoge Veluwe' (5,500 ha) and 'Veluwezoom' (5,000 ha), both of which are among the largest and oldest national parks in the Netherlands.

About 20% of the area is covered by heathlands and drift sands, habitats known for their considerable biodiversity and unique flora and fauna (van der Heide et al., 2008). Heathlands are a threatened habitat in Europe and therefore are of special conservation concern (Berg, Vergeer, & Roelofs, 2003). Over the past few decades many heathlands, both in the Netherlands and in Europe in general, have reduced in area and experienced considerable biodiversity loss (Berg et al., 2003). They are particularly threatened by nitrogen deposition from pollution caused by agriculture and industry which results in the habitat of the heathlands shifting to one dominated by fast growing grasses which support less biodiversity (Bobbink, Hornung, & Roelofs, 1998; van Breemen & van Dijk, 1988). Therefore, the Veluwe is of considerable conservation value to the Netherlands, partly due to the large areas of heathland that is contains.

The Veluwe Natura 2000 site was designated taking into account the landscape approach, thus, is aimed at conserving the natural areas it contains by considering the landscape as whole- particularly to account for edge effects (Bennett & Mulongoy, 2006). Therefore, with regards to the Veluwe, all areas that have been designated as Natura 2000 can be considered the core whilst the areas which are adjacent to the site, including Julianatoren, can be considered as part of a buffer zone where human activities are regulated in order to avoid damage to the core areas through edge effects (Figure 3.3).

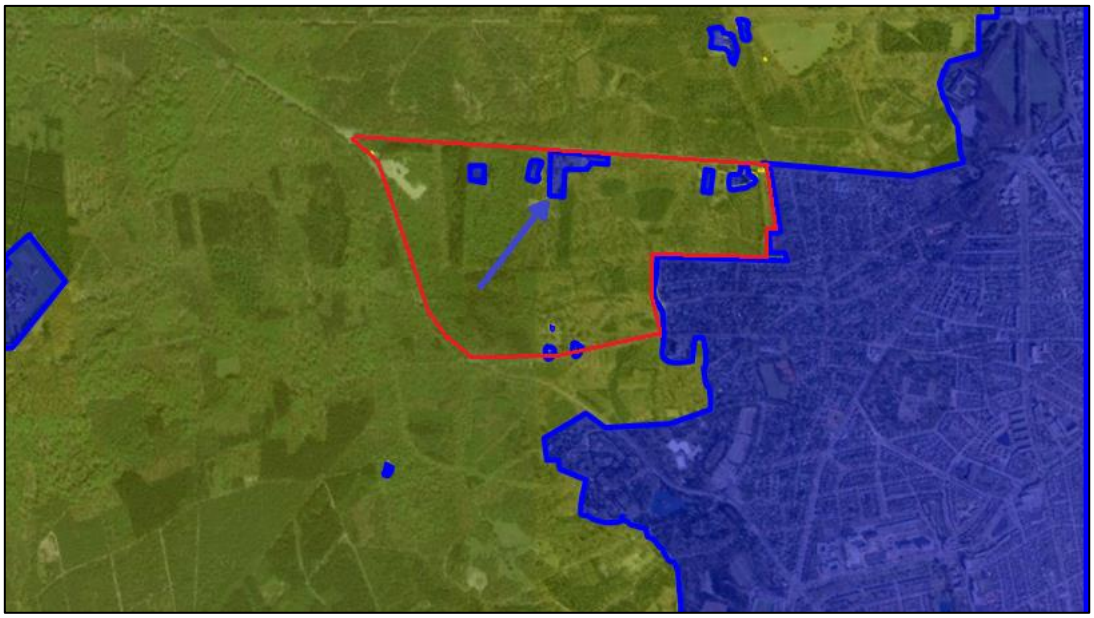

Figure 3.3: Map of the Westrand depicting an approximation of a hypothetical buffer zone (blue) including already existing sites that have been excluded from the Natura 2000 classification such as the Julianatoren (purple arrow). Surrounded by these areas is the core area of the Veluwe Natura 2000 site (yellow), among which the Juniperbos (red outline). As adapted from Alterra, 2016.

A buffer zone is an area around the outside of a conservation area where regulated human activity occurs, which surrounds the core of a protected area (Wind & Prins, 1989). This area of limited activity provides a zone around the periphery of the conservation area which buffers the ecologically important core zone from edge effects from the surrounding human dominated landscapes. The periphery of the core area may be of lower ecological value than the centre of the core because it is experiencing the edge effects from the buffer zone. However, the periphery of the core conservation area is still of crucial importance in conserving the ecological value of the conservation area as a whole as it is the area, which absorbs the edge effects from the surrounding buffer zone.

If detrimental development is allowed to occur in the buffer zone surrounding the Veluwe than the edge effects such as pollution, noise and other disturbances occurring from the surrounding human dominated landscape will have a greater impact on the area currently considered the core. Furthermore, if the peripheral areas are degraded, then this will cause the edge effects to be felt deeper into the core of the conservation area- effectively shifting the boundary of the buffer zone towards the centre of the core. These peripheral areas could become degraded either through directly being developed in a detrimental way or from increased edge effects from the buffer zone. In order to ensure that the area not being affected by edge effects does not become smaller, detrimental environmental impacts should be avoided even in the periphery of the core zone of the Veluwe. Due to the sensitivity of heathlands to nitrogen deposition, areas such as the Juniperbos may be particularly important in protecting the centre of the core area of the Veluwe from the higher nitrogen deposition levels caused by industry and traffic (Noordijk, van Hinsberg, van Jaarsveld, & van Pul, 2011).

Furthermore, if peripheral areas of the Veluwe such as the Juniperbos are degraded, this could reduce the area of habitat contained within the protected area. This could have potentially severe consequences on the ability of the area to sustain the biodiversity that is currently present, which is also demonstrated by the principles of island biogeography and meta-populations. Therefore, when considering the ecological value of the Juniperbos it is important to consider the ecological importance of the Veluwe as a whole.

In conclusion, the Juniperbos contains several rare and protected species as well as important habitat types of high conservation value. This demonstrates that the Juniperbos has considerable ecological value as well as having legal implications for how the area can be developed. Additionally, regardless of the local ecological value, the primary ecological importance of the Juniperbos is to protect the centre of the Veluwe from the edge effects of the surrounding human dominated landscape which includes the relatively large cities of Apeldoorn, Amersfoort and Arnhem as well as intensive agricultural areas. This includes sites such as the Julianatoren that existed prior to the Natura 2000 designation but, which have been excluded from the designation.

3.3 Sociocultural values of the Juniperbos

The following will analyse the sociocultural values that the Juniperbos bears for the local community of Apeldoorn. For this, a quantitative study by NBTC-NIPO Research will be summarised to show the residents' general preferences of recreational activities. Subsequently, a short qualitative study will be presented in order to give insight to the sociocultural values of the Juniperbos for its users. This section seeks to examine indicators of sociocultural values do users of the forest attach to the Juniperbos area.

3.3.1 Leisure preferences of the residents of Apeldoorn

Table 3.2. shows the findings of a quantitative study on the types of leisure activities that residents of Apeldoorn became engaged in. The findings are derived from a study concerned with how Dutch people spend their leisure time, which has been conducted by NBTC-NIPO Research (Gelders Overijssels Bureau voor Toerisme, 2011a). Understanding the types of recreational activities of the community helps assess the importance of the sociocultural values which are to be established.

Table 3.2. Leisure activities conducted by residents of the municipality of Apeldoorn. Activities as ranked in terms of percentage of residents who would partake in that particular activity*

Aspect	**Top 5**				
	1	**2**	**3**	**4**	**5**
Recreation	Recreational cycling (65%)	Recreational walking (55%)	Water recreation (47%)	Non-water recreation (39%)	Touring by car (34%)
Attraction parks	Fairs (45%)	Attraction parks, etc. (43%)	Zoos, etc. (40%)	Petting zoos (32%)	Playground (28%)

Gelders Overijssels Bureau voor Toerisme, 2011a

* The findings in this table are based on the combination of two datasets. One data set consists of 4,285 respondents who were surveyed for the activities they conduct throughout the year. The other data set consists of 16,038 respondents, who were questioned regarding their recreational activities during a week. The percentages state, how many people would state 'yes' for having participated in this activity. Only the results of Apeldoorn residents are included.

The results of this study show the dominant mode of leisure activities which residents of Apeldoorn are often involved in. The research demonstrates that the residents value attraction parks as a leisure activity, indicating to the popularity of attraction parks such as the Julianatoren. Overall, 55 - 65% of respondents are engaged in recreational walking or cycling outside. Therefore, outdoor activities are also valued highly. This data indicates the potential sociocultural value that both the recreation and attraction parks in the area could have. Due to of the scope of this project, the qualitative research into sociocultural values focusses on the meaning that is attached to the Juniperbos by its users, which is related to recreation. However, attraction parks, including the Julianatoren, are also an important activity for the inhabitants of Apeldoorn and further research would be needed in order to determine their sociocultural value.

3.3.2 Meaning of the Juniperbos to its users

Sociocultural values of an area can be established through the perspective of its users as they constitute the subjective emotions of attachment to the forest (Boeije, 2010). The concept of a 'value' in this context is an aspect of the environment which creates an emotional bond or attachment between individuals and places. Proshansky, Fabian and Kaminoff (1983, as cited in Ujang & Zakariya, 2015, p. 374) relate the "interplay of affects and emotions, knowledge and beliefs, and behaviours and actions" as a means of establishing an attachment to a place. Further, Altman and Low (1992) formulate the theory of place attachment and thereby establish a relationship between the meaning that users attach to a place and the local value of the place. They note that, when a group of people assign a specific meaning to a place, they establish a sociocultural value to it, which is constituted within the community itself (Altman & Low, 1992, p. 2) and which needs to be researched through qualitative research.

For this purpose, eight semi-structured in-depth interviews have been conducted. The interviews were transcribed, coded and key categories were established as the indicators of sociocultural value in the Juniperbos. For further methodological backgrounds, the interview guide and selected methods of data analysis (Appendix 5). Apart from the findings of the interviews about the meaning of the forest, it is interesting to look at the demographics of interviewees as well as the frequency of visits of the Juniperbos. The estimated age groups of the interviewees is between 35 years and 60 years. Five out of the eight interviewees are living in Apeldoorn, two interviewees live within a 20 km distance of Apeldoorn and one interviewee came to visit Apeldoorn from about 120 km away. Seven out of the eight interviewees visit the forest at least three times a week and therefore use the forest very frequently. Three interviewees state that they have been coming to the forest frequently for more than ten years to walk their dogs. This general information about the frequency of usage shows that the forest is a part of the interviewees' everyday life, as they return multiple times during the week. The coding process of the interviews revealed three key categories as indicators of sociocultural values of the Juniperbos for the community of Apeldoorn, which will be presented in the following.

Utility for dog-walking

The category of dog-walking appeared as the key category during the coding process, as most of the interviewees visit the forest for the purpose of walking their dogs. Seven out of the eight interviewees come to the forest with their dogs very frequently and state dog-walking as the main activity they undertake in the area. The interviewees appreciate the forest as an off-leash area, an area where it is allowed to let dogs run free without leashes. The Juniperbos is perceived as the only forest in Apeldoorn in which dogs can run free which is a valuable asset of the forest for the users. They also appreciate that the Juniperbos is the only place in Apeldoorn where there is both the space for the dogs to roam freely as well as the fences to make it a safe place. The Juniperbos is therefore valued as an ideal place to visit with a dog as the dog can safely run free alongside the owner. The interviewees also use the forest as a meeting place, where they meet up with their dogs in order to socialise and train them. Some of the forest users have known each other for a long time and also make appointments to meet each other to walk their dogs. The usefulness of the forest for dog-walking appeared as the most important aspect that users see in the Juniperbos and it constitutes an important sociocultural value for the community of Apeldoorn.

Relaxation and health benefits

The second important category that emerged during the coding process was the aspect of health and relaxation in the Juniperbos. Interviewees state that they enjoy the serenity and the calm environment in the forest which they contrast to the urban environment in the city. The forest is seen to be a crucial asset of Apeldoorn by the interviewees as it renders the city a more green and natural place to them. A concept which appeared repeatedly in this context was the idea that the forest enables people to escape from the city and experience the calm, natural environment in the Juniperbos. The sociocultural value in this is the factor of relaxation and the contrast to everyday life in the city, which some interviewees regard as benefiting their health – both mentally and physically. The stress relief triggered through time spent in the forest as a contrast of the perceived busy city life is seen as a benefit for the mental well-being of people. Another aspect considering health addressed in the interviews was the health benefit of walking through nature and doing exercise. Some

interviewees regarded the forest as beneficial for their physical health as they recurrently use it for hiking or running. These aspects show the importance the interviewees attach to the forest for health reasons.

Further, the users of the Juniperbos see the forest as a place to meet other people and to socialise. Some of the interviewees have already been coming to the forest for about a decade, so they have established close relationships to other users of the forest, who also frequently visit the forest. Here, the Juniperbos holds the sociocultural value of a meeting place for people sharing the same hobby or interest, and as a place where such relationships can be established and nurtured. Concluding, the Juniperbos is seen as an important place for recreation and relaxation benefiting the health of users as a meeting point for social contacts and as a contrast to the more urban areas in the city.

Uniqueness of the Juniperbos

The interviewees value the Juniperbos for its uniqueness in the region around Apeldoorn. When asked about the characteristics which mean the most to the respondents, they indicate different aspects which together illustrate the uniqueness of the Juniperbos in this area. For one, they appreciate the Juniperbos as the only forest in which dogs can roam free without a leash. Compared to the Juniperbos, other off-leash areas are rather small and do not fulfil the requirements of most dogs. Second, users value the Juniperbos for its age and diversity. Interviewees state that the trees are older than those of most other forests they have encountered in the Netherlands, which makes the Juniperbos stand out compared to the other forests. They note the diversity of the flora and fauna, which they perceive as a confirmation of the forests well-being. Third, an often recurring concept addressed during the interview is the proximity of the Juniperbos to the city of Apeldoorn, rendering it ‘a forest in the city’. Because the forest is so closely located to the city, it is a very convenient location for individuals to visit numerous times during the week without spending time on travelling there. The convenient location of the Juniperbos for inhabitants of Apeldoorn emerged as a concept of importance and appears to be an important feature of the forest to the interviewees. Overall, the uniqueness of the Juniperbos regarding its regulations for dog-walking, its size and relatively old age, as well as its proximity to Apeldoorn constitutes a substantial sociocultural value for the community of Apeldoorn.

Next to these main three topics, attraction parks in the area around the Juniperbos were also touched upon during the interview. However, although quantitative research shows the importance of attraction parks in leisure activities, this turned out not to be a main topic in the interviews. Most interviewees did mention that they were satisfied with attractions in the surroundings and the Julianatoren was the most often mentioned attraction. However, due to the age category of the selected interviewees, several of them mentioned that the Julianatoren used to be of greater importance to them when their children were younger. Since their children had grown up now, the Julianatoren decreased in terms of sociocultural values. Next to that, conducting the interviews at a different location, namely closer to the entrance and exit of the Julianatoren, might have led to different results in regards to the value of the Julianatoren.

Concluding, the Juniperbos is an area of noteworthy sociocultural value for the community of Apeldoorn. Considering that many of the valued activities of residents of Apeldoorn concern outdoor activities and nature related recreation, the Juniperbos constitutes a suitable area for recreation and leisure in the city. It bears sociocultural significance, as it is an ideal space for dog owners to walk

their pet, to enjoy the natural environment and walk for recreation. This is the most important sociocultural value found in the Juniperbos. However, the combination of its unique characteristics such as its age, size, regulations of usage and its proximity to Apeldoorn increase the importance of the forest for the community.

