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The Future of the Utrechtse Heuvelrug as Imagined by its Residents

Regional Integration Project: Research Report

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1. Introduction

The concept of sustainability does not only concern the present, but also encompasses our expectations for the future. This especially regards land use management in areas such as the Utrechtse Heuvelrug in the Netherlands, which is utilized for a variety of purposes including land conservation and recreation (Gemeente Utrechtse Heuvelrug, 2020). These purposes, amongst others, determine our future and analyzing them is crucial. To ensure sustainability in multifunctional areas like this one, a future-oriented approach based on constructing scenarios is essential. Scenario-making is a tool that aids the process of thinking of and designing plausible futures, ultimately reducing uncertainty and providing insights on the opportunities and challenges of these futures that can be considered and acted upon in the present (Van den Ende, 2021). However, there is a prominent knowledge gap on scenario-making in this location, which is why this study will adopt such an approach for the Utrechtse Heuvelrug by applying scenario development methods.

The Utrechtse Heuvelrug is a municipality located to the east of Utrecht, consisting of several cities, towns, and villages, and hosting the second largest forest in the country (Filyushkina, 2020). This unique area full of history also contains the National Park Utrechtse Heuvelrug, which extends over 20,000 hectares of forest and heathland (National Park Utrechtse Heuvelrug, 2020). Due to several contextual factors the area is facing challenges across different sectors. Climate change, for instance, requires different adaptation/mitigation measures to be implemented, which challenges divergent interests and strains the decision-making process of the municipality (Filyushkina, 2020). Furthermore, Covid-19 has partially led to an increase in tourism and recreational activities, which have had visible effects on nature (Topic Definition document, p.22). Generally, the need to preserve and expand Protected Areas (PAs) to safeguard biodiversity and ecosystem services has been emphasized, largely placing them under pressure (Filyushkina, 2020). This study will focus on four main sectors: *tourism & recreation*, *mobility*, *nature & biodiversity*, and *housing*. Key challenges and trends within these sectors will be identified with the intent of placing them under a futuristic lens.

Exploratory scenario-making will be used to investigate multiple future situations in this area, based on key assumptions about future trends that will be obtained from the knowledge and perception of local residents through surveys. Since the perceptions/ideas of residents differ, there will be multiple versions of plausible futures that will be identified and combined. Sources including municipality reports will be used, and sample scenarios proposed by Filyyushkina (2020) will serve as a basis for this research and will be further elaborated on in the next section. The aim of this paper is to identify how residents perceive a sustainable future of the Utrechtse Heuvelrug in order to construct possible and relevant scenarios. This study works towards answering the following research question: *How do the residents of the Utrechtse Heuvelrug perceive and envision a sustainable future*

of the Utrechtse Heuvelrug with respect to nature & biodiversity, tourism & recreation, mobility, and housing? The following sub-research questions were formulated to guide the research:

- *What do residents perceive to be the main challenges to the future of the Utrechtse Heuvelrug from nature & biodiversity, tourism & recreation, mobility, and housing?*
- *What scenarios can be constructed from the obtained perceptions of residents?*

The next section presents a literature review that focuses on existing knowledge on the subject. This is followed by a third section that explains the methods used to collect and analyze data. The fourth section describes the findings accompanied by visual representations and introduces the constructed scenarios. In the fifth section, the scenarios are elaborated further and the limitations of the study are discussed. Lastly, the sixth section summarizes this research and concludes the report, while the seventh section discusses the relevance of this study and integration possibilities with other overarching topics.

2. Literature Review

When looking for literature on sustainability in the Heuvelrug region, barely any articles could be found that explicitly focus on sustainability. In most papers, 'sustainability' is only alluded to briefly, and most research focuses on the Netherlands in general. For example, one study talks about how the landscape in the Netherlands has been changed for flood protection, urbanization and agriculture (Van Dijk, 2018). Most Dutch ecosystems and nature reserves are therefore currently intensively managed and conserved due to external disturbances caused by other land uses (ibid). Another study adds to this by explaining that this has caused considerable biodiversity loss in the Netherlands (van Strien, 2016). However, the ecosystems have recovered slightly from 1990 to 2014 (ibid). Overall, few scientific articles have been found that specifically focus on Utrechtse Heuvelrug.

One of these is the policy brief from the Envision conservation project, that discusses the sustainable management of certain *Protected Areas* mainly in the Utrechtse Heuvelrug (Filyushinka, 2020). It contains four visions pertaining to the future of the municipality, each of which present a unique character. The four visions are a) Inclusive cultural landscape for sustainable living, b) Productivity-oriented landscape, c) A peri-urban landscape of convenience and d) Environmentally-friendly landscape. These visions serve as the conceptual basis of this study and justify the division of this research into four topics: *nature & biodiversity, housing, mobility* and *tourism & recreation*. In the report distinctive characteristics were identified for each vision that correspond to a particular landscape type and function (i.e. agricultural land). Vision A presents a scenario in which various

landscapes (agricultural, recreational & natural) vie for a place in the municipality in a delicate "balancing act". Vision B presents a scenario in which the majority of the land is used for agriculture and the generation of wind and solar energy, while the natural areas take on a more segregated role. Vision C aims to turn the municipality into a residential area in which road networks are expanded and new living areas built. Lastly, Vision D offers a primarily environment-focused future in which conservation takes on the central role, farming practices are organic and the other land-use types are kept to a minimum.