3.4 Economic values of the Juniperbos

This section will discuss the economic value of the Juniperbos in terms of monetary value that is generated in the area based on reviewing relevant literature. However, it is beyond the limitations of this report to calculate an exact economic value. Therefore, a brief overview will be provided focussing on the aspects that are regarded to be of important economic value. This will include a valuation of the attraction parks in the Juniperbos and Westrand which are important to the area. Additionally, an overview of the ecosystem services of economic value generated by the Juniperbos will be provided- both at a local level and as part of the wider landscape. However, due to the difficulty in establishing concrete economic values of most services, this report will only provide an exact monetary estimate of one of those services which has been identified as being of considerable economic value in other studies, namely groundwater infiltration (Hein, 2011). Determining economic value is considered to be of importance in ensuring proper policy and decision-making (Hein, 2011) which will contribute to the main aim of this project. Information on the economic value of the area has been obtained by reviewing published documents regarding the earnings of the attraction parks as well as literature reviewing the economic value of ecosystems services obtain from the Veluwe.

3.4.1 Valuation of attraction parks

Although exact figures have been unobtainable, it is reasonable to assume that the Julianatoren is a major source of economic value of the Juniperbos occurring alongside any economic ecosystem services that can be obtained from the area. The Julianatoren appears to be a very successful business and has expanded since its founding becoming a major visitor attraction for the area both for the local residents of Apeldoorn and for visitors from further afield (Monumenten Advies Bureau, 2013). The Julianatoren is among the top 5 most visited attractions in Gelderland (Gelders Overijssels Bureau voor Toerisme, 2011b). However, due to it being a private business no figures are obtainable[1] although it is estimated that annual average net turnover will be approximately €12 million derived from approximately 490,000 visitors a year (Table 3.3). Again, no data is available but it is assumed that the attraction park will directly employ a number of employees presenting further direct economic value. In addition, the impact of the Julianatoren may possibly be felt indirectly throughout the local area as people may also spend money at other local businesses within the Apeldoorn area such as restaurants, cafes and accommodation. However, the exact monetary value of this remains undetermined and can only be established through further research on the habits of visitors to the attraction parks.

Alongside the Julianatoren, there are three other significant visitors attractions in the immediate vicinity of the Westrand: Apenheul (a monkey zoo), Boschbad (a swimming pool) and Paleis Het Loo (a royal palace). They generate significant income representing considerable economic value as well

[1] The management of the Julianatoren were contacted in order to obtain further data on the economic value of the Juniperbos but they declined to participate.

as employing a large number of people (Table 3.3). These attractions are also among the top 10 largest attractions in Gelderland in terms of numbers of visitors (Gelders Overijssel Bureau voor Toerisme, 2011b).

Table 3.3: Visitor numbers, annual net turnover, annual turnover after operational costs and the number of people employed for the three main visitor attraction parks of the Westrand. Indicated is the year at which data has been obtained

Attraction park	Annual visitor numbers	Annual net turnover (€)	Annual turnover not including operation costs (€)	Number of employees
Julianatoren	490,000 (2013)	11,711,000* (rough estimation)	Unknown	Unknown
Apenheul	447,000 (2013)	8,659,000 (2013)	424,569 (2013)	~99 (2013)
Paleis Het Loo	356,386 (2015)	19,247,374 (2013)	2,923,982 (2013)	154 (2015)
Boschbad	No information available			

Stichting Apenheul, 2013 [Apenheul]; Kos, 2015 [Paleis Het Loo]; NBTC Holland Marketing, 2012, 2013 [Julianatoren]
* An estimate based on annual visitor numbers (490.000 visitors) and the average spending per visitor (€23.9 per visit).

3.4.2 Valuation of ecosystem services

Asides from the economic value of the Julianatoren and the other two attractions, the Juniperbos area can be valued economically at a local level in terms of ecosystem services (Table 3.4). Many of these ecosystem services operate at a local level within the Juniperbos (such as timber and house prices) whilst others only have a significant economic value when considering the Veluwe landscape as a whole. However, if the peripheral areas around the Veluwe, which the Juniperbos is a part of, are degraded and edge effects are felt deeper into the core than this may negatively affect the provision of these services. Establishing a definitive economic value for these services, particularly at a local level, is an extremely difficult task- especially those which are indirect such as house prices or revenues from tourism to natural areas. Studies examining the economic benefits generated by the National Park 'De Hoge Veluwe', along with other studies discussing economic value of the Veluwe, provide an indication of the relative economic value of these services for the Juniperbos at a local level as well as part of the Veluwe landscape (Hein, 2011; Schrijver, Beltman, & Boers, 2013) (Table 3.4). However, further studies are required to establish much of the economic value derived from ecosystem services- particularly at a local level.

Nature tourism

As well as tourism revenue generated by the attraction parks, the natural areas themselves provide a service by promoting further tourism and attracting visitors (Table 3.4). As there is little data available about visitors to Apeldoorn, it is not possible to review the contribution of non-ecosystem services compared to ecosystem services in regards to tourism and recreation. Further research is needed in order to provide reasonable estimates of the contribution of the natural areas around the Apeldoorn (namely the Veluwe) to the revenue gain by the tourism sector. Research conducted on the Veluwe as a whole suggests that the presence of the Veluwe likely contributes considerable economic value to the tourism sector but it currently remains unknown how this value compares to the revenue generated by the attraction parks as discussed previously. Previous estimates suggest that total expenditure from tourism in the Veluwe as a whole is approximately €490 million with

tourism related activities generating 6,200 jobs (Bloemberg, Riefel, & Wagenaar, 2011). This includes revenue generated directly through national park entrance fees as well as indirectly through revenue generated from businesses offering food and accommodation. The average amount of money spent by visitors in the region of Apeldoorn is currently below the national average (Gemeente Apeldoorn, 2014). This is why the municipality is keen on increasing the average amount of money spent in the area (Gemeente Apeldoorn, 2014).

Table 3.4: Overview of the ecosystem services that are of economic value and are either obtained from the Juniperbos at a local level or the wider landscape that the Juniperbos is a part of. Also provided is a relative indication of the relative contribution of this service to the overall economic value of the area.

Scale of ecosystem service	Category of service	Ecosystem service	Indication of economic value
Local (Juniperbos)	Provisional	timber	very low
		house prices	unknown
		groundwater filtration	high
		local recreation	unknown
	Regulating	air filtration	moderate
Landscape (Veluwe)	Provisional	timber	low
		game meat	low
		groundwater filtration	high
		recreation	high
	Regulating/Supporting	air filtration	high
		carbon sequestration	very low

Most visitors to Gelderland come from the Netherlands with international tourism representing only 2.8% of the total number of visitors (Gelders Overijssels Bureau voor Toerisme, 2011b). Interviews with Dutch citizens suggest that, for most of the Dutch people visiting Gelderland, the natural areas and the Veluwe may represent a major attraction. For example, 384 Dutch citizens were interviewed regarding keywords they associate with the Gelderland. The most frequently cited associations were the Veluwe, forests and nature (NBTC Holland Marketing, 2014). Some of the attraction parks located in the Westrand were also mentioned but to a much lesser extent (NBTC Holland Marketing, 2014). Analysis of the interests of Dutch citizens in relation to their preferences for tourism related activities indicate that 57% of the Dutch population value nature-based activities when travelling domestically whilst 24% value visiting attractions such as those which are currently present in the Westrand which would include the Julianatoren (Gelders Overijssels Bureau voor Toerisme, 2011a).

However, as these percentages refer to visitors to Gelderland, the exact contribution of this type of nature-based tourism to Apeldoorn in particular remains unknown. Furthermore, the Veluwe is an important destination for domestic tourists in the Netherlands (Gemeente Apeldoorn, 2014). The municipality acknowledges that, because of the position of Apeldoorn adjacent to the Veluwe area, the Veluwe is an important impulse for the economy of Apeldoorn in terms of recreation. 6% of the

jobs of people in Apeldoorn is provided by the leisure industry which is equal to approximately 6,000 jobs (Gemeente Apeldoorn, 2014). For example, it has been noted that there are at least 38 campsites within the municipality of Apeldoorn, which presumably attract visitors who are at least somewhat interested in nature (Bedrijvenpagina, 2016).

The Juniperbos represents a considerable amount of the total natural area contained within the municipality and likely contributes to the overall 'natural' appearance of the Westrand in general. Therefore, if nature is deemed to be of considerable value to Apeldoorn in terms of tourism revenue, this will give added economic value to the Juniperbos in particular.

House prices

The impact that the Juniperbos has on local house prices remains completely unknown and could only be established through fieldwork that was beyond the scope of this project. However, it is well established that the proximity of real estate to natural areas can add considerable value to house prices in the Netherlands and that activities that disturb the natural environment, such as noise and traffic, can reduce house prices (Lake, Lovett, Bateman, & Langford, 1998; Luttik, 2000). For example the company Witteveen and Bos (2011) uses an indicator of 5-14% of the real estate value for living close to attractive landscapes. Economic value in terms of the effect of the Juniperbos in increasing the value of real estate in the local area is currently likely to be undervalued. Economic value of this type is likely to be of particular interest to the municipality as the amount of real estate tax (Dutch: Onroerendezaakbelasting [OZB]) paid to the municipality by the property owners is directly related to the price of that property for which they are paying taxes. This tax contributes on average 8% to the revenues of the municipality (Vereniging van Nederlands Gemeente [VNG], 2016).

Groundwater infiltration

Together with recreation and air filtration, previous estimates identified groundwater infiltration as accounting for over 90% of the total economic value of the National Park 'De Hoge Veluwe' (Hein, 2011). The value of groundwater infiltration in the Veluwe in general is calculated as a replacement cost (detailed calculations: Appendix 4). A replacement cost determines an economic value, as the increased cost incurred if a certain ecosystem service would have to be replaced. In the case of groundwater infiltration in the Veluwe, the amount is determined by how much more it would cost to obtain drinking water from elsewhere if the groundwater of the Veluwe was no longer useable.

With regards to the water pumping station located in the Westrand, it is reasonable to assume that if the groundwater from the Veluwe was no longer useable than drinking water would be obtained from nearby rivers- as occurs nearby in other parts of the Netherlands (Hein, 2011). Due to the polluted nature of rivers in the Netherlands, costs for the treatment of this water for drinking are higher than the costs for treating the groundwater infiltrated through the Veluwe (Vitens, 2008). A reasonable estimate of this increased cost is given by Vitens (2008) (the local water utility company which operates the water pumping station in the Westrand) where the increased cost of treating water from the Rhine is €0.40 per m^3. This therefore results in a replacement costs that would be incurred if the Veluwe groundwater was no longer usable for drinking water. However, this does not take into account additional possible transportation and infrastructure costs that would be incurred if a new water pumping station needed to be built at a new location. Therefore, economic value calculated solely using replacement costs is a conservative estimate of the true cost needed to

extract water from a new source. For example, the environmental manager of Vitens estimated the cost of building a new water pumping station at €10 million (J. van Engelenburg, personal communication, 17 June 2016). However, the questions still remains as to what the total annual replacement cost of groundwater infiltration in the Veluwe is as a whole and what this means in the context of the Juniperbos.

Average net infiltration rate per hectare for the Veluwe is estimated at 400 mm/year (Tauw, 2003). Therefore, over the entire 884 km² area (European Environment Agency, 1998) of the Veluwe groundwater replenishment is 353.6 million m^3. Data from Vitens indicates that 29% of the groundwater that infiltrates in the Veluwe is used for drinking water production (Vitens, 2008). Therefore, the total economic value of this groundwater infiltration in terms of the above mentioned replacement costs is approximately €41 million (Appendix 4). At a more local level, this also contributes considerable economic value to the Westrand area of Apeldoorn. The water pumping station located in the area is authorised to extract 5.5 million m^3 of water annually of which approximately 95% is used for drinking water (Provincie Gelderland, 2012) The total annual replacement cost of this water in terms of the previously m cost of €0.40 per m^3 is therefore approximately €2.1 million (Appendix 4).

The local contribution of the Juniperbos specifically to this overall value in terms of water infiltration is also significant. Groundwater infiltration rates depending on the type of land cover. For instance, infiltration rates are higher in drift sand and heathland than they are in coniferous forest (Hein, 2011). Therefore, the infiltration rates in the Juniperbos, which is mainly covered by forest, may be different than for the Veluwe as whole which also contains areas of heathland and drift sand. Assuming, that the Juniperbos is completely covered by coniferous forest or buildings (the more conservative estimate) than the approximate net infiltration rate per hectare of the Juniperbos area is 280 mm/year (Bastiaanssen & Roozekrans, 2003; Gehrels & Dolman, 1996). This would result in an annual groundwater replenishment for the 1.4 km^3 area. of the Juniperbos of 392,000 m^3 (Appendix 4). The environmental manager of Vitens indicates that, due to the close proximity of the Juniperbos to the water extraction site, 90% of the water infiltrating through the Juniperbos will be extracted at the water pumping station in the Westrand (J. van Engelenburg, personal communication, 17 June 2016) which amounts to approximately 353,000 m^3 annually. Of the extracted water, approximately 95% is used for drinking water amounting to approximately 335,000 m^3 annually. Using the previously mentioned figure of €0.40 per m^3, the total annual replacement cost of this amount of water if it was rendered unusable is approximately €134,000 (Appendix 4).

4. Legal analysis

Legislation for nature conservation in the Netherlands is a complex endeavour which is being undertaken by a multitude of supranational, national and regional actors. For the purpose of a legal analysis of nature conservation legislation in the Veluwe, and of the Westrand specifically, several different legal frameworks will be discussed in this chapter. The Birds Directive and Habitats Directive as amended by the Member States of the European Union (EU) will be examined, which together form the Natura 2000 network. These supranational directives are the most critical for such a legal analysis, because the hierarchy of legislations states that laws at supranational levels have to be implemented into national legislation (Treaty of Lisbon, 2007, art 70). The most dominant legislation is thus set by the European Union and will serve as an entry point of this legal analysis. The aim of this chapter is to analyse the legal rules and restrictions of the Natura 2000 network and establish the implications for the Juniperbos. As the directives in turn are directly incorporated into national laws, these will also be touched upon in this chapter. Although the European Directives will be the core focus of this analysis, additional legislation and regulations will also be discussed which have a direct relation to the Juniperbos area. These include legislation concerning the nitrogen deposition regulations (Dutch: Programmatische Aanpak Stikstof; henceforth PAS), groundwater protection areas (Dutch: grondwater beschermingsgebied), silence areas (Dutch: Stiltegebieden) and silence policy areas (Dutch: Stiltebeleidsgebieden).

This chapter will first elaborate on the Birds Directive and Habitats Directive in order to highlight some of the key rules and guidelines as well as their implications. Additionally, the national legislation and regulations will be discussed. Following the legal analysis, the remainder of this chapter will focus on the establishment of legal criteria which will be used for the evaluation of the different development scenarios in the latter of this report.

4.1 The Birds Directive and Habitats Directive

On a national Dutch level, the areas which are subject to the two aforementioned European directives, are currently protected as incorporated in the Dutch Nature Protection Law of 1998 (Dutch: Natuurbeschermingswet; BWBR0009641). In general, the rare flora and fauna species found in the Netherlands are protected by the Flora and Fauna Law (Dutch: Flora- en Faunawet; BWBR0009640). On its own, the latter provides possible criteria in terms of flora and fauna species protection in the Netherlands additional to the ones protected under the European directives in the Natuurbeschermingswet.

4.1.1 Procedural steps related to the Natura 2000 sites

The various sites throughout Europe that together form the Natura 2000 network, are the areas which are declared under the Birds Directive as being Special Protection Areas (SPAs) and those which are declared Special Areas of Conservation (SAC) under the Habitats Directive. This implies that a specific site can both be declared a SPA as well as a SAC (European Environmental Agency, n.d.).

The first step in the process of developing the Natura 2000 network is the proposition of Sites of Community Importance (SCI). This is done by Member States on the basis of an analysis of present habitat and species types. Once accepted by the European Commission, the proposed areas are declared SCIs. Through a legal formalisation process in which a decree (Dutch: besluit) is adopted

nationally, the SCI are effectively designated as SACs (Habitats Directive, 1992, art 1 para l). The Veluwe area was proposed by the Netherlands as an SCI in July of 1998 and it was accepted in 2004. The formalisation process on national legal grounds in the Netherlands was completed in June 2014 which effectively made the area an SAC. Through the guidelines of the Birds Directive, the Veluwe area has been designated as an SPA in March 2000. The combination of the titles SPA and SAC render the Veluwe subject to both the Birds Directive and the Habitats Directive (European Environmental Agency, n.d.). This includes the area of the Juniperbos, which is a designated Natura 2000 site reaching up to the periphery of Apeldoorn (Figure 3.3).

4.1.2 Implications of the directives for development of the area

The most significant guidelines mentioned in the directives in relation to Natura 2000 sites are stated in article 6 of the Habitats Directive (Appendix 3). The paragraphs of this article specify what Member States are expected to do in terms of legal and management provisions, what steps should be taken to avoid adverse effects on SACs and how the ecological focus of the Habitats Directive relates to social and economic aspects. Thus, the fact that the Veluwe has been declared an SAC according to the decree for the Veluwe (Dutch: Aanwijsbesluit 057 Veluwe; PDN/2014-057) - issued by the Ministry of Economic Affairs - has several implications.

First paragraph of article 6

According to the first paragraph of article 6, the Members States shall establish the required measures which meet the requirements of the habitats and species for which the site has been designated. These measures include the development of a management plan specific for the Veluwe and “appropriate statutory, administrative or contractual measures” (Habitats Directive, 1992, art 6 para 1). The decree for the Veluwe - as mentioned in the former - is the administrative measure which signifies the exact borders of the site, as well as the legal obligations concerning the management of the Veluwe. Moreover, this paragraph clearly states the ecological focus of the Habitats Directive. As mentioned, Member States are to “establish the necessary conservation measures … which correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites” (Habitats Directive, 1992, art 6 para 1). For the Westrand in general, this relates to the habitat types and species as mentioned in Appendix 1. Reinforcing this, the strong focus on ecological values is additionally specified in the second paragraph of article 6.

Second paragraph of article 6

The second paragraph of article 6 stipulates the obligation of Member States to avoid the deterioration of the habitat types (Annex I Habitats Directive) and the disturbance of the species (Annex II Habitats Directive). As explained elsewhere:

> Member States are required to take preventive measures to avoid deterioration and disturbances connected with a predictable event. These measures apply only to the species and habitats for which the sites have been designated, and should also be implemented, if necessary, outside the sites. (European Commission, 2000, p. 25).

With a clear focus on species and habitat types for which the site has initially been designated a Natura 2000 site, this guideline does not only account for impacts that are caused within the site, but

also from possible impacts occurring outside of the designated area. Case law has demonstrated that activities which cause damage to Natura 2000 sites are prohibited, regardless of whether the activity actually occurs within or outside the site (C-98/03 Commission v. Germany, 2006, p. 36).

Third paragraph of article 6

Whereas the first two paragraphs of article 6 mainly refer to obligations of Member States, the third and fourth paragraph are concerned with procedural aspects related to possible adverse effects which may arise in or around the SAC. Closely related to the point made in the previous section, the article 6 paragraph 3 states:

> Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives (Habitats Directive, 1992, art 6 para 3).

This implies that, in disregard of the specific habitat types and species as mentioned respectively in Annex I and II of the Habitats Directive, any plan, project or combination of plans or projects likely to significantly affect the site, thus meaning any part of the SAC, should be subject to such an assessment. This accounts “not only from plans or projects located within a protected site but also from plans or projects located outside a protected site” (European Commission, 2000, p. 34, emphasis in original). With this, the whole site’s integrity is dependent on inside and outside influence in relation to the conservation objectives of the site. For the Veluwe and the Juniperbos specifically, this means that, according to article 6, paragraph 3 of the Habitats Directive (as incorporated in the ‘Natuurbeschermingswet’ article 10a, as incorporated in the ‘Aanwijsbesluit 057 Veluwe’), it is not allowed to execute plans or projects without this prior assessment. The likelihood that the execution of a plan or project will have an adverse effect is subject to a safeguard. It is stated elsewhere that the assessment of ‘likelihood’ does not concern certainty, but should take on a precautionary rationale (European Commission, 2000). This means that “it is unacceptable to fail to undertake an assessment on the basis that significant effects are not certain” (European Commission, 2000, p. 33).

Any proposed project must thus commence with an appropriate assessment of its potential impacts on the Natura 2000 site in terms of its set conservation objectives. This assessment process is not only an ecological assessment, but a combination of both legally binding guidelines and an ecological assessment (Sundseth & Roth, 2013). Significant impacts of the projects need to be identified, taking into account the site specific conservation objectives. In order to identify the potential impacts, it is crucial to understand which activities of the plan or project are likely to have negative effects on designated sites (European Commission, 2001). Methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive has reported four stages to assess the significance of negative impacts on conservation areas, to provide probable alternative solutions and also to assess the potentially needed compensatory measures. Several assessment criteria are used to identify the significance of negative impacts of the plan or project (Appendix 8).

Fourth paragraph of article 6

Article 6 paragraph 4 of the Habitats Directive stipulates that there is an exception for imperative reasons of overriding public interest, even when a plan or project will have negative impacts. However, these reasons of public interest - which do allow for social and economic factors - are considered to be overriding when they "refer to situations where plans or projects envisaged prove to be indispensable" (European Commission, 2000, p. 44). Considered 'imperative reasons of overriding public interest' are for example issues of public health and safety as well as special obligations of public service and fundamental policies for the state and society (European Commission, 2000).

Although compensatory measures are not strictly specified in the Habitats Directive, the guidance document on article 6 paragraph 4 of the Habitats Directive has made a distinction between mitigation measures and compensatory measures *sensu stricto*. According to this document:

> Mitigation measures in the broader sense, are those measures which aim to minimise, or even cancel, the negative impacts on a site that are likely to arise as a result of the implementation of a plan or project. These measures are an integral part of the specifications of a plan or project. … Compensatory measures *sensu stricto*: are independent of the project (including any associated mitigation measures). They are intended to offset the negative effects of the plan or project so that the overall ecological coherence of the Natura 2000 Network is maintained. (European Commission, 2007, p.10).

It is stated elsewhere that the compensatory measures *sensu stricto*, are based on the fact that "a site should not be irreversibly affected by a project before the compensation is indeed in place" (European Commission, 2000, p. 45). Moreover, "compensation must be additional in relation to the Natura 2000 network to which the Member State should have contributed in conformity with the directives" (European Commission, 2000, p. 45).

Nonetheless, the major problem related to compensation is, that there are certain types of rare habitats which cannot be compensated for, or which may require a longer period of time to provide the same ecological function as the habitat which has been compromised. Therefore, in many cases compensation will not be an effective measures to deal with the problems of habitat destruction (Van Hoorick, 2014).

4.2 Additional legal arrangements

4.2.1 Nitrogen deposition regulations

In the Netherlands, additionally to the strict guidelines of the Habitats Directive and the Birds Directive, the deposition of nitrogen has also been subject to increasingly stringent regulations. The nitrogen deposition regulations (PAS) is the Dutch program put into force, which aims at facilitating economic development and ensuring healthy natural assets while reducing nitrogen levels in the soil throughout the country. The PAS is executed through the cooperation of government entities together with nature organisations and businesses. (Ministry of Economic Affairs, n.d.-a) By setting limits to nitrogen deposition for different areas, such as the habitat types and species mentioned in the Birds Directive and Habitats Directive in particular, the PAS results in reports on the development

of the nitrogen deposition as well as the state of those habitat types and species in relation to the deposition of nitrogen. Such reporting is also available for the Veluwe area.

In the 'PAS area analysis of the Veluwe' (Dutch: PAS gebiedsanalyse 057 Veluwe) of August 2015 several findings have been mentioned. The calculations made for the Veluwe area as a whole show that, at least up until 2020, there will be an expected decrease in nitrogen deposition. However, overall these levels will still exceed the acceptable amount (Ministry of Economic Affairs, 2015). In relation to the habitat types (Annex I, Habitats Directive), the PAS also states some significant points. For the Westrand area of Apeldoorn, including the Juniperbos, three different habitat types (Annex I, Habitats Directive) are present to varying extents (Figure 3.1):

- Dry heathland, north of the Juniperbos, as well as to the south-west of the Juniperbos
- Drift sands, west of the Juniperbos
- Beech and oak forest with holly, patches throughout the whole Westrand, including one patch within the Juniperbos

The overall objective within the guidelines for each of these habitat types is increasing their size and quality. The PAS analysis shows that for these three habitat types the current nitrogen levels are too high. For the dry heathlands the expectations are that in the coming years the nitrogen burden will lessen to a state where more than 50% of these heathlands are at least in a stable state. However, for the drift sands and the beach and oak forest with holly the current nitrogen burden exceeds the limits in many areas in the Netherlands and it is expected that this burden will endure, regardless of the PAS (Ministry of Economic Affairs, 2015).

If private actors introduce new development plans, their proposition must contain a specification of the estimated amount of nitrogen deposition that the economic activity will cause, and give an indication about the amount of available territory. This in turn is tested by qualified authorities such as the province or the Minister of Economic Affairs (Ministry of Economic Affairs, n.d.-b).

4.2.2 Groundwater protection area regulations

A specific area of land located within the Juniperbos is a groundwater extraction area (Figure 4.1). A groundwater extraction area is private land belonging to a water utility company (in this case Vitens) which is often fenced to ensure the quality of the groundwater. This area covers the 1-year zone where any groundwater that is present will reach the groundwater extraction site within 1 year. The groundwater extraction site (1-year zone) is surrounded by the groundwater protection area which covers the 25-year zone (Provincie Gelderland, 2012). This area covers the 25-year zone where any groundwater that is present will reach the groundwater extraction site within 25 years. The majority of the Juniperbos, along with the immediately surrounding areas, is considered a groundwater protection area (Figure 4.1). This specific groundwater protection area is considered as highly vulnerable (Provincie Gelderland, 2015).

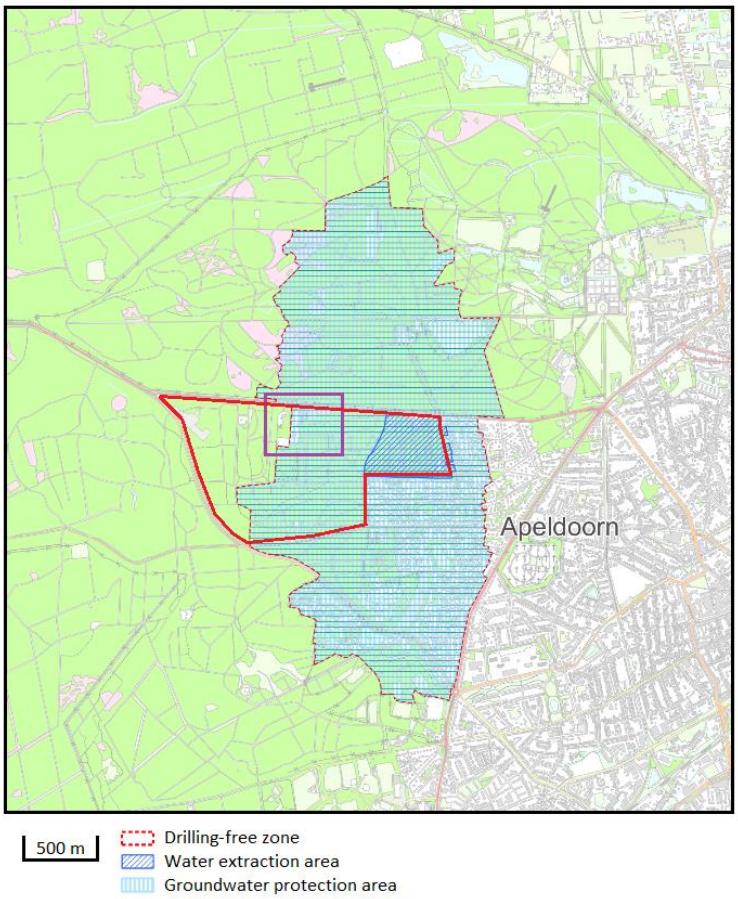

Figure 4.1: Location of water extraction and groundwater protection areas in and around the Juniperbos (indicated by the red outline). The position of the Junianatoren site has been indicated by the purple outline (as adapted from Beschermingsgebieden Grondwater, Provincie Gelderland, 2015, retrieved from http://www.gelderland.nl/drinkwater.

The regulations regarding groundwater protection areas stipulate a 'stand-still/step forward' principle (Gelderland, n.d.-c; J. van Engelenburg, personal communication, 17 June 2016). This principle implies that "future developments cannot contain an increased contamination risk to the soil and/or groundwater as compared to the current situation, and a decrease in risk will be strived for" (Gelderland, n.d.-c, first section, own translation). This means that in groundwater protection areas, the development of new infrastructure or land-uses is only permitted when it poses less risk to the groundwater quality than the former land-use. When some infrastructure is removed from the area, it is only allowed to be replaced with infrastructure that has an equal or lower effect on the groundwater quality. It is possible to compensate for the risk by changing the land-use elsewhere within the groundwater protection area so that the overall risk within the groundwater protection zone remains the same (J. van Engelenburg, personal communication, 17 June 2016). For example, if a natural area in a groundwater protection area is converted to agriculture than it is possible to compensate for this by converting an agricultural area of the same size to a natural area in the same groundwater protection area. Construction that reduces the natural area in a groundwater protection area is not permitted as this poses a significant threat to the groundwater quality (J. van Engelenburg, personal communication, 17 June 2016). Therefore, the regulations of groundwater protection areas present considerable restrictions to the possibilities for development.

4.2.3 Silence areas regulations and silence policy area regulations

The province of Gelderland is in share of the obligation of silence (policy) areas. The province responded to this obligation by designating silence as a core quality in some of their policies including ‘Gelders Natuurnetwerk’ (nature network of Gelderland) and ‘Groene Ontwikkelingszones’ (green development zones). Additionally, silence areas and silence policy areas were designated. The Juniperbos is designated as a silence policy area. Silence areas involve provincial regulations to prevent or limit noise pollution, whereat the standard for silence areas is set at an average of 40 decibel. In silence policy areas on the other hand, there is no average decibel limit, however, noise pollution should be stabilized or reduced. Existing activities and initiatives in silence policy areas can be continued as normal. In order to maintain or reduce noise nevertheless, different measures should be taken, among which, limiting the maximum speed and using a certain type of asphalt (Provincie Gelderland, 2015; Lensink, 2014).