These four visions loosely correspond to the four themes of this research. No corresponding theme, however, exists for Vision C (*productivity-oriented landscape*) because residents may be the least informed and involved in this sector. *Mobility* was chosen instead, as mobility and transportation make up a large component of residents' daily lives. Furthermore, these scenarios are explicitly used in one of the survey's questions (see question 4 in Appendix A), as it would be interesting to see which of these visions is favored the most by the residents of the area.

Strikingly, there is an abundance of non-scientific articles on the subject. The municipality of Utrechtse Heuvelrug has of late been occupied with sustainably improving the towns and nature within their control. In 2017, a sustainability report from Gemeente Utrechtse Heuvelrug was created, which stated that the municipality aims to be climate neutral by 2035 and how they plan to do so. Since it was published, many non-scientific articles have been written about the report, the implementation, and the progress. The substantial difference between the amount of scientific and non-scientific papers could be described as a knowledge gap. The absence of scientific papers and theoretical frameworks on this topic from very expansive search engines, like Google Scholar or Worldcat, signifies that academically, there is little knowledge on this topic. A possible reason for this could be that many sustainability papers on the Netherlands are focused on energy and how it is consumed, wasted, conserved, etc. Additionally, Utrechtse Heuvelrug is sparsely populated and mostly consists of forests. This might make the area less attractive for researchers as it provides less energy data and is therefore less fruitful for sustainability research.

The future is an abstract term, thus a practical tool is required to structure the process of thinking of and designing the future. As mentioned before, however, there is currently a lack of theoretical frameworks used to describe the future of the Utrechtse Heuvelrug. Thus, exploratory scenarios have been used in this study as a practical tool to construct plausible futures (Van den Ende et al., 2021). Here, exploratory scenarios are based on information gathered from local residents, and their purpose is to explore and prepare for uncertainties in the future, like economic growth, new technologies and the effects of climate change (Avin & Goodspeed, 2020). Scenarios are based on

precise analysis of direct and indirect drivers that lead to change, and they can bring light to regional problems addressed by society through the lens of local residents.

Scenarios offer a myriad of advantages which will be briefly described. Scenarios cover a wide range of outcomes consisting of several different factors. Furthermore, there is flexibility to construct storylines with no creative limits. As the participants are local and regional residents, they have first-hand experience and knowledge of what is currently happening in the area and what they believe are possible future scenarios; thus, this method will be likely to create an accurate description. Furthermore, the constructed scenarios are directly applicable to formulate policy responses and in areas where the nature of the problem remains unclear (ipbes, 2021).

A well-known example of exploratory scenarios is the Socioeconomic Pathways (SSPs) that have been implemented for the IPCC 6th assessment report due in 2021 (Hausfather, 2018). SSPs contain a set of global development scenarios created through the challenges and drivers in a certain area gathered by regional expertise (Palazzo et al., 2017). The pathways are five different narratives with qualitative and quantitative elements on possible trajectories for human development and change in the future, and they focus on the climate change mitigation strategies that could be achieved in the future. (van Vuuren, 2017).

3. Methods

For this research, surveys were the most effective method to gather data since they have a myriad of advantages. Firstly, surveys have the ability to target specific information. Therefore, researchers have control over what information they receive. Secondly, surveys carry low costs for large sample sizes as they do not require many resources. Lastly, surveying is a descriptive research method and can be extrapolated to larger populations. On the other hand, surveys also have disadvantages; they can lack accuracy as questions may be misinterpreted by participants. Furthermore, there is no space for the participants to elaborate or explain their answers, as surveys usually consist of multiple-choice questions or require short answers; this decreases the depth of the research.

In this research project, it is intended to measure the extent to which residents agree or disagree with different statements and questions about the future of the Utrechtse Heuvelrug. These statements reflect and determine what residents find important in their residential area, both now and in the future. In doing so, possible scenarios for the future of the Utrechtse Heuvelrug will be identified; a range of plausible futures will be explored. Therefore, exploratory scenario-making will

be used to do so (Avin and Goodspeed, 2020). Moreover, surveying is an effective way of getting a sense of what these scenarios could be, as they gather data from a large sample size. The target audience of this study's survey were the residents of the Utrechtse Heuvelrug, and it consisted of several statements, ranking questions and multiple-choice questions based on four main topics: *nature & biodiversity, housing*, *mobility*, and *tourism & recreation*.

In order to gain as many responses as possible, convenience sampling was used. This is a type of sampling that does not rely on probability in its selection process. Instead, convenience sampling aims to gather as many responses as possible and is targeted at whoever is easily accessible, considering there is a limited amount of time and resources. Before handing out the questionnaire, each respondent was first asked whether they are a resident of the Utrechtse Heuvelrug, as they are the main target group of this research.

The data collection method comprised two parts, which were subject to change due to existing Covid-19 measures. Firstly, residents were surveyed in real life by stopping them on the streets and other crowded intersections. As time was limited and the research group only consisted of a small team, the focused areas were narrowed down to three main towns. These were Zeist, which lies in the north-west of the municipality, Doorn, which lies in the south, and Maarn, which lies in the north. An entire day in each area was spent so as to gather a sufficiently large and consequently representative sample. Nevertheless, existing Covid-19 regulations might have disincentivized people from participating in the surveys, limiting the maximum number of people reached.