4.3 Legal criteria relevant to the development scenarios

In order to assess the four different development scenarios published by the municipality of Apeldoorn in terms of legislation, some legal criteria evolving from the previous analysis of legislation will be stated in the following. Although the legislation presented earlier are not exhaustive, they do reflect the significant regulations which apply to the area with regards to the relation between human activity, nature and possible development. In the following, legal criteria for the analysis of the published development scenarios will be established in accordance to the previous legal analysis. Since the ideas of the development scenarios do not give extensive and specific explanations, it is not possible to state conclusively whether or not these criteria will be met by these development scenarios.

Following from the legal analysis, different conclusions can be drawn in light of the establishment of the legal criteria. First, the Habitats Directive safeguards a procedure which should be followed when plans or projects are proposed that may affect the habitat types (Annex I Habitats Directive) or species (Annex II Habitats Directive). Although this procedure does allow for a possibility to employ plans and projects in a Natura 2000 site, this is not allowed (when it is not of overriding public interest) when it will impact these habitat types and species. Taking into account the deterioration of the habitat types and disturbance of the species are, then, logical criteria for the analysis of the scenarios. Second, the PAS is closely linked to the Natura 2000 policy. Since nitrogen levels in the Veluwe and some specific habitat types, including those found in the Juniperbos, are exceeding the acceptable levels, taking into account this aspect results in the third criteria. Third, the legislation for

silence policy areas is in force around the Juniperbos. With the goal of maintenance of noise levels original to the area, it can be stated whether or not is likely that development scenarios take into account this policy. Since this can be a highly restricting factor for large scale developments, it is logical that this becomes a criterion as well.

Out of these considerations, the following legal criteria are thus formulated for the evaluation of the proposed scenarios:

- The scenario will avoid impact on the habitats (Annex I, Habitats Directive) in terms of deterioration
- The scenario will avoid impacts on the species (Annex II, Habitats Directive) in terms of disturbance
- The scenario takes into account the Dutch nitrogen deposition regulations
- The scenario takes into account the regulations for groundwater protection areas
- The scenario takes into account the silence area and silence policy area regulations

5. Impacts on the values

Future development of the Juniperbos will result in activities which may impact the previously established ecological, sociocultural and economic values of the area. If these impacts are not accounted for during the creation of development scenarios, then the area may be reduced in its capacity to provide these values in the future. Furthermore, at times the landscape approach justifies consideration of the potential impacts of development on the values of territory surrounding to the Juniperbos. For example, heathlands are an ecologically important habitat located just north of the Juniperbos, which may be indirectly affected by development of the Juniperbos itself. Therefore, understanding and anticipating what types of impacts might occur is a crucial part of the decision-making during the planning process. This section will discuss how the previously established values may be impacted by development in the area by reviewing relevant literature.

5.1 Impacts on the ecological values of the Juniperbos

Development can impact the ecological value of natural areas in numerous ways. With regards to the case of the Juniperbos, the major potential impacts are threefold arising from possible increases in noise pollution, the amount of road traffic and in the human presence in the forest. All three of these potential impacts will be discussed in some detail. Additionally, the most obvious impact that could be experienced following development of the Juniperbos may be reductions in the size of the natural habitat due to a shift towards more human-dominated land-uses. The negative impact of habitat loss would be particularly strong if the valuable habitats present in the Juniperbos were affected- namely, the areas of old growth forest and the protected areas of beech and oak forest with holly (Figure 3.1). Reducing the area of these habitats will likely reduce the level of biodiversity that can be supported in line with the island biogeography and edge effects principles. Often, development schemes attempt to compensate for foreseen habitat loss, by allocating new natural areas where the lost habitat is to be re-developed. However, often it is impossible to provide adequate replacement habitat that mimics the environmental characteristics of the habitat that is lost. As a result, replacing old growth forest with anthropogenic land uses and subsequently compensating by planting a new forest will not provide adequate replacement for the lost habitat due to the younger age of the new trees. Failure to take this into account when planning development in the Juniperbos may risk a loss of species, which are dependent on old growth forest. This includes some protected species such as the black woodpecker.

5.1.1 Impact of increasing traffic amount

A wealth of scientific studies have discussed the numerous impacts that roads and traffic can have on the ecology of natural areas (Coffin, 2007; Spellerberg, 1998; van der Ree, Jaeger, van der Grift, & Clevenger, 2011). Roads and traffic can affect the ecological value of an area directly, by causing a physical disturbance or indirectly, by increasing noise or pollution. With regards to the Juniperbos, it is important to make a distinction between the ecological effects of building roads, such as the immediate destruction of the habitat where the new road will be, and effects that are related to the amount of traffic on the road. The effects of the roads passing close to the Juniperbos will already be present now, and are unlikely to increase in the future unless new roads are built. However, future development may indirectly alter the amount of traffic and this itself could affect the surrounding natural area.

Notably regarding the amount of traffic, is the effect it could have on mortality rates of wildlife populations. It is well established, that collisions with traffic can have severe consequences on wildlife populations by increasing mortality rates (Fahrig & Rytwinski, 2009; Garriga et al., 2012). Often, the increase in mortality is dependent on the amount of traffic (Fahrig & Rytwinski, 2009; Garriga et al., 2012). This is known to be the case with some of the protected species, which are also found in the Juniperbos. For instance, the increase in the number of roads has been implicated as the major factor behind the decline of badgers in the Netherlands (van der Zee, Wiertz, Ter Braak, van Apeldoorn, & Vink, 1992). Furthermore, studies conducted in Denmark and England demonstrate that the mortality rate of badgers increases, as the amount of traffic on roads increases (Aaris-Sørensen, 1995; Clarke, White, & Harris, 1998). Additionally, very high amounts of traffic may prevent or reduce the dispersal of badgers between populations separated by roads, adding a further threat to their long-term conservation (Clarke et al., 1998). Similar effects as those seen in badger populations have also been demonstrated in other protected species found in the Juniperbos, including pine marten and bats (van Langevelde, van Dooremalen, & Jaarsma, 2009; Zurcher, Sparks, & Bennett, 2010). Furthermore, it is also necessary to consider the timing of major traffic flows. For instance, it is reasonable to assume that most badger road crossings occur in the evening and night due to their nocturnal habits (Jaarsma, van Langevelde, Baveco, van Eupen, & Arisz, 2007). Therefore, activities that will cause a change in the timing of major traffic flows, such as if the attraction parks begin to receive visitors at night, could lead to a greater impact on the nocturnal species present in the Juniperbos.

The other major impact of increasing traffic amounts can result from increases in atmospheric pollution at a local level. Most importantly regarding the Juniperbos, increases in traffic amounts would correspond to increases in atmospheric pollution from vehicular emissions of NOx and NH_3. Increases in NOx and NH_3 emission from vehicles would lead to higher nitrogen deposition on vegetation and soils adjacent to roads (Angold, 1997; Truscott, Palmer, McGowan, Cape, & Smart, 2005). This is particularly a problem concerning the wider area of the Westrand, because it contains areas of heathland which is particularly sensitive to degradation from nitrogen deposition as explained previously. Indeed, studies conducted in Scotland have demonstrated that nitrogen deposition from vehicular emissions can cause degradation of heathland habitats and that the level of degradation increases as the amount traffic increases (Angold, 1997). The degradation of heathlands due to vehicular emissions has been demonstrated to occur up to 200 m from the side of roads in cases with high traffic flow (Angold, 1997). An increase in the amount of traffic on the roads around the Juniperbos would therefore present a considerable threat to the surrounding heathland habitats. Particularly at risk are those habitats north of the Juniperbos, which are well within 200 m in distance from the road at their closest point (Figure 3.1).

An additional threat to the Juniperbos, and the Westrand in general, is acidification resulting from increasing nitrogen deposition from vehicles. Acidifying deposition enhances the weathering process of minerals in the soil and results in the degradation of heathland, forest and grasslands rich in species (Bergsma et al., 2016). Acidification as a result of the deposition of nitrogen compounds is particularly a problem in base-poor sandy soils, like those found in the Veluwe. (Nihlgård, 1985; van Breemen & van Dijk, 1988; Dise & Wright, 1995). Acidification is a cumulative process in terms of the amount of deposited acid, which means that its impact builds up over time. A recent study on ‘De Hoge Veluwe’ national park demonstrates that the anthropogenically accelerated weathering of the last 74 years is equivalent to 8500 years of natural weathering and leaching (Bergsma et al., 2016).

Therefore, the level of weathering is already high in the area, and a further increase in acidifying deposition would only worsen the situation. For instance, vehicular emissions of NOx have been implicated in playing a part in the decline of Dutch forests (Dise & Wright, 1995; Nihlgård, 1985; van Breemen & van Dijk, 1988; van Straalen, Kraak, & Denneman 1988). Therefore, increasing amounts of traffic would also pose significant threat to the protected forest habitats located within the Juniperbos, namely the beach and oak forest with holly. Furthermore, the effects of nitrogen deposition and acidification on these habitats can scale up through ecosystems to have substantial effect on animal communities (Graveland, Van Der Wal, Van Balen, & Van Noordwijk, 1994; van Straalen et al., 1988).

5.1.2 Impact of increasing noise pollution

Increasing amounts of traffic could also impact the environment by increasing noise pollution. However, it is also worth considering the problem of noise pollution in terms of other sources as well as traffic. For instance, the various attraction parks in the area also generate a large amount of noise. Furthermore, the level of noise pollution may be expected to increase if the area of the attraction parks or the number of visitors they receive increases. Increasing numbers of visitors to the attraction parks could also indirectly increase noise pollution by increasing the amounts of traffic.

Noise pollution in natural areas is known to have profound effects on wildlife. In particular, birds can be heavily impacted (Francis, Ortega, & Cruz, 2009; Ortega, 2012). However, a diverse range of organisms are known to be affected including amphibians, mammals and freshwater fish (Francis & Barber, 2013). Many species are able to adapt to the presence of anthropogenic noise. For instance, a landmark study on great tits (*Parus major* L.) in Leiden demonstrated that they alter the frequency of their calls in response to urban noise (Slabbekoorn & Peet, 2003). However, many species will respond by altering their behaviour which will make it more difficult for them to survive. For instance, noise from traffic has been shown to force some species of bat to need more time to find prey, and to have decreased success in catching prey (Siemers & Schaub, 2011). Therefore, even species that are able to adapt to high levels of noise pollution may suffer reduced population sizes (Francis & Barber, 2013; Francis et al., 2009; Herrera-Montes & Aide, 2011). At its most extreme, noise pollution can alter the species composition of natural areas, as only those species with the highest capability to survive in the noisy environment are able to persist there (Francis & Barber, 2013; Francis et al., 2009; Herrera-Montes & Aide, 2011). For example with regard to birds, larger species that sing at lower frequencies appear to be the most likely to be excluded from noisy habitats (Francis et al., 2009; Herrera-Montes & Aide, 2011).

Further development of the attractions is therefore likely to negatively affect the biodiversity of the area by both directly and indirectly increasing noise pollution. Particularly birds could be affected, of which there are a number of protected species present (Appendix 1). However, due to the species specific way in which animals react to noise, the exact impact that increased noise pollution would have on the species composition of the Juniperbos is difficult to predict.

5.1.3 Impact of increasing human activity in the forest

Additionally, increasing human activity within the forest could also have a negative impact on the wildlife. For example, studies on pine marten, a protected species present in the Juniperbos, demonstrates that they can experience greater stress levels when there are greater numbers of tourists visiting their habitat (Barja et al., 2007). Additionally, research conducted in the Veluwe indicates that increasing visitor density negatively impacts the populations of several rare bird species (Pouwels, Sierdsema, Aranyosi, van Eupen, & Henkens, 2010). Notably, however, this effect was not found for the honey buzzard and black woodpecker, which are two rare species found in the Juniperbos (Pouwels et al., 2010). Nevertheless, development scenarios that will increase the numbers of people present in the Juniperbos could negatively affect the rare and protected wildlife there by increasing their disturbance.

5.2 Impacts on the sociocultural values of the Juniperbos

The sociocultural values of the Juniperbos can potentially be affected by the suggested development in the Juniperbos area. The established sociocultural values are the suitability of the Juniperbos for dog-walking, its health benefits and relaxation of users and the uniqueness of the forest in the area of Apeldoorn. The following will present a number of potential outcomes of development, which could affect these values through a literature review.

5.2.1 Impact on the utility for dog-walking

Intensive development in the area can diminish the suitability of the forest for dog-walking. A number of scholars has researched dog owners' perceptions of the utility and quality of off-leash areas (Lee, Shepley, & Huang, 2009; McCormack, Rock, Sandalack, & Uribe, 2011). Lee et al. studied the use patterns, user satisfaction, and perception of off-leash areas and measured items such as park size, location, site layout, recreational facilities, parking, maintenance, and safety. Development of the Juniperbos can have a number of positive and negative effects on these items. In the case of the Juniperbos, recreational facilities and site layout are of importance, but not relevant for the feasibility of dog-walking in the area and will therefore not be considered for the evaluation of possible impacts on this value. Potential positive outcomes of development in the Juniperbos area would be an increased accessibility through the creation of additional parking spaces and increased safety through more holistic fencing (Lee et al., 2009, p. 315). Increased human activity in the area might also imply funding for the maintenance of the forest, which could result in positive outcomes for dog owners such as seating, handrails or disability-adapted walking paths. Thus, development in the Juniperbos could have a number of positive effects on the utility of the forest for dog-walking. The potential negative effects on this value for dog-walking concern the size of the forest. During the interviews conducted with users of the Juniperbos, a number of respondents mentioned the size of the Juniperbos as an important feature, as it is seen as the largest off-leash area in Apeldoorn. Reducing the size of the Juniperbos to the benefit of attraction parks would therefore also reduce the utility of the forest for dog-walking and therefore negatively impact this sociocultural value. Overall, the sociocultural value of dog-walking in the forest is assumed to be viable even in the case of development in the forest. As a designated Natura 2000 site, the Juniperbos is expected to stay useful for the purpose of dog-walking, regardless of the development in the area.

5.2.2 Impact on the health and relaxation benefits

Aspects deemed important by the interviewees when considering the relaxation and health benefits of the Juniperbos are in line with theory on the contribution of nature to both mental as well as physical health. The idea that nature has a positive effect on human health is widely accepted amongst scholars (Joye & van den Berg, 2013; Hartig, Mitchell, & de Vries, 2014; Ferrer-i-Carbonell & Gowdy, 2007). The main aspects through which nature contributes to health constitute of air quality, physical activity, social cohesion and stress reduction (Hartig et al., 2014).

"Trees and other vegetation can reduce levels of gaseous air pollutants (e.g., ozone, oxides of nitrogen (NOx) and oxides of sulfur)" (Fowler, 2002 in Hartig et al., 2014, p. 6). Air quality in the area is likely to be affected by the increase of traffic in the area which would be inherent to more development in the area. The possibility for physical activity can be influenced both positively as well as negatively, depending how the area of the Juniperbos will be developed. The fact that a natural place, such as the Juniperbos, can facilitate social cohesion was confirmed by the interviewees as an important reason for visiting the forest. Natural areas initiate more interaction with fellow users but also leads to an increased sense of community.

The largest predictor in health benefits of nature is stress reduction. Something that is stressed in both literature (Joye & van den Berg, 2013; Hartig et al., 2014) as well as in the interviews, is the importance of existence of natural areas in urban settings. Urban settings are perceived as more stressful surroundings due to the high cognitive resource demands they imply. As worded by Beveridge (1977, in Joye & van den Berg, 2012, p. 58), "[natural] scenery worked by an unconscious process to produce relaxing and "unbending" of faculties made tense by the strain, noise and artificial surroundings of urban life". Natural areas, in this case the Juniperbos, function as restorative environments in which relaxation, stress recovery and attention restoration can take place. This refers back to the calmness and relaxation interviewees stressed when describing the Juniperbos. If more development would take place in the Juniperbos area it would affect the quality of relaxation and stress reduction that the forest currently offers.

Next to the socio-economic value of health, it can be considered an economic value of the Juniperbos too (Table 3.4), which again can be impacted. Stress is not only a direct cost for the government but people are also willing to pay more to live in healthy environments (Hein, 2011).

5.2.3 Impact on the uniqueness of the forest

During the interviews with forest users, a number of features of the Juniperbos were regarded as important characteristics for the area, which render the Juniperbos a unique forest. Through development in the forest, these characteristics could be subject to change and affect the sociocultural value of uniqueness. For one, the Juniperbos is among the 4.1% of the oldest forests in the Netherlands (Schelhaas et al., 2014). As stated above, development schemes often attempt to compensate for felled trees in other areas. However, these trees for compensation will be planted in a young age, which would further change the local residents' perception of the forest and therefore also change its unique character.

Second, the users of the forest appreciate the Juniperbos as a forest close to the city of Apeldoorn. Extensive development could transform the natural, green area into a more urban and developed

one, which would result in the forest losing its unique character. Major development in the area would therefore diminish the current sociocultural value of the 'forest in the city', which residents perceive as a unique feature of the Juniperbos.

Third, the tranquillity of the forest is perceived as an important and unique characteristic by the users. Some interviewees have mentioned a rapid increase in human activity in the area in the last decade and assess it negatively. Additional development of attraction parks would further lead to more human activity, more noise and potential overcrowding. Research by Goossen and Langers (2000) on the quality of rural areas for outdoor recreation in the Netherlands found that tranquillity has a positive effect, while overcrowding has a negative impact on the perceived quality of an area for recreation. Perez-Verdin, Lee and Chavez (2004, p. 904) further conducted a study on the outcomes of development of outdoors recreation and found a significant positive correlation between the factors of perceived overcrowding, perceived loss of traditional cultural values and the change of manners and customs in an area. This illustrates that the development of attraction parks in the Juniperbos area might lead to more human activity, which in turn leads to more noise and eventually to perceived overcrowding. This would also impact the tranquillity of the area and change the way in which local residents perceive the value of the Juniperbos. Overall, there are a number of effects that the development of attraction parks can have on the sociocultural value of the uniqueness of the Juniperbos.

5.3 Impacts on the economic values of the Juniperbos

The economic value of the Juniperbos may be affected by the implementation of future development scenarios. Due to the limitations of this project, the impacts on the economic value of the Juniperbos will focus mainly on recreation, house prices and groundwater infiltration. As described previously, the nature in the area attracts visitors, increases housing prices and provides groundwater infiltration. These three ecosystem services combined with the value of people visiting the attraction parks depend on the role of nature and infrastructure in the future development scenarios. This section will provide an overview of the possible impacts on the economic value of the Juniperbos in terms of potential development.

5.3.1 Impact on the value of attraction parks

The three attraction parks together generate a turnover of almost €40 million, attract more than a million visitors and occupy about 250 employees (Table 3.1). Together with nature and culture, they contribute to the 'top touristic landscape' (Dutch: toeristisch toplandschap) of the Veluwe (Gemeente Apeldoorn, 2015). The four development scenarios contain differences in terms of nature and infrastructure. These differences will affect the economic value of the attraction parks. If expansion of the attraction parks is permitted, an increase of their economic value will be likely due to a higher entrance fee, an increase of visitor numbers, or a combination of both. However, visitor numbers are also limited because of traffic congestion and parking problems. So in order to raise visitor numbers, these two infrastructural problems need to be addressed within the development of the area (Gemeente Apeldoorn, 2015). Both the Apenheul and the Julianatoren are limited by the current infrastructure and expansion possibilities regarding expansion. If the limitations are not met by future development plans, relocation of one of the attraction parks might be conceivable, possibly to the region of another municipality or province. This would have serious implications on the economic value conceived by the attraction parks in this region.

5.3.2 Impact on ecosystem service values

Nature tourism

The Westrand contributes to the €490 million that is spent on tourism related activities in the Veluwe (Bloemberg et al., 2011). By investing in the area the municipality wants to create more employment and boost the amount of money that is spent on a day by tourists. There is some room for improvement, since average amount of money spent by visitors is currently below the national average (Gemeente Apeldoorn, 2014). Increasing human activities in the Westrand may affect nature which indirectly affect the economic value of the area by reducing the number of people who visit the area for nature-based tourism. However, the impacts of development on this type of value are difficult to determine and would require further research on the preferences of visitors to Apeldoorn.

House prices

As noted, the presence of natural areas near houses can significantly add to their economic value. According to Witteveen and Bos (2011) this added value is at least 5% and can reach 14% of the actual value of the real estate. The scenarios all present different proposals that change the environment, which then indirectly affects local house prices (Lake et al., 1998). The effect on the price will depend on the effect the scenario will have on the living environment of the residents. For example, when a scenario results in more noise pollution than this will affect the price of real estate negatively. The municipality will also be affected by this through tax collection. Since this is around 8% of the municipality earnings, the municipality will also be affected by measures that lower the price of real estate (Vereniging van Nederlands Gemeente [VNG], 2016).

Groundwater infiltration

This is the only concrete economic value for which an exact monetary estimation has been provided. The replacement costs are estimated at approximately €2.1 million, which might be affected by the scenarios. The groundwater protection area is major part of the Westrand. Construction and developing new activities will involve new risks to the drinking water extraction at the water pumping station which has been established since 1894 (Bekenstichting, 2016). The water pumping station provides a major part of the drinking water supply for the municipality of Apeldoorn (Provincie Gelderland, 2012). Development within the groundwater protection area may lead to groundwater contamination, which will affect the economic value of the groundwater infiltration.

As the groundwater extraction area is privately owned by Vitens and fenced it will not be directly impacted by development of the Westrand. As it forms the 1-year zone, it is important to keep risks to groundwater in this area to an absolute minimum as there will be little time to develop solutions following a contamination event. The time for reaction subsequently to a contamination event in the groundwater protection area is longer, as it forms the 25-year zone. However, the risks should still be kept to a minimum, as reductions in the quality of the drinking water will still be felt in the relatively near future. Contamination of groundwater can come from a wide variety of chemical sources, several of which may be expected to increase following development, including vehicular pollution (Nixon & Saphores, 2007; Vizintin, Souvent, Veselič, & Curk, 2009). A number of car parking areas can be found in the area. Generally, these facilities have been identified as posing particularly big risks to groundwater, as the large numbers of stationary cars can lead to concentrations of leaking oil and

gasoline (Provincie Gelderland, 2012). In the occurrence of a contamination event, the economic value of the area will be reduced due to the increased costs of treating the groundwater at the current site or from more polluted alternatives, such as nearby rivers. Development of the Juniperbos and the Westrand could therefore increase the risk of a groundwater contamination event, particular if the number of vehicles and/or car parks increases. In turn, increasing risk of groundwater contamination presents a significant threat to the economic value of the area.

6. Evaluation of the development scenarios

The Westrand of Apeldoorn is characterised by its mixed deciduous forests, well-known attractions and quiet residential areas. Residents of Apeldoorn requested a clear long-term solution, in which the multiple development plans that are operative in the Westrand are combined (R. van Dijk, personal communication, 8 June 2016; appendix 6). In early 2015, the board of the municipality began an exploration of possible future developments of the Westrand using a collective approach. A bottom-up approach was used when creating the scenarios and the stakeholders important to the area where asked to define their 'dreams' for the Westrand (R. van Dijk, personal communication, 8 June 2016). Among the consulted stakeholders were the inhabitants of the Westrand, the attraction parks and nature conservation organizations. One stakeholder who was not involved in the development of the scenarios is Vitens, the water utility company operating in the Juniperbos (J. van Engelenburg, personal communication, 17 June 2016).

Central to this exploration is the question of how the community and municipality of Apeldoorn want to develop the Westrand in the coming 20 years. The goal was to produce a widely supported, long-term vision of the development of the Westrand, with a focus on living, recreation and nature (R. van Dijk, personal communication, 8 June 2016). The following common objectives were used as the starting point for developing the scenarios (Gemeente Apeldoorn, 2015);

1. Resolving the conflict between recreation and protected natural areas.
2. Reducing traffic congestion, especially on peak days.
3. Developing a holistic vision and collective approach.

Taking into consideration these common objectives, different stakeholders were asked to express their 'dreams' for the future of the area. The municipality stressed the importance of thinking in opportunities rather than limitations. However, the scenarios are still deemed to be realistic, depending on the time allowed for development. Although the municipality acknowledges that Natura 2000 is one of the main limitations in the area and should be kept in mind while developing the concept, it should not have the only focus because adjustments might be made with help of the province or government (R. van Dijk, personal communication, 8 June 2016). A general impression is given of how nature, attraction parks and living could be represented in the area and therefore the document still provides opportunity for discussion.

The attraction parks also play an important role in the scenarios as they are considered an important asset for the economy of Apeldoorn. If the attraction parks would decide to relocate outside of Apeldoorn, it would have drastic impacts to leisure industry of Apeldoorn. Furthermore, the project manager, René van Dijk, believes that it is important to use the expertise of stakeholders. For example, the knowledge of the management of attraction parks can give an understanding of the dynamics of the market (R. van Dijk, personal communication, 8 June 2016). Information provided by the attraction parks as well as an analysis on tourism in Gelderland provided by the province were used in the formulation of the scenarios. Therefore, no specific analysis has been conducted by the municipality on tourism in Apeldoorn in the light of the scenarios.

Due to the legal restrictions, the diverging interests of stakeholders and the urgency of action to address the mentioned problems it will be challenging to satisfy all stakeholders. Four different development scenarios have been created, which will have different outcomes and effects on the

Juniperbos. The following will shortly present and describe the development scenarios, give an indication of their impacts on the values of the Juniperbos and examine their feasibility regarding legal restrictions. Finally, recommendations will be given for the conservation of these values and compliance with relevant legislation, in order to obtain a sustainable future of the Juniperbos.

6.1 Evaluation scenario 1: Roots in the Woods

This scenario aims to maintain the connection of Apeldoorn to the Veluwe, from which the city receives many benefits. In this scenario, the 'DNA of the Veluwe' (Gemeente Apeldoorn, 2015, p. 27) is central to the developments of the Westrand. A theme will be developed using the important and unique characteristics of the Veluwe which will be made visible throughout the Westrand. Every aspect of development, such as recreation, infrastructure and living, should take into account that the area is part of the Veluwe and the forested area in particular. There might be some space for new recreational developments, as long as they do not affect the values of nature and include the 'DNA of the Veluwe'. Fundamental to this scenario is the existing ecological value, although other aspects can also be considered. In this scenario, it is likely that most attraction parks will remain at their already existing locations. Any degradation of nature due to small expansions of attractions should be compensated for, although it remains unspecified how compensation will occur.

6.1.1 Assessment of the scenario Roots in the Woods

The focus on the conservation of the ecological value of this scenario would seem to make it suited for minimising the damage to the ecological values. However, it also allows for some small expansion plans of the current attraction parks and possibly the development of new attractions under the condition that they do not damage the ecological value. No mention is made of how the indirect impacts on natural area from possible expansions will be mitigated for. Therefore, it is important to consider that any expansion of attraction parks may impact the ecological values, possibly through increased noise and traffic .

If the aim of this scenario to conserve the Juniperbos as a natural area next to Apeldoorn is achieved, its sociocultural value of 'a forest in the city' would be maintained. The utility of the forest for dog-walking is unlikely to be impacted by minor developments in the area. Due to the focus on ecological values in this scenario, health and relaxation benefits, as well as the uniqueness of the forest are expected to be maintained. This scenario is therefore assumed to have little impact on the sociocultural values of the Juniperbos.

The premise of minor expansion of attraction parks has several implications for the economic values of the Juniperbos. For one, the potential degradation of the ecological values may have indirect effects on nature tourism. For instance, increased noise levels may reduce the attractiveness of the area for nature tourism. Increasing visitor numbers to attraction parks can also have a negative impact on real estate prices as it could increase parking problems and traffic congestion. Further, any expansion of attraction parks could increase the risk towards the quality of the groundwater, which has further implications regarding the regulations of groundwater protection. The minor expansions together with the added quality of the 'DNA of the Veluwe' could possibly lead to a slightly higher turnover and employment rate of the attraction parks.

Regarding the legal restrictions, the forest as a whole will not experience intensive change in this scenario. However, it is important to closely examine the territory around attraction parks which are to be expanded, in order to comply with the Birds Directive as well as the Habitats Directive. It will depend on the exact expansion plans of the park as to whether the nitrogen deposition regulations (PAS) and silence policies are adhered to. Since there is only little indication on the exact expansion plans of the attraction parks, the compliance with applicable legislation is largely unknown (Table 6.1).

Table 6.1. Expectations of compliance with of the scenarios in terms of legal criteria (described as likely, unknown and unlikely).

Scenarios **Legal criteria**	**Roots in the Woods**	**Groot Berg en Bos**	**Apeldoorn Adventure Park**	**Veluws Kant**
The scenario will avoid impact on the habitats (Annex I of the Habitats Directive) in terms of deterioration	Likely	Unlikely	Likely	Likely
The scenario will avoid impacts on protected species (Annex II of the Habitats Directive) in terms of disturbance	Unknown	Unlikely	Unknown	Likely
The scenario meets the Dutch nitrogen deposition regulations (PAS)	Unknown	Unknown	Unlikely	Likely
The scenario adheres to the silence policy regulations	Unknown	Unlikely	Unlikely	Likely
The scenario adheres to the silence policy regulations for groundwater protection areas	Unknown	Unlikely	Unknown	Likely

6.1.2 Recommendations for the implementation of Roots in the Woods

The degree of expansion of the attraction parks and its successive compensation are not clearly stated in the scenario, so there is a need for more precise information and close monitoring in the area before development is being initiated. An assessment of the feasibility of this scenario with the legal provisions of Natura 2000, nitrogen deposition regulations (PAS) and silence policy of Netherlands should hereby focus on the territory into which the attraction parks are to expand. Moreover, to reduce the negative impacts of traffic, it is recommended to establish a consolidated car parking facility outside the area or to divert the primary entrance away from the Natura 2000 site. Possible expansions within the groundwater protection area should be audited regarding groundwater protection regulations, even if the expansions will only be minor. The usage of the forest should be monitored during the expansion processes, in order to maintain the value of the Juniperbos for the users of the forest.

6.2 Evaluation scenario 2: Groot Berg en Bos

This scenario is focussed on promoting physical activities in the Westrand of Apeldoorn. During consultations with the stakeholders, several outdoor recreation concepts were put forward. As in the scenario ‘Roots in the Woods’, the Westrand is framed as a buffer zone between the city and the Veluwe. Visitor attractions will not be limited to the existing locations. Additionally, activities may also take place in-between the different attraction parks within the buffer zone. New recreational activities are mainly focussed on outdoor recreation as well as expansion of existing attraction parks. The aim is to have Apeldoorn known as *the* outdoor recreation city of the Netherlands within ten years (Gemeente Apeldoorn, 2015, 33). To lower infrastructural pressure, parking areas with public

transport connection to the attraction parks will be constructed. Additionally, the possibility of a new train station called 'Apeldoorn West' is mentioned (Gemeente Apeldoorn, 2015). This scenario also considers compensation measures necessary when natural areas are impacted by the newly developed activities.