Secondly, surveys were shared through social media. The links to the Dutch and English online surveys were publicized in Facebook groups, and SurveyMonkey was used to create and conduct the questionnaires. Using social media was chosen as a possibly effective way to reach a larger number of people, but the success of these surveys largely rested on how active each group was. Three Facebook groups were identified that were fundamentally related to the Utrechtse Heuvelrug, namely 'Nieuws uit de Utrechtse Heuvelrug', 'Evenementen in de Utrechtse Heuvelrug', and 'Buy Nothing Project Utrecht, Netherlands'. However, the challenge was to interest people enough to complete the survey, since they could not be convinced by the research group in person. Additionally, using Facebook groups might have not provided a representative group of participants, as every group had a particular agenda and could therefore, lead to bias. Nevertheless, both data collection methods were used in the research to increase the overall sample size of the study.

Regarding the conduction of the survey, certain things had to be considered. For example, before handing out the questionnaire, a short introduction of the research team as well as the aim of the research was given. With respect to any personal data collected, the privacy statement and the management of data was explained. After, the respondents' informed consent was requested (see

Appendix A). For the majority of the questions, a Likert scale from 1 to 5 was used, corresponding to the degree to which the respondent agreed or disagreed with each statement (1 being completely disagree and 5 being totally agree). This scale was used to have more data compared to just 'agree' or 'disagree' as options. Furthermore, a Likert scale shows how confident the residents were in their answers and allows for neutral answers to some statements. For some questions, a selection of choices was provided. At the end of the survey, one open question was provided to give the participants a chance to elaborate more on their answer, as well as to allow them to mention any issues that might have been missed otherwise. The complete survey can be found in Appendix A. Some of the questions in the survey can seem suggestive, for example, question 10: *I believe that some recreational activities need to be changed for the purpose of conserving biodiversity.* This was deliberate; this choice was made to better understand the relationships between the four different themes of the survey. The questions were based on relations that were researched in literature beforehand. These types of suggestive questions about relationships can also show to what extent the residents were aware of them.

The survey results will be analyzed through visual representations, including pie charts and histograms, to understand how the data is distributed. However, the usage of statistical tests as part of the analysis has deliberately been neglected. This choice was made due to the qualitative nature of the research question. It does not compare two populations, nor does it aim to discover a certain correlation between two variables. As a result, the only possible test to conduct would be one that examines the descriptive statistics of the results. The set of tests available (frequency tests for descriptive statistics) are designed to describe a (large) data set of continuous variables. As the results of the survey provide a small sample of exclusively discrete data, such tests could lead to spurious conclusions.

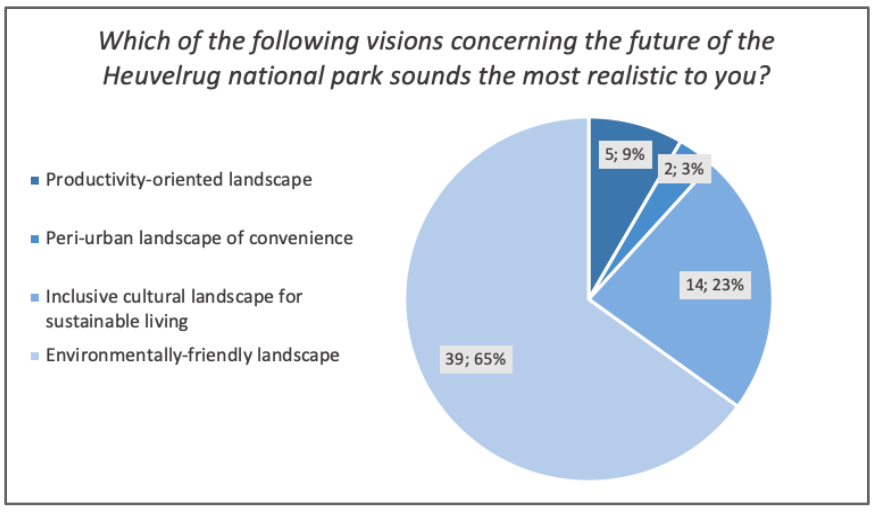
4. Results

This study made use of a questionnaire to gather important information on the perceptions of residents regarding the future of the Utrechtse Heuvelrug. In total, 61 responses were collected, spread over three towns in the following way: 10 from Doorn, 7 from Maarn, and 26 from Zeist. Additionally, 18 responses were collected from the shared online survey. Personal information gathered from the respondents included whether they were a resident of the municipality and for how long they have been so. In this section, a summary of the survey findings will be given with respect to each sustainability topic, with the aim of identifying trends and extracting relevant data. Furthermore, important connections between the results from different questions will be made, and the constructed scenarios will be briefly introduced.