6.2.1 Assessment of scenario Groot Berg en Bos

This development scenario appears to be largely incompatible with conserving the ecological values of the Juniperbos and the surrounding areas. It is unlikely that compensation measures will be able to adequately maintain the ecological values of the area due to the scale of the development plans. There will be a substantial increase in human activity and therefore also noise levels in the forest, which are likely to impact the habitats and species located in the area. The planned access to public transport anticipates a reduction of the amount of traffic on the natural area. However it is unknown whether this reduction in the amount of traffic would outweigh the expected increases resulting from the further development of the attractions.

This scenario will have significant impact on the sociocultural values of the Juniperbos. The utility of the forest for dog-walking will be severely impacted through intensive development. More outdoor activities in the area might discourage people from taking their dog for a walk in the Juniperbos due to potential overcrowding and increasing noise levels. Furthermore, the integration of nature and recreation could have effects on the health and relaxation benefits of the forest. The possible positive effects would refer to physical and social activities, which would be promoted through the creation of new facilities for outdoor fitness. However, increases in human activity, corresponding increases in noise levels, and the felling of many trees would diminish the uniqueness of the Juniperbos for the community of Apeldoorn. Therefore, this scenario is likely to significantly reduce the overall sociocultural value of the Juniperbos.

This scenario will also have impacts on the economic value of the Juniperbos. In terms of negative impacts, the planned outdoor activities will be located closer to the residential area in the forest, which could cause noise pollution and damage to the landscape. Therefore, it is likely that house prices in the local area will decrease. The fact that outdoor activities will take place in the groundwater protection area poses a further risk to the economic value due to the increased risk of groundwater contamination. As a positive outcome for the economic value, the attraction parks might generate a higher turnover. Alongside the development of new outdoor activities, this may increase employment opportunities in the area.

A number of legal regulations are expected to be violated in this scenario, due to the increase in outdoor activities that will be allowed in the Westrand and specifically in the Juniperbos (Table 6.1). As some activities need to be developed and recreation will not be limited to the existing locations, it is likely that these activities will not comply with the rules and guidelines set by Natura 2000. The level of nitrogen might be decreased through the focus on facilitating public transport in this scenario, however an increase in visitors might also increase deposition. Compliance with the nitrogen deposition regulations (PAS) will therefore have to be closely monitored. Additionally, through the increased human activity, this scenario is likely to violate the regulations of the silence policy area. As long as the outdoor activities do not require the construction of infrastructure at ground level, it will not violate the regulations of the groundwater protection area. However, the infrastructural development necessary to facilitate these activities will likely lead to violations of these regulations.

6.2.2 Recommendations for the implementation of Groot Berg en Bos

This development scenario will have large impacts on the different values of the Juniperbos. In terms of ecological values, it is recommended to further revise this scenario while taking into account all the legal regulations However, the extensive development plans are likely to violate most of the legal rules and restrictions applicable to this area. Within the groundwater protection area, it is suggested to focus on outdoors activities with little need for construction, as infrastructural developments need to take into account the groundwater protection area regulation. Furthermore, most of the sociocultural values of the Juniperbos would be heavily impacted by this scenario. In order to avoid this, specific dog-walking areas should be designated in the forest. Also the tranquillity of the area should be guaranteed, when activities for the outdoor theme are decided on. Although the scenario might have certain positive economic impacts, it is recommended to obtain better insight into the economic implications of this scenario. Overall, it is suggested to set this scenario aside in favour of a more feasible scenario regarding ecological, sociocultural, economic and legal aspects.

6.3 Evaluation scenario 3: Apeldoorn Adventure Park

This scenario would render Apeldoorn to be considered as a family-friendly city and a popular holiday destination as well as a part of the Veluwe. Fundamental to this scenario is combining the Julianatoren, Apenheul and a possible new safari park at the current location of the Apenheul. By constructing this 'Apeldoorn Adventure Park', it is assumed that the impacts of the attraction parks on the Juniperbos will be reduced. Additionally, it is expected that the local residents will benefit from the presence of a well maintained natural area. However, this scenario requires a large amount of compensation measures for the loss of natural area around the Apenheul. It will include a consolidated car parking facility to serve all of the attraction parks in order to reduce parking pressure on the surrounding areas.

6.3.1 Assessment of the scenario Apeldoorn Adventure Park

Overall, the impacts of this scenario depend on the exact location of Apeldoorn Adventure Park. Regarding the Juniperbos specifically, this scenario is likely to ensure the preservation of the ecological values as well as maintaining the presence of species and habitat types in line with the relevant regulations. Since it is unlikely that human activity in the forest itself will increase, it is expected that noise levels will be low, thereby creating a better environment for the wildlife present. However, intensive development around the Apenheul may increase wildlife disturbance, local traffic and visitor numbers, harming the ecological values of the surrounding natural areas (Figure 3.1). Although, no special protected habitat types are located around the Apenheul it is important to determine if any protected species are located in the area in order to adhere to the relevant regulations. Visitor numbers could increase due to the convenience of the combination of attraction parks, the creation of the new safari park and the improvement of parking facilities. As the regional infrastructure will remain the same, it is expected that the silence policy regulations and nitrogen deposition regulations (PAS) could be violated (Table 6.1).

Regarding the Juniperbos specifically, this scenario takes into account the sociocultural value. By relocating the attraction parks outside Juniperbos, the forest will not be affected negatively. Instead, it will have an positive effect on the health and relaxation benefits of visitors. By maintaining the Juniperbos as a unique 'forest in the city', its recreational value as well as its utility for dog-walking

will be retained. However, the recreational value of the natural areas surrounding Apenheul will significantly decrease due to the creation of Apeldoorn Adventure park.

Considering the economic values of the Juniperbos, it is hypothesised that the prices of houses nearby the Juniperbos will increase or stay the same, while the value of real estate close to the Apenheul will decrease. Although the area of Apenheul itself is part of the groundwater protection area, the surrounding areas of the Apenheul are not. Removing the Julianatoren can lower the risk of groundwater contamination under the condition that it is relocated outside of groundwater protection areas that are surrounding the Apenheul.

6.3.2 Recommendations for the implementation of Apeldoorn Adventure Park

First of all, stakeholders should be aware of what species are present around the Apenheul. As there are no protected habitat types present in the close proximity of the Apenheul, it is only necessary conduct an assessment of the species in order to adhere with the Birds Directive and Habitats Directive. In order to meet the regulations of the silence policy area, the developers of Apenheul Adventure Park could also establish a noise barrier around the area surrounded by the Natura 2000 site (Figure 3.1). Additionally, it is recommended to establish a parking area outside the Natura 2000 site and develop public transport links between the parking area and Apeldoorn Adventure Park in order to comply with the silence policy area regulations and nitrogen deposition regulations (PAS). Finally, information about the potential for attraction parks to expand within Apeldoorn Adventure Park is currently lacking, so it remains unclear whether the attraction parks will benefit economically.

6.4 Evaluation Scenario 4: Veluws Kant

In this scenario, the city of Apeldoorn, Paleis Het Loo and the Veluwe are intertwined with the Westrand. The Apenheul and Julianatoren will be relocated outside the Westrand of Apeldoorn. In this scenario, the Westrand is expected to be the quiet ‘backdoor' of Apeldoorn rather than the ‘busy entrance’ (Gemeente Apeldoorn, 2015, p. 39). Instead, the arrival point of visitors should be close to the highway, where there is more space for infrastructure and the effects on nature will be less severe. The transformation within the Westrand is expected to occur in slow stages, in which ideas about small scale recreation could be implemented incrementally. The area of the relocated attractions will be used to develop new natural areas, combined with some new housing.

6.4.1 Assessment of the scenario Veluws Kant

Overall, the impacts of this scenario depend on the exact new location of the attraction parks. This scenario is the most likely to effectively conserve the ecological value of the Juniperbos as well as the ecological value of the Westrand in general, because species and habitats present in the Westrand will be spared (Table 6.1). By removing the current attraction parks and developing new houses, the overall noise disturbance and traffic congestion might reduce. The reduced amount of traffic that uses the roads passing through the Westrand will also contribute positively to conserving the wildlife and habitats present. Additionally, the nitrogen deposition regulations (PAS) will be complied with, as it is expected that with this decrease in traffic, the emission of nitrogen will decline. In addition, the regulation of the silence policy and silence areas will be adhered to as the removal of the attraction parks will reduce noise levels.

Considering the sociocultural values of the Juniperbos, this scenario is also assumed to have fairly positive impacts. The utility of the forest for dog-walking would be maintained, or even increased if the area suitable for dog-walking was to increase. All the main determinants for increased health and relaxation held by nature will be positively affected due to the focus on tranquillity within the Westand. This scenario would also retain the uniqueness of the forest as one of the oldest forests in the Netherlands, as its size would for most part be maintained, and the characteristic of the Juniperbos as a 'forest in the city' would also be upheld.

It is unclear how the attraction parks will be affected by this scenario as it is unknown where the they will be relocated to. It is possible that relocation of the attraction parks may create possibilities for expansion, allowing the attraction parks to generate more revenue. However, it remains unknown how the new location will affect visitor numbers and visitor types. Furthermore, moving the attraction parks will certainly involve considerable costs and the extent to which this will be offset is unknown. House prices may increase due to the relocation of the attraction parks. However, new houses may be built at the vacant locations which is likely to affect the serenity of some of the neighbourhoods as they will no longer be located at the border of the forest and city. If the attraction parks are removed from the groundwater protection area, the risk of groundwater contamination will be likely to decline. However, the effect of the new houses on the risk of groundwater contamination is unknown.

6.4.2 Recommendations for the implementation of Veluws Kant

This scenario appear to be the most suitable scenario in order to maintain the ecological values of the Juniperbos. However, it is crucial to take into concern the local ecological values of the new area to which the attractions will be moved and how these would be affected. Concerning sociocultural values of the Juniperbos, this scenario is assessed to be beneficial for the users of the Juniperbos. For this scenario it is important to conduct tourism research on the numbers of visitors to Apeldoorn, their intentions and expectations and how these would be affected by the new scenario. This will ensure that the relocation of attraction parks is well planned and that the investments for relocation will be profitable in the future. During the relocation of the attraction parks, all applicable regulations need to be taken into account.

6.5 General recommendations for a sustainable future of the Juniperbos

There are several recommendations to be made that apply to all of the above scenarios which should be considered when developing a final plan for the Juniperbos. These primarily relate to the way in which the scenarios were developed and the need for further data.

The scenarios mostly do not take into account the different legal regulations that apply to the area. Therefore, the first general recommendation is to prioritise the legal aspects concerning Natura 2000, nitrogen deposition regulations (PAS) and silence policy area regulation when constructing development scenarios. The Birds Directive and Habitats Directive are strict guidelines, leaving little room for individual interpretation. For example, several of the development scenarios mention compensation measures to replace habitat lost by the expansion of the attraction parks. Whilst some development is permitted in Natura 2000 areas that are not special protected habitat types, the regulations for compensation measures that must accompany this are stringent. The second general recommendation is therefore to take these strict compensation regulations into account, when

creating development plans that will result in lost habitat. The replacement habitat must replicate the exact ecological conditions of the compromised habitat, which may not always be possible depending on the habitat type considered (Habitats Directive, 1992, art 6 para 4). Therefore, the difficulty of compensation may present a considerable obstruction to possible development plans.

The third general recommendation is to carefully consider the measures that need to be taken in groundwater protection areas through consultation with Vitens. Groundwater protection areas cover a considerable area of the Westrand. If new development will occur in the groundwater protection area, it may be necessary to consider compensation schemes that adhere to the relevant regulations. However, the strict nature of the regulations referring compensation in groundwater protection area may mean that many of the development scenarios encounter an immovable obstacle. Although many different stakeholders have been consulted during the establishment of the scenarios (Gemeente Apeldoorn, 2015), Vitens was not part of this process (J. van Engelenburg, personal communication, 17 June 2016). As a result, there appears to be a considerable gap between the development scenarios and the regulations of the groundwater protection areas which needs to be addressed.

The fourth general recommendation concerns a need for further data collection. The municipality has expressed a strong desire to develop Apeldoorn as a major tourist destination (Gemeente Apeldoorn, 2015). Despite this, little data is available on the profiles and preferences of visitors to Apeldoorn. As a result, it remains unclear if the scenarios are promoting development in a way which is likely to attract visitors. Therefore, it remains largely unknown how these scenarios are contributing to the municipality's aim of developing a major tourist destination. More visitor data needs to be collected in order justify investment into possible expansions or relocations of the attraction parks.

7. Discussion

In the following, the findings of this project as well as the used methods will be critically reflected on, in order to allow for an understanding of potential shortcomings or limitations of the project.

First, it is interesting to examine the different scales which are used to examine different values of the Juniperbos. The landscape approach promotes a large-scale perspective of a landscape as a whole, and the Juniperbos itself is part of the larger natural area of the Veluwe. It is therefore important to assess the Juniperbos through the lens of the landscape approach, in order to take into account the interconnectedness and multifunctionality of a natural area such as the Juniperbos to its wider landscape of the Veluwe. On the other hand, it was necessary to contrast the Juniperbos to its surrounding area in order to understand the local specificities present in the forest, as well as potential impacts of the development scenarios. Therefore, the report uses the lens of the landscape approach for the assessment of the forest as part of a landscape, while locally specific contents are regarded in the small scale of the Juniperbos itself. This has an influence on the findings of the project, because the combination of the different scales sheds light on the functionality of the forest in a local context as well as the regional context.

Second, this report is significantly influenced by the time constraints of the project. An exhaustive assessment of different values of the Juniperbos was not achievable, because a complete scientific assessment would have required a much longer time span for fieldwork and data collection. This is why the report focusses on giving indications of the present values, instead of claiming definitive and exhaustive findings on the values.

In terms of the ecological values of the Juniperbos, conducting fieldwork was impossible due to the time constraints. It was therefore necessary to rely on previously conducted studies about the Veluwe, on previously commissioned consultancies in the context of Apeldoorn and communication with the fauna manager of the Juniperbos to establish an indication of these values. This is a limitation of the report insofar, as the scientific reliability and validity of the used reports cannot be ensured, which might also have impacts on the findings of this report. However, the previous consultancies have been scrutinised regarding their scientific reliability before being implemented into the findings of the present report.

Another limitation concerning time constraints touches upon the sociocultural values of the Juniperbos. The project was conducted during May and July 2016, so all interviews with forest users were conducted during the summer season. Further interviews in different seasons of the year might have resulted in more exhaustive findings and found additional concepts regarding the sociocultural values of the forest. The sociocultural evaluation of the Juniperbos furthermore lacks an evaluation of the sociocultural importance of the present attraction parks, specifically the perspective of the visitors of the Julianatoren. Examining the meaning and value of the Julianatoren to its visitors could have given an insight into the benefits of both the forest as well as the attraction park, to allow for a comparison of their importance for the community of Apeldoorn.

In terms of the economic values only a monetary indication for the groundwater infiltration is produced. Groundwater infiltration is just one of the many ecosystem services of the forest, but due to a lack of existing data and time constraints, it was impossible to conduct an exhaustive analysis.

Other non-market valuation methods like hedonic pricing, travel cost method or questionnaires were unfortunately impossible within the given time.

Furthermore, the unspecific nature of the development scenarios published by the municipality of Apeldoorn constitutes a limitation of this project. The report attempts to enhance an understanding of the impacts of the implementation of development scenarios on the values of the forests and their compliance with legislation. However, there are only few specific plans for development stated in the development scenarios, so the elaborated impacts on the values and the compliance with legislation are subject to speculations. This report solely has the purpose of assisting the stakeholders in finding a solution for a sustainable future of the Juniperbos, so the assumed outcomes of the assessment of development scenarios conveys a foresight to the stakeholders.

Overall, the findings of this report are affected by the different scales used to examine the Juniperbos, by the time constraints of the project and missing data, as well as the unspecific nature of the development scenarios which were to be assessed.

8. Conclusion

Using the theoretical underpinning of a landscape approach, this report contributes to finding a sustainable future of the Juniperbos area. It does so by evaluating the four development scenarios developed by the municipality of Apeldoorn which were made in order to find a long-term solution for problems and conflicting interests in the Westrand. Before this could be done, an overview of indicators of ecological, sociocultural and economic values of the Juniperbos is given in the report. With the establishment of an evaluation of the Juniperbos and a subsequent analysis of legal guidelines applicable to the area, the report narrows the identified knowledge gap of the outcomes of development scenarios regarding the identified values and applying legislation in order to assist stakeholders with establishing a final development plan.

It can be concluded that in terms of ecological values, the Juniperbos carries both wider landscape values in regards to the Veluwe, and also specific ecological values of the forest itself such as the existence of protected animal species as well as specific habitat types in and around the forest. Sociocultural values of the Juniperbos include the dog-walking utility of the forest, the relaxation and health benefits and the uniqueness of the Juniperbos as a forest in the city. The economic values turn out to be related to both ecosystem services and to the value of attraction parks.

Since legislation for nature conservation in the Netherlands is complex, and different legal frameworks apply to the area of the Juniperbos, a legal analysis is provided of applicable legislation. Significant applicable legal frameworks are the Birds Directive and Habitats Directive of Natura 2000, nitrogen deposition regulations (PAS), groundwater protection area regulations and silence policy area regulations. In order to evaluate the development scenarios in terms of legislation, legal criteria are developed based on the legal analysis.

From the evaluation of the scenarios in the light of the established values and legal criteria, it can be concluded that none of the scenarios are *entirely* feasible for implementation in the way they currently are. Firstly, the different scenarios do not respect all the values of the Juniperbos. Furthermore, they violate several legal guidelines applicable to the area. As the scenarios are not specific and conclusive yet, this report contributes to this discussion by giving recommendations. For each of the development scenarios, there are specific recommendations that should be taken into account. Furthermore, four general recommendations are given that should be taken into concern when improving existing scenarios or creating a new one in order to decide on a final development plan. Although legal guidelines have been taken into account in the development of the scenarios, it is indicated that this was not the only focus of the municipality.

The first recommendation is therefore to prioritise the legal aspects concerning Natura 2000, nitrogen deposition regulations (PAS) and silence policy area regulations. The second recommendation is connected to legislation and concerns the compensation measures that need to be taken in Natura 2000 areas. As compensating for lost habitat types is complicated and regulations are stringent, it is advised to critically reflect on the potential effects of the development scenarios on the protected habitat types, and adjust them according to this stringent legislation. Furthermore, it is crucial to account for the groundwater protection areas that cover a considerable area of the Westrand. It is identified that Vitens, the water utility company, was not consulted during the process of developing the scenarios with stakeholders. The recommendation is therefore to carefully

consider the measures that need to be taken in groundwater protection areas by consulting with Vitens. Finally, in order to determine the economic feasibility of the scenarios, tourism research is suggested, because the lacking information on visitors to Apeldoorn leaves the feasibility of the aim to develop a top tourism landscape unclear.

Finally, it can be concluded that the development of an area like the Westrand of Apeldoorn is a very complex and difficult endeavour, because a number of conflicting interests of stakeholders as well as legal restrictions need to be taken into concern. A sustainable future of the Juniperbos should be the goal of all stakeholders, but this can only be achieved through a collective effort for mutual consent.

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Appendices

Appendix 1. List of species

List of species that are legally protected under the Dutch Flora- en Faunawet or the European Birds Directive and Habitats Directive whose presence has been indicated by ecological consultants (BRO or Faunaconsult), fauna manager (FM) or records of volunteer sightings (Waarneming.nl) in the Juniperbos in the Juniperbos (appendix 2). Indicated is the organization for which the record of the species has come from as well which legislation this species is protected under. Descriptions of the legislation categories can be found in the footnote.

Species	Record obtained	Legislation		
		Flora- en faunawet	Habitats Directive	Birds Directive
European hedgehog (*Erinaceus europaeus*)	BRO	Table 1		
European mole (*Talpa europaea*)	BRO	Table 1		
Greater white-toothed shrew (*Crocidura russula*)	BRO	Table 1		
Common shrew (*Sorex araneus*)	BRO	Table 1		
European polecat (*Mustela putorius*)	BRO	Table 1		
Fox (*Vulpes vulpes*)	BRO & FM	Table 1		
European roe deer (*Capreolus capreolus*)	BRO & FM	Table 1		
European rabbit (*Oryctolagus cuniculus*)	BRO	Table 1		
Bank vole (*Myodes glareolus*)	BRO	Table 1		
Common vole (*Microtus arvalis*)	BRO	Table 1		
Wood mouse (*Apodemus sylvaticus*)	BRO	Table 1		
Red squirrel (*Sciurus vulgaris*)	BRO & Waarneming.nl	Table 2		
Wild boar (*Sus scrofa*)	BRO, Faunaconsult, Waarneming.nl & FM	Table 2		
Stag beetle (*Lucanus cervus*)	Faunaconsult & Waarneming.nl	Table 2	Annex II	
Red deer (*Cervus elaphus*)	Waarneming.nl	Table 2		
Natterer's bat (*Myotis nattereri*)	BRO	Table 3	Annex IV	
Brown long-eared bat (*Plecotus auritus*)	BRO	Table 3	Annex IV	
Daubenton's bat (*Myotis daubentonii*)	BRO	Table 3	Annex IV	
Slow worm (*Anguis fragilis*)	BRO & Waarneming.nl	Table 3		
European pine marten (*Martes martes*)	BRO & Waarneming.nl	Table 3		
European badger (*Meles meles*)	BRO, Faunaconsult & FM[2]	Table 3		
Honey buzzard (*Pernis apivorus*)	BRO	Table 3 (Category 4)		Annex I
Common buzzard (*Buteo buteo*)	BRO, Waarneming.nl & FM	Table 3 (Category 4)		
Goshawk (*Accipiter gentilis*)	Waarneming.nl	Table 3 (Category 4)		Annex I
Sparrowhawk (*Accipiter nisus*)	Waarneming.nl	Table 3 (Category 4)		Annex I
Black woodpecker (*Dryocopus martius*)	BRO & Waarneming.nl	Table 3 (Category 5)		Annex I
Great tit (*Parus major*)	BRO & Waarneming.nl	Table 3 (Category 5)		
Great spotted woodpecker (*Dendrocopus major*)	BRO	Table 3 (Category 5)		

[2] BRO focussed on the picnic forest (currently part of the Julianatoren), Faunaconsult on the surroundings of the theme park. Both visited areas belong to the Juniperbos. The volunteer sightings are from the natural area 'Berg en Bos', which includes the Juniperbos.

Nuthatch (*Sitta europaea*)	BRO & Waarneming.nl	Table 3 (Category 5)		
Pied flycatcher (*Ficedula hypoleuca*)	Waarneming.nl	Table 3 (Category 5)		
Raven (*Corvus corax*)	Waarneming.nl	Table 3 (Category 5)		
Carrion crow (*Corvus corone*)	Waarneming.nl	Table 3 (Category 5)		
Common dog violet (*Viola riviniana*)	Waarneming.nl	Table 3 (Category 5)		
Marsh tit (*Poecile palustris*)	Waarneming.nl	Table 3 (Category 5)		
Lesser spotted woodpecker (*Dendrocopos minor*)	Waarneming.nl	Table 3 (Category 5)		
Woodlark (*Lullula arborea*)	BRO	Table 3 (Category 4)		Annex I
Middle spotted woodpecker (*Dendrocopos medius*)	Waarneming.nl	Table 3 (Category 4)		Annex I

References: BRO, 2014; Faunaconsult, 2015; Waarneming.nl, 2016

1 Under certain conditions, table 1-species may be disturbed by certain types of activity without permission.

2 The presence of table 2-species requires a mitigation plan before development begins (which needs to be approved by the ministry of Economic Affairs) in order to prevent a breach of the prohibitions. If this is not possible and the activity has both a 'reasonable goal' and does not have a negative effect on the favourable conservation status of the species, an exemption can be made.

3 The presence of table 3-species requires a mitigation plan before development begins in order to prevent a breach of the prohibitions. If this is not possible, an exemption can be made when species specific criteria will be met. Species can be allocated to different types of categories: Annex I-species mentioned in the appendices of the national decree Exempting protected animal and plant species, Annex IV-species mentioned in the appendices of the European Habitats Directive, category 4 species which are always protected throughout the year, and category 5 species which are always protected during the breeding season. At serious factors or environmental circumstances, they can also be protected throughout the year.

4 Annex I: bird species for which special protected areas should be designated by the European Birds Directive.

5 Annex II: animal- plant species for which special protected areas should be designated as described in the Habitats Directive.

6 Annex IV: animal and plant species which are strictly protected by the European Habitats Directive. Member states need to take the requisite measures to establish a system of strict protection of Annex IV-animal and plant species as described in Article 12 and 13 respectively of the Habitats Directive (1992).

Appendix 2. Method collecting species present in the Juniperbos area

As an indication of the ecological value of the Juniperbos area, a list of possibly present and on a European or Dutch level protected animal and plant species has been made by consulting three resources:

1. Two reports concerning the natural value of Juniperbos. 'Natuurtoets Picknickbos Koningin Julianatoren, Apeldoorn' (BRO, 2014) is commissioned by Julianatoren and concerns the natural value of the picnic forest (currently part of Julianatoren). 'Visie Koningin Julianatoren te Apeldoorn' (Faunaconsult, 2015) concerns the natural area directly surrounding Julianatoren and has been commissioned by Stichting Werkgroep Milieuzorg Apeldoorn, a partner organisation of Stichting Behoud Juniperbos.
2. Personal communication with the local fauna manager Dick van Beek (30 May 2016).
3. The free online database 'Waarneming.nl'. Only volunteer sightings from 1 January 2015 till 30 May 2016 concerning the area 'Berg en Bos' in which the Juniperbos is located have been included in the list.

Appendix 3. Article 6 of the Habitats Directive

1. For special areas of conservation, Member States shall establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans, and appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites.

2. Member States shall take appropriate steps to avoid, in the special areas of conservation, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of this Directive.

3. Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

4. If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.

Obtained from Habitats Directive (1992).

Appendix 4. Explanation of the economic calculation

Calculations of monetary value of groundwater infiltration in terms of replacement costs.

Calculations were conducted according to the previous estimates of Hein (2011).

Annual replacement costs of all water infiltrated in the Veluwe

Step 1. area of the Veluwe x groundwater infiltration rate = average annual groundwater replenishment

=> 884,000,000 m2 x 0.4 m/year = 353,600,000 m3/year

Step 2. 29 % of the average annual groundwater replenishment = annual amount of water extracted for drinking

=>(353,000,000 m3/year ÷ 100) x 29 = 102,544,000 m3/year

Step 3. amount of groundwater extracted for drinking x replacement cost per m3 = annual total replacement cost of water infiltrated in the Veluwe

=> 102,544,000 m3/year x €0.4 = €41,017,600/year

Annual replacement cost of all water extracted from the water pumping station in the Westrand

5,500,000 m3 water extracted at the water pumping station in the Westrand (J. van Engelenburg, personal communication, June 17, 2016)

Step 1. 95% of the annual amount of water extracted at the water pumping station = annual amount of water extracted for drinking

=>(5,500,000 m3/year ÷ 100) x 95 = 5,225,000 m3/year

Step 2. Annual amount of water extracted for drinking x replacement cost per m3 = total annual replacement costs for all water extracted at the water pumping station

=>5,225,000 m3/year x €0.4 = €2,090,000/year

Annual replacement cost of water infiltrated in the Juniperbos

Step 1. area of the Juniperbos x average annual infiltration rate of the Juniperbos = annual groundwater replenishment of the Juniperbos

1,400,000 m2 x 0.28 m/year = 392,200 m3/year

Step 2. 90% of the average annual groundwater replenishment = annual amount of water extracted

=>(392,200 m3/year ÷ 100) x 90 = 352,980 m3/year

Step 3. 95% of annual amount of water extracted = annual amount of water extracted for drinking

=> (352,980 m3/year ÷ 100) x 95 = 335,331 m3/year

Step 4. amount of groundwater extracted for drinking x replacement cost per m3 = annual total replacement cost of water infiltrated in the Juniperbos

=> 335,331 m3/year x €0.4 = €134,132/year

Appendix 5. Interviews with forest users

Qualitative interviews with users of the Juniperbos was set out to examine the usage of the forest, the socially constructed meaning of the forest by the community, as well as the forest users opinion about the development scenarios published by the municipality of Apeldoorn, therefore a qualitative approach is the most feasible measure for the purpose of data collection (Boeije, 2010, p. 32). The question set out to be answered with the interview is, what indicators of sociocultural values users of the forest attach to the Juniperbos area. As qualitative methods offer to yield results reflecting the participants' usage of forest, it is expected that the findings will have relevance for formal stakeholders in the area which can assist the decision-making process on development scenarios (Boeije, 2010, p. 33). An interview guide was constructed as a preparation for the interviews, whereat the questions are based on the study conducted by Jacobs and Buijs (2011) in which they focus on uncovering meanings and attitudes and rely on the concept of attitudes as presented in the theory of planned behaviour (Ajzen, 1987). The research population consists of inhabitants of Apeldoorn who frequently visit the Juniperbos for specific purposes. Because this topic has not been researched in the context of the Juniperbos before, qualitative research techniques are favourable due to their explorative power (Boeije, 2010, p. 31). The interviews were conducted by the social scientists, Malou van Kempen, Remko Lette and Friedericke Kuhn, on Sunday the 5th of June 2016 between 10.00 am and 1.00 pm in the Juniperbos. Each interview took between 10 and 20 minutes. The weather during the data collection process was sunny and warm, so the forest was well visited around the time of data collection. Eight interviews have been conducted with nine participants, four of which were female and five of which were male. The point of saturation was reached after these eight interviews, when the researchers detect a number of recurring themes during the interviews and no new themes appeared (Boeije, 2010, p. 63). Before the qualitative in-depth questions of the interview guide, a number of quantitative questions about the demographics of interviewees were asked. The age groups of interviewees ranged from about 35 to 70. A large part of the interviewees came from Apeldoorn and the surrounding villages, further two interviewees visited from Leiden. All interviewees visit the forest on a regular basis, either every day, a few times a week, or for recurring holiday visits throughout the year. Having conducted eight interviews with recurring users of the Juniperbos, we assume to have addressed a representative sample of the users of the forest in order to examine the forest's meaning to the local community of Apeldoorn.