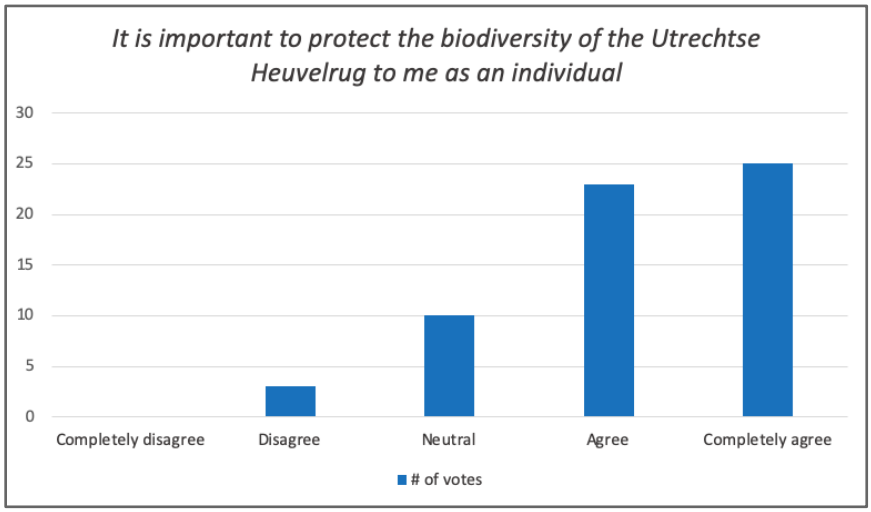
Nature & Biodiversity

Question 4 of the questionnaire provided four options of plausible visions - created by the Envision project - that could be chosen based on which appeared most realistic to the respondents. When looking at Graph 1, a 'productivity-oriented landscape' and a 'peri-urban landscape of convenience' were the least favored visions. The most favored option was an 'environmentally friendly landscape', which was chosen by 39 (65%) out of 61 total respondents, which is quite significant. Similarly, Graph 2 shows that 23 people (38%) agreed and 25 people (41%) completely agreed with the statement *'It is important to protect the biodiversity of the Utrechtse Heuvelrug to me as an individual'* in question 8. Strikingly, there were no respondents who completely disagreed with this statement and only 3 people disagreed. This shows that biodiversity plays an important role for the residents of the Utrechtse Heuvelrug, also considering that 55,7% chose the land-sharing approach as the best strategy in question 9.

Graph 1: Pie chart illustrating the popularity of each of the four visions, constructed by the ENVISION project.



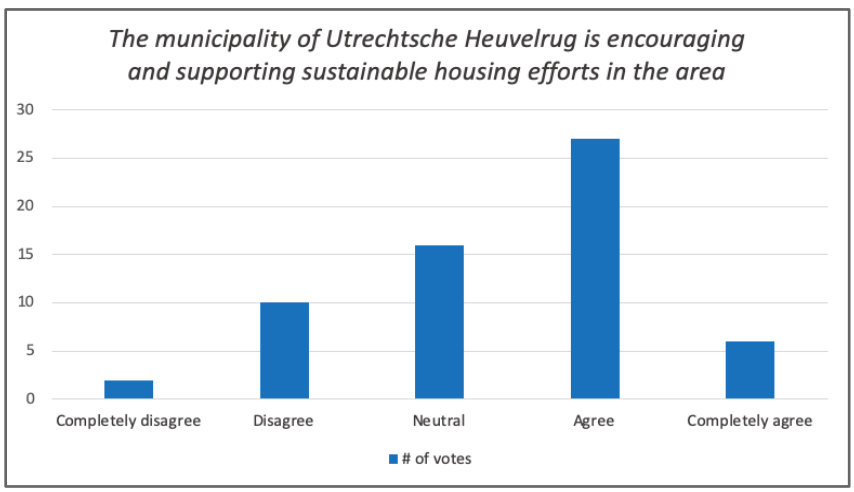
Graph 2: Histogram depicting the choices of respondents to the statement provided in question 8, about the importance of protecting biodiversity.



Housing

Questions 5, 6, and 7 address housing as an issue of sustainability. Question 5 proposed the statement *'The municipality of Utrechtse Heuvelrug is encouraging and supporting sustainable housing efforts in the area',* and 27 (44%) respondents agreed while 10 (16%) disagreed (see Graph 3). Here, the data seems to approach a normal distribution. Meanwhile, 19 (31%) respondents completely agreed and only 7 (11,5%) disagreed with the statement '*You are encouraging and supporting sustainable housing efforts in the area'* in question 6. When also considering that the majority of respondents (42,6%) agreed with the statement *'The inhabitants of Utrechtse Heuvelrug are sustainability and energy conscious'* from question 7, it can be understood that the residents are aware of the importance of sustainable housing, and further elaboration on the results from question 21 will strengthen this observation.