The interviews have been transcribed using the method of a simplified verbatim transcription by Kuckartz, Dresing, Rädiker, & Claus (2008). Subsequently, the obtained data was segmented and reorganised for the coding process. Data analysis was conducted using a three step method of coding. Hereby, the open coding process helped in "breaking down, examining, comparing, conceptualising and categorizing data" (Strauss & Corbin, as cited in: Boeije, 2010, p. 96), whereat a focus was set on the elaboration of inductive codes. Second, the axial coding facilitated the establishment of relationships between open codes, and resulted in the emergence of key categories. In a last step, the selective coding, connections between the key categories were established and concluding findings were drawn. The usage of this method for analysis was particularly useful in this context, as findings are inductively worked out of the collected data and concepts can emerge out of the interviewees' individual social reality (Boeije, 2010). Thus, the qualitative analysis using a three-step coding method enabled the elaboration of subjective findings of the forest users, namely the personal meaning they attach to the Juniperbos.

The interview guide as used by interviewers is presented in the following:

1. Short introduction

- Name, student of WUR, project on a sustainable future of the Juniperbos
- Part of this project is getting to know what the Juniperbos means to its users
- Therefore, the interviewee is of great importance to us
- If yes, then discuss outline (3 different parts of the interview)
- Okay with recording the interview?
- Ask e-mail address if the interviewee wants to receive the final report

2. General Questions

a. Do you live in Apeldoorn?
b. How far away from here do you live?
c. How often do you come to the Juniperbos?
d. When you come here, how long do you stay?
e. When you come here, what do you do in the forest? Activities?
f. Could you give an indication of other visitors; what type of people are visiting, tourists or residents? And how would you describe the intensity of the use of the forest? (how often, many or little people, etc.)

3. Section 1) Place meaning of the Juniperbos to it's users

a. What does the Juniperbos mean to you?
b. What key words come into mind when you would describe the Juniperbos?
c. possible follow up question: What are characteristics that you would ascribe to the Juniperbos?
d. How important do you regard the Juniperbos for yourself?
e. And why do you ascribe this certain importance to the forest?
f. How do you value the Juniperbos compared to other forest patches in the area?

4. Section 2) Attitudes towards nature and recreation

a. Are you satisfied with the Juniperbos as it currently is?
b. How do you evaluate the recreational opportunities in the area around the Juniperbos?

5. Section 3) Beliefs that constitute attitudes - different situations

We shortly explain that there are four different situations that we are going to describe. We would like to know how you would feel about some of the situations that we will describe below. After having described the situation, people can indicate what they believe would be positive consequences and what they believe would be negative consequences.

Situation one: the Juniper forest will stay the way it currently is. However, there will be room for minor expansion of recreational activities. In the direct area of the Juniperbos that would mean the Julianatoren & the swimming pool would stay but have the possibility to slightly expand. Describe situation shortly - Junipersbos the same, with room for minor expansion

a. What do you see as a positive consequence in this situation?
b. What do you see as a negative consequence in this situation?

Situation two: recreation and nature are more integrated in the Juniperbos area. This will result in more outdoor activities which will cause more pressure on nature in the Juniperbos area. However, other areas would be used to compensate for this loss of nature.

a. What do you see as a positive consequence in this situation?
b. What do you see as a negative consequence in this situation?

Situation three: the KJT and the Boschbad were relocated to the area of the Apenheul? This would imply there is more room for nature in the Juniperbos area at the cost of less nature in the Apenheul area.

a. What do you see as a positive consequence in this situation?
b. What do you see as a negative consequence in this situation?

Situation four: the all attractions (apart from Paleis Het Loo) would be moved out of the area completely? A more quiet area would be created with the focus on some historical sites related to Apeldoorn and the Veluwe. The new location for the attraction is unknown, it could also be outside of Apeldoorn.

a. What do you see as a positive consequence in this situation?
b. What do you see as a negative consequence in this situation?
c. How do you see the future of the Juniperbos in terms of nature and recreation?

Appendix 6. Interview with the municipality of Apeldoorn: René van Dijk

A qualitative interview with René van Dijk from the municipality of Apeldoorn was conducted in order to generate an answer to the research sub-question: "What criteria do the key stakeholders of this case take into concern when developing development scenarios?". René van Dijk is a project manager at the municipality of Apeldoorn, and has knowledge about the development of the four scenarios. Contact was first established through the public phone line for the municipality of Apeldoorn, which led to the connection of the researchers with the interviewee. Qualitative research methods enable the researcher to find out about participants' perspectives to the substantive field, in this case the development of West-Apeldoorn, and can yield results relevant for the implementation of policy measures (Boeije, 2010, p. 33), which is why qualitative interviews have been selected as a suitable method to examine the standpoint of the municipality of Apeldoorn in this context. As a preparation, a semi-structured interview guide was constructed. Because the question this interview seeks to investigate the criteria that the municipality takes into concern when establishing development plans for the Juniperbos, it is crucial to avoid suggestive elements in the questions. Therefore, the interview can be categorised as an open semi-structured interview (Boeije, 2010, p. 62). The interview guide preparation did not rely on underlying theory, but focussed mainly on the knowledge gap of the researchers regarding the municipality's criteria for the creation of development plans. The interview was conducted on Wednesday, the 8th of June between 1.00 pm and 3.00 pm in the municipal facilities of Apeldoorn. Because of the time restrictions of this research project, the interviewee was asked for his willingness to be contacted via email after the conduction of the interview in case of emerging follow-up questions or other concerns from the side of the researchers. In this way, reaching a point of saturation was guaranteed for this data source, as the possibility for follow-up questions for further data collection was held open (Boeije, 2010, p. 107).

The interview has been transcribed using the method of a simplified verbatim transcription by Kuckartz et al. (2008). The transcription key is presented in Appendix 7. Due to the sensitivity of the obtained information and ethical concerns from the side of the researchers, the transcript is not included in the Appendix. Subsequently, the obtained data was segmented and reorganised for the coding process. The analysis was conducted with the method of a qualitative content analysis by Mayring (2014). Hereby, inductive codes with regards to the research questions have been elaborated, and categories were created regarding the topics addressed in the interview guide. Finally, conclusions were drawn by relating the categories to each other whilst keeping in mind the research question. The method of a qualitative content analysis was particularly useful for the analysis of the interview for a number of reasons. For one, the data is coded around the axis of emerging categories (Mayring, 2014, p. 79), which ensures the development of valid findings of the interview. Second, it is a relatively fast, economically efficient and precise procedure (Mayring, 2014), which is feasible for this project regarding the time constraint of eight weeks. Third, the coding process is conducted with a clear intention of answering the research question (Mayring, 2014), so the developed findings are clearly useful for the purpose of this project. The qualitative content analysis using inductive codes was therefore a useful method for the interview with René van Dijk. The Dutch interview guide constructed prior to this interview is presented in the following. Subsequently, the obtained data was segmented and reorganised for the coding process.

The Dutch interview guide constructed for this interview is presented in the following:

1. Introductie

- Bedankt voor tijd & interview
- Korte uitleg project & groep
- Malou zal vragen stellen en Tim ook aanvullende vragen
- Is het oké om het interview digitaal op te nemen?
- Daarnaast, het opnemen van uw naam in het rapport, of liever anoniem?
- Korte uitlijning van het interview

2. Bestemming van gebieden (5-10 min)

a. Wat zijn de voornaamste wetten waar jullie “op dagelijkse basis” rekening mee dienen te houden in het opstellen van nieuwe bestemmingsplannen?
b. Uit documentatie blijkt dat bestemmingen van gebieden (bijv. “Natuur”, “Verkeer-parkeren” & “cultuur en ontspanning” kunnen worden veranderd. Kunnen jullie daar iets meer over vertellen?
c. Bijv ook relatie van bestemmingsplannen & provincie; stellen jullie eerst op en vragen daarna om goedkeuring provincie?
d. Wat is de regelgeving (verschillende wetten) die van toepassing zijn bij het veranderen van een bestemming van een gebied?
e. Wat zijn de procedures als er (veel) bezwaren worden aangetekend tegen een bestemmingsplan?

3. Rol van natuur in het gebied (5-10 min)

a. Hoe belangrijk is natuur voor jullie in de gemeente?
b. Hoe zien jullie de balans tussen natuur en economische activiteiten in de gemeente?
c. Juniperbos is stiltebeleidsgebied; wat houdt dat in en wat is het verschil tussen stiltegebieden en stiltebeleidsgebieden?

4. Natura 2000 - topic of focus (20 Min)

a. Is het deel zijn van Natura 2000 een bewuste keuze voor gemeenten?
b. Of hebben jullie “simpelweg” in moeten stemmen met wat door de provincie is besloten?
c. Indien zelf besloten, waarom hiervoor gekozen?
d. Wat zijn de verantwoordelijkheden van de gemeente als het gaat om Natura 2000?
e. Wie beheert Natura 2000? Verschillende bronnen zeggen verschillende dingen; Staatsbosbeheer, provincie of gemeente? Rol van nationale overheid?
f. Hoe is de communicatie tussen de gemeente en de provincie als het gaat om Natura 2000 wetgeving? Is er een soort van communicatie plan of strategie?
g. Hoe ervaren jullie de Natura 2000 wetgeving?
h. Jullie geven in bestemmingsplan aan dat “ontwikkeling en vernieuwing dienen plaats te vinden binnen de randvoorwaarden zoals die vanuit de omgeving (Natura 2000 en EHS) gelden.” (Bestemmingsplan Juliana Toren en parkeerterrein), hoe gaat dit in praktijk in zijn werking?

i. Tijdens het maken / implementeren van nieuwe ontwikkelingsplannen?
j. Uitleg en overleg met verschillende stakeholders?
k. In hoeverre is het de verantwoordelijkheid van ondernemers (zoals KJT) om op de hoogte te zijn van natuurbescherming? Lichten jullie de ondernemers in hierover?

5. <u>"Herplantingsplicht"</u>

a. Financiële gedeelte van Natura 2000; krijgen jullie compensatie voor het feit dat sommige gebieden nu niet voor (economisch 'waardevollere') activiteiten kunnen worden gebruikt bijv.? Geld voor bescherming, monitoren, en dus compensatie?
b. Wat gebeurt er met privé aangekocht land als het in Natura 2000 gebied? (wanneer nodig, situatie Julianatoren uitleggen)
c. Hebben jullie ervaring met mensen/ondernemers die 'natuurwetten' hebben overtreden? Hoe gaan jullie om met dergelijke conflicten?

6. <u>Recreatie en toerisme</u> (10 min)

a. Wij hebben van Roelof de Graaf het een en ander ontvangen wat betreft bezoekersinformatie. Geen duidelijk informatie over wat toeristen voor dingen doen/willen doen tijdens bezoek in Apeldoorn. Dus we vroegen ons af waarop de wens om een toeristisch hoogtepunt van NL (d.m.v. de attractieparken) op gebaseerd was?
b. Welke informatie over bezoekers is verwerkt in de vier scenario's?
c. Naar hun mening; voor- & nadelen van attractieparken en voor- & nadelen van "natuur"?
d. De verschillende pretparken: bezoekersaantallen bekend? Zowel om te kijken of het binnen wetgeving past als gebruiken om de waarde in te schatten.
e. Een voorbeeld daarvan: "Het Familiepretpark Koningin Juliana Toren wordt beschouwd als één van de belangrijke toeristische dragers in de sector vrijetijdseconomie." Waarop is dat gebaseerd?

Indien echt in detail over de verschillende scenario's:

a. In het tweede scenario wordt het gebied gezien als buffer zone, in deze zone zouden verschillende nieuwe activiteiten plaats kunnen vinden(voornamelijk outdoor), kan het dan nog wel als bufferzone gezien worden?
b. Verplaatsen van de Julianatoren (Nieuw Millengen); echt een optie?
c. Wat wordt er bedoeld met het DNA van de Veluwe?

7. <u>Wanneer we tijd hebben, ook voor de gemeente</u>

a. Juniperbos is stiltebeleidsgebied; wat houdt dat in en wat is het verschil tussen stiltegebieden en stiltebeleidsgebieden?
b. Metingen in woonwijk, waarom? Decibel, waar meten, etc.

8. <u>Afsluiting interview</u>

a. Willen jullie zelf nog iets toevoegen aan het interview?
b. Veel dank voor tijd en interview
c. Eind juni rapport klaar - zullen we dan sturen

d. Mochten we in de tussentijd nog vragen hebben, is het dan nog mogelijk om Ineke de Vries te contacteren?

Appendix 7. Transcription method

In order to prepare the collected data for an analysis, the recordings of the qualitative interviews were transcribed. The usage of a coherent transcription method secures validity and reliability of the constructed transcripts, and therefore further maintains the reliability during data analysis. Kuckartz et al. (2008) established a set of rules for a simplified verbatim transcription which emphasises the content of a qualitative interview, rather than the interaction between interviewer and interviewee. In this way, the transcripts created with this method can be analysed regarding their content, while social interaction between interviewer and interviewee are disregarded if they are deemed irrelevant by the researcher. This method emerged as a feasible transcription method for the purpose of data preparation of this research, which is mainly concerned with the contents mediated by the interviewees. Kuckartz et al. (2008, as cited in Dresing & Pehl, 2013) formulate a number of instructions for this method, which will be presented in the following.

1. The interview is transcribed word-for-word. Every word that is said during the interview is being written down in the transcript.
2. Joint or linked words are being separated. Example: gonna = going to
3. Stammers and interruptions are left out of the transcript to facilitate legibility.
4. Dialects and accents are disregarded in the transcription.
5. Punctuation serves the purpose of legibility and is set by the researcher.
6. Pauses are indicated through suspension marks set in brackets. Example: (...)
7. Signals of comprehension by the interviewer such as ‘mhm’, ‘ah’, ‘yes’ are not transcribed, unless they constitute an expression of the interviewee.
8. General intonation is not transcribed. Explicitly loudly expressed words or exclamations are transcribed in capital letters.
9. Every spoken argument is assigned to its own paragraph. There are blank lines between the arguments in order to increase legibility.
10. Emotional, non-verbal expressions are typeset into brackets. Example: (laugh), (sigh)
11. Actions which do not concern the interview are typeset into square brackets. Example: [coughing]
12. Incomprehensible words are indicated through (incomp). Incomprehensible sentences are indicated through the source of noise interference and a time indication typeset into brackets. Example = (motor sounds, 30 seconds).
13. The researcher is identified with ‘R’, the interviewee is named ‘I’. In case of numerous researchers or interviewees, a numeration is added. Example: R1, I2.

Appendix 8. Assessment criteria

Assessment matrix suggested by methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (as adapted from European Commission, 2001).

Assessment Criteria
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of: · size, scale, land-take, etc. · distance from the Natura 2000 site or key features of the site · resource requirements (e.g. water abstraction etc.) · emissions and waste (disposal to land, water or air) · physical changes that will flow from the project or plan (from excavation, dredging etc.) · transportation requirements · duration of construction, operation, decommissioning, etc. · cumulative impacts with other projects or plans
Describe any likely changes to the site arising as a result of: · loss of habitat area · disturbance to key species · habitat or species fragmentation · reduction in species density · changes in key indicators of conservation value (water resource, water quality etc.) · climate change.
Describe any likely impacts on the Natura 2000 site as a whole in terms of: · interference with the key relationships that define the structure of the site · interference with key relationships that define the function of the site
Provide indicators of significance as a result of the identification of effects set out above in terms of: · habitat loss (e.g. percentage of loss) · fragmentation (e.g. Duration or permanence, level in relation to original extent) · disturbance (e.g. distance from site) · change to key elements of the site (e.g. water quality)
Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.