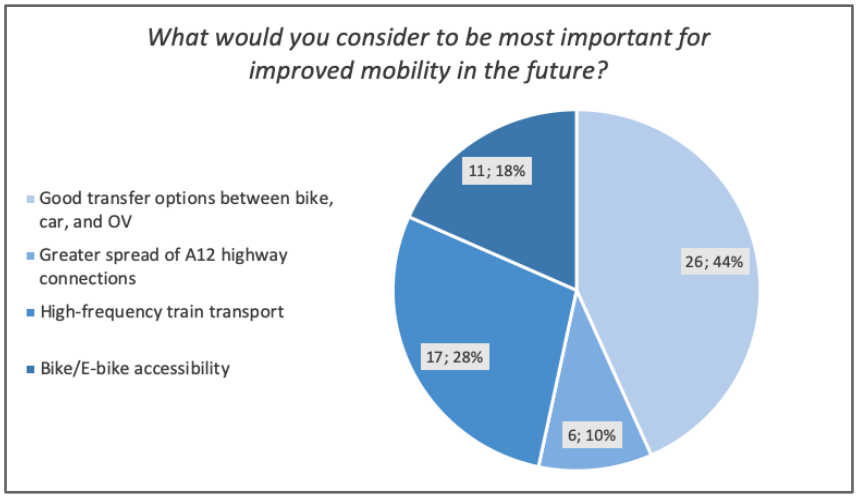
Graph 3: Histogram depicting the choices of respondents to the statement provided in question 5, about the municipality's role in encouraging and supporting sustainable housing efforts.



Mobility

Question 15, *'What would you consider to be most important for improved mobility in the future?'*, offered a choice rather than a statement. A maximum of two options could be chosen; the option *'good transfer options between bike, car, and OV'* was most frequently chosen with 26 votes, while the option *'greater spread of A12 highway connections'* received the least votes (see Graph 4). A possible reason for this may be that the majority of respondents also completely agreed with the statement '*I would be in favor of making more car-free areas in the municipality*', hinting at a possible reduction in car mobility in the future. The remaining two options *'high-frequency train transport' and 'bike/E-bike accessibility'* were the second and third most chosen options respectively. Due to the nature of this question and the lack of a mean measure, no statement can be made regarding the distribution of the data.

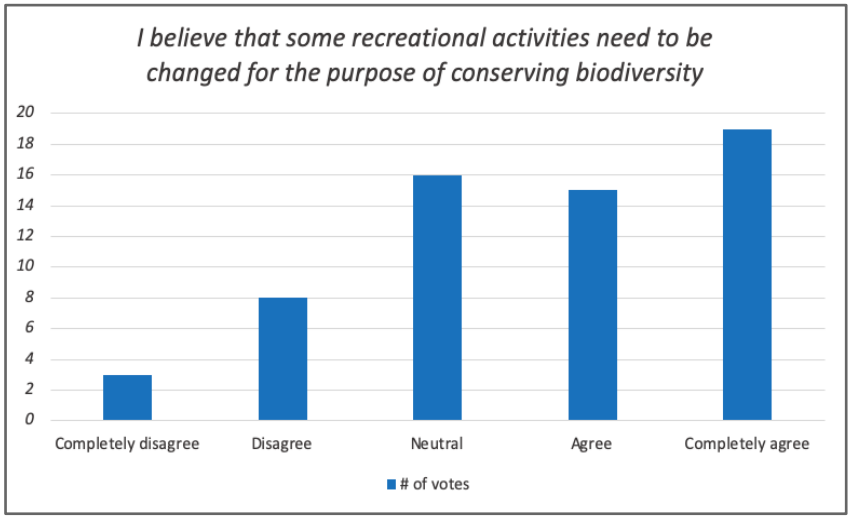
Graph 4: Pie chart illustrating the share of people who chose each option from question 15, about the preferred improvement in mobility.



Tourism & Recreation

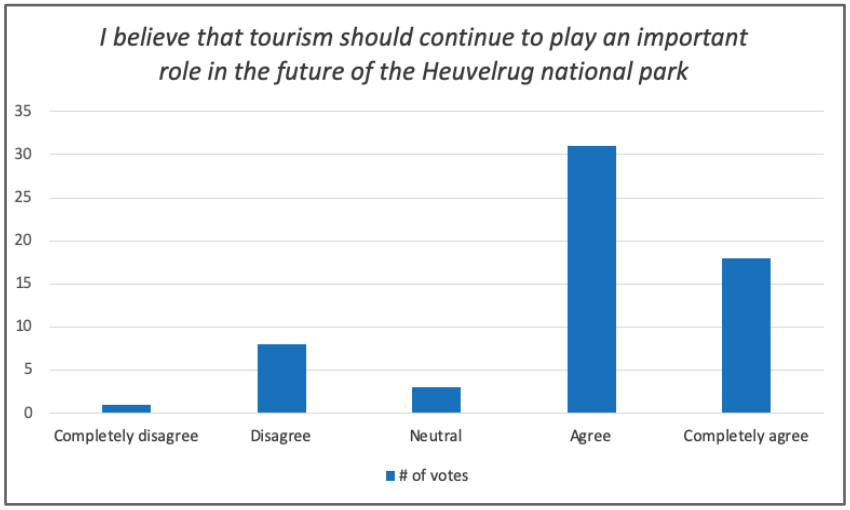
Question 10 corresponds to the perceived sense that recreational activities need to be changed in the interest of conserving biodiversity. Graph 5 depicts the responses, which are slightly skewed to the right. The options 'completely agree', 'agree', and 'neutral' for the statement *'I believe that some recreational activities need to be changed for the purpose of conserving biodiversity'* have been chosen approximately the same number of times. However, 68,8% of respondents (completely) agreed with the statement *'I believe that the Heuvelrug national park experiences a healthy level of recreational activities'* in question 18, somewhat contradicting the results from question 10.

Graph 5: Histogram depicting the choices of respondents to the statement provided in question 10, about the willingness to change recreational activities in the interest of conserving biodiversity.



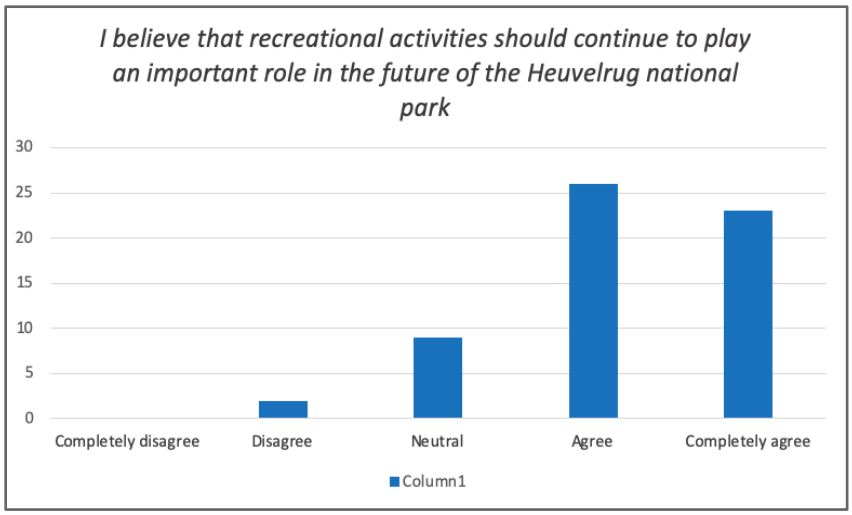
Questions 17 and 19 focus on the future of recreation and tourism. The statement in question 17 is *'I believe that tourism should continue to play an important role in the future of the Heuvelrug national park'.* The first option received 1 vote, after which the others received 8, 3, 31, and 18 votes respectively. Nevertheless, the results are still slightly skewed towards the right (affirmation). From these findings, and considering that 59% of respondents agreed that the national park receives a healthy level of tourism in question 16, it can be understood that tourism plays an important role for the municipality, most likely influencing the area's future economic, social, and environmental conditions.

Graph 6: Histogram depicting the choices of respondents to the statement provided in question 17, about the role of tourism in the future of the municipality.



Regarding question 19, which presents the statement *'I believe that recreational activities should continue to play an important role in the future of the Heuvelrug national park'*, the results are almost identical to those of question 8. The results in Graph 7 show that most people (26) agree with the statement, while no one completely disagreed. Once again, a strong skewness towards agreement can be observed.

Graph 7: Histogram depicting the choices of respondents to the statement provided in question 19, about the role of recreational activities in the future of the municipality.



Open Ended Question

Question 21, '*What do you think the municipality of the Utrechtse Heuvelrug should prioritize regarding future sustainability?*', is an open-ended question with the scope of receiving a more extensive answer and possibly exploring new areas of information. Out of 37 written responses, 15 (40,5%) included either terms of "sustainable housing" and/or "solar panels". Out of these, 4 answers included the terms "subsidies" and "financing" for people with limited financial resources. Additional answers included "reducing gas" and "nuclear energy". Furthermore, 10 responses (27%) referred to transportation, including either terms of "less transport", "car-free zones", "bikes", and/or "OV". In total, 4 answers contained the term "biodiversity", with one answer explicitly referring to "mowing, pruning, and chopping of trees" that disrupt biodiversity. Moreover, 3 answers referred to "awareness" and "better information" on how residents can make more sustainable choices, while 2 answers included "stop on tourism" and "tourism and recreation". Lastly, 3 answers relating to "waste" and "waste management" were received, one of which referred to "the way plastic is being used". Overall, the most common answer addressed sustainable housing and renewable energy, suggesting that the municipality's residents hope for a more sustainable housing future. Based on

these survey findings, four different visions have been created, namely a *biodiversity-centered future*, *a cultural & recreational vision*, *climate-neutral mobility* and *energy-neutral housing*.

5. Discussion

Visions

After collecting data, the goal was to create several different scenarios that encompass all the different aspects of the future. However, from the gathered findings it was more appropriate to focus on these aspects separately rather than combining them to form complete scenarios. This is because four apparent themes came forward when looking at the data, that were not broad enough to be scenarios on their own. Therefore, the decision was made to create visions rather than distinct scenarios. These visions can coexist and be complementary in character, rather than mutually exclusive. Moreover, there are commonalities between these visions. For example, all of the visions require the participation of both residents and the government. Furthermore, each vision focuses on sustainability to a certain extent. The visions created are *biodiversity-centered future, a cultural and recreational vision, climate neutral mobility* and *energy-neutral housing*. All visions are relevant when creating an interdisciplinary perspective on sustainability in the Utrechtse Heuvelrug for the future.

Biodiversity centered future

The first vision is based around biodiversity conservation and land sharing. Since a majority of people chose ‘an environmentally friendly landscape’ in question 4 of the survey, it was clear that taking nature into account with forest management was important to the participants. This became even more clear with question 8, where almost all respondents either completely agreed or agreed that biodiversity was important to them as individuals. Moreover, in the open question 21, multiple participants mentioned biodiversity (conservation) when asked what the municipality should prioritize with regards to sustainability. For this reason, the decision was made to make a vision based around biodiversity. In the question regarding land-sharing versus land-sparing, a majority chose land-sharing, which is why this vision focuses on a land-sharing approach. This means that the focus would be to create more biodiversity by working with farmers and integrating ‘nature’ with agriculture through organic farming practices or food forests for instance.

The results of the survey showed that residents found biodiversity important for a sustainable future. One reason for this could be the fact that biodiversity in the Netherlands has been decreasing

over the last several decades (Mulder, 2018). Consequently, awareness on biodiversity loss has increased. These factors could be drivers for residents of the Utrechtse Heuvelrug to want a scenario based around biodiversity conservation. Another driver of this vision could be the pressure that is put on the municipality of the Utrechtse Heuvelrug by other stakeholders, such as NGOs, to be more sustainable and protect its forested areas. In the policy brief by Filyushkina (2020) a similar scenario was constructed; an 'environmentally-friendly landscape' scenario with environmental concerns lie at the center. Besides that, biodiversity conservation would be key across both natural and agricultural landscapes (Filyushkina, 2020). This shows that other research in futuring has come up with similar results. Other visions, like climate-neutral mobility and energy-neutral housing could aid to create a biodiversity-centered future.

A cultural & recreational vision

As seen in question 17, a large majority of the respondents either agreed or completely agreed with the statement that tourism and recreation should continue to play an important role in the future of the park. Thus, another plausible vision is one that predominantly focuses on tourism and recreation. In this case, more space would be needed for recreational and touristic activities, and more transport services would be required for people to reach the places of such activities. Nature conservation areas might also be reduced in order to create walking and biking routes. Tourism, however, has a negative impact on the environment through soil erosion, vegetational damage, disturbance to wildlife, water pollution, and litter (Buckley, 1991). Nevertheless, although tourism may have consequences on the local environment, it benefits the national income. The economy is stimulated by the multiplier effect; the government initially spends money to invest in tourism but the national income is increased by the spending of tourists (Sengupta, 2021). This vision could also be realistic, as tourism is growing globally due to decreasing costs and travel time. Furthermore, there is an increasing desire to experience different cultures due to increasing media coverage of different places.

The findings of question 10 show that the majority of the residents completely agree that some recreational activities need to be changed to conserve biodiversity. The Utrechtse Heuvelrug could apply sustainable tourism to acquire a level of tourism that is healthy for the environment and the economy. Sustainable tourism aims to conserve primary tourist resources and supports the livelihoods of local residents (Sengupta, 2021). Therefore, sustainable tourism allows tourists to experience nature that is intact and ensures that their presence doesn't degrade the environment. Other methods to preserve the environment in combination with tourism are surveillance of access and activities, educating the public and physical conservation of specific areas (Buckley, 1991). Therefore, it is possible for a cultural & recreational future to coexist with a biodiversity-centered future through the use of ecotourism.

Climate-neutral mobility

A third possible future vision is based around climate-neutral mobility. This would entail creating more car-free zones as well as increasing public transport options and E-bike subsidies. Climate-neutral mobility strengthens the biodiversity-centered future as it reduces the carbon emission levels, which improves biodiversity. As seen in question 13, the majority of the respondents completely agreed with making more car-free areas in the municipality. In a car-free city center only the functionally necessary motor traffic is permitted (Topp & Pharoah, 1994), such as delivery services. In the case of the Utrechtse Heuvelrug, it is not realistic for the entire municipality to be car-free as a lot of traveling takes place from town to town. However, implementing car-free areas in the city centers will reduce CO2 emissions and increase the attractiveness and economic vitality of the centers. Therefore, the centers will become more pleasant to stay in, experiencing less noise and better air quality.

As seen in the survey, a large portion of residents believe that more efficient public transport transfers should be implemented. This makes public transport a more attractive option to use. Furthermore, residents often opted for a higher frequency of train transport which would also increase the amount of train passengers, reducing CO2 emissions from cars. According to question 14, bikes are currently the most popular type of transport in the Utrechtse Heuvelrug. This is already a start to reaching a climate neutral future. Another way to become climate neutral is to increase the usage of E-bikes in the Utrechtse Heuvelrug. If the government were to subsidize E-bikes, they could become more popular, especially for the elderly. A lot of senior citizens live in the Utrechtse Heuvelrug, before or after their retirement, for the natural scenery (Klaassen & Van Der Vlist, 1990). As their health decreases when they get older, they have more difficulty in riding a bicycle; thus E-bikes may be the climate-neutral solution. Through implementing car-free zones, subsidizing E-bikes and having more efficient transfers, this vision becomes feasible.

Energy-neutral housing

Lastly, a sustainable housing-based vision focused on solar panels has been constructed. In this vision, the main focus is to increase sustainable energy options, especially in and around houses. Thus, both energy-neutral housing and climate-neutral mobility focus on using renewable energy in order to become more sustainable and reach a biodiversity-centered future. The strategy for this would be increasing the number of solar panels on roofs. However, other solutions such as moving away from gas and isolation of houses are also viable. The construction of this vision was based mainly on the last question of the survey. As mentioned before, around 40% of the responses to the open-ended question included either the terms “sustainable housing” and/or “solar panels”. Multiple of these responses also included the words “subsidies” and “financing” for people who cannot afford solar

panels/sustainable housing. Because of that, it was concluded that a vision based around sustainable housing and solar panels would be viable.

In the Utrechtse Heuvelrug, the use of solar panels seems like the most feasible option for sustainable energy, since many residents do not like the idea of having windmills in the area due to possible noise issues. Besides that, many residents think that windmills do not fit the area's cultural landscape (Huurneman, 2012). Therefore, installing more solar panels on roofs and subsidizing this strategy seems like a possibility for the future. However, one participant of the survey explained that in some areas of the Utrechtse Heuvelrug, solar panels on roofs are prohibited because houses are considered cultural heirlooms. Furthermore, issues of landscape maintenance are present in the municipality. For example, one participant of the survey explained that the municipality is tasked with maintaining trees at a certain height so that they do not cover roofs in case residents have solar panels or want to put them but neglect to do so. These examples showcase some current problems with implementing more solar panels. However, if they can be overcome, this fourth vision could be feasible.

Limitations and Future Considerations

There are multiple limitations of the research that need to be considered. To start with, a sample size of approximately 60 respondents may be too small to be appropriate for extrapolating the data to the entire population. However, due to COVID-19 many people were hesitant to be in close proximity to the research team. Additionally, there were often multiple research groups in the same location, so respondents were asked to complete more than one survey which many of them denied. If this research were to take place again in the future, a QR code could be made that could be distributed on flyers to reach more people and be more time-efficient.

Furthermore, the number of respondents varied significantly between the different locations that were visited; there were many more respondents from Zeist than other villages, which may have led to bias. Thus, the representation was not spread evenly, reducing the validity of a geographic analysis. As a result, a better-defined minimum of respondents could have been settled, in order to more easily reach the desired number of respondents in each location. Moreover, some of the results gathered are contradicting, making it difficult to draw conclusions. For example, as seen in question 18, most respondents agreed that the national park receives a healthy level of recreation. However, the majority of respondents also completely agreed that some recreational activities need to be changed in order to conserve biodiversity. These contradicting answers complicated the construction of appropriate scenarios.

Respondents may also have answered questions according to social desirability, meaning that they answered in a way that they felt was socially accepted. For example, some respondents knew that the research team involved sustainability students, which may have pressured them to give the "right" answer, creating biased results. In order to tackle this challenge, questions could be formulated in a more neutral and indirect way and the fact that the researchers were sustainability students could have not been mentioned. Moreover, interviewer variability may have taken place as some students were asked to read out the questions and other respondents filled in the survey themselves. This may have caused fluctuations as, for example, land sharing and land sparing approaches may have been explained differently. To overcome this, a fixed survey method could have been decided upon, which also needed to consider that not all team members spoke Dutch. Furthermore, respondent fatigue may also have played a role, as the surveys took around 15 minutes (especially when reading out the questions), so the attention span of the respondents may have decreased by the end of the survey. To tackle this issue, questions could have been worded in a simpler way and the survey could have been shortened to avoid the feeling of tiredness.

As mentioned in the Methods, another issue could be that some questions could seem suggestive. This could lead to biased answers. One example of this is question 12 of the survey, about the relationship between recreation and mobility. In this question, it is suggested that an increase in recreation has the definite effect of reduced road traffic. Even though this can lead to bias, these questions can still be valuable as they explore relationships between the four themes of the survey and allow for connections between them to be made. Lastly, some of the questions may have been difficult to understand for the participants. One example of this would be question 4, about the four visions based on the Envision project. These visions could be interpreted in different ways when not having read the policy brief that they were based on. This could be improved by adding more explanations to these visions. However, the choice was made not to do this to avoid other issues such as respondent fatigue and bias.

6. Conclusion

In this report, a study was conducted on the perceptions of residents of the Utrechtse Heuvelrug on *nature & biodiversity, housing, mobility* and *tourism & recreation* in the municipality. Surveys were chosen as the preferred method to gather data, which were based on convenience sampling. A total of 61 questionnaires were collected from Zeist, Doorn and Maarn, as well as three social media groups based in the municipality. The gathered data enabled the construction of four visions for the future of the Utrechtse Heuvelrug. Each vision touches upon a separate sector, and are not mutually exclusive

for this reason. Similarly, the four visions are not distinct enough to make up separate scenarios and instead make up different components of the same (or similar) ideal future(s). In an ideal world, all four visions of the future would actually complement each other and create the best possible scenario for the municipality, that is both sought-after by the community and sustainable. The scope of this research naturally does not address the feasibility of any of these visions and merely presents themes and elements that the residents perceive to be most significant.

When considering the primary limitation of this research, it should be clearly noted that all responses are based on a relatively small sample size, limiting the scope of these findings. Furthermore, the amount of responses per location varied significantly, with Zeist receiving the most respondents due to its larger population size, limiting the validity of any comparisons that could be made between individual towns. Additionally, the respondents' answers may have been driven by social desirability, as explained in the Discussion, which may have led to biased results. Nevertheless, these limitations have been considered and possible solutions to overcome them have been outlined.

Overall, it can be stated that the residents of the Utrechtse Heuvelrug are both aware and concerned about the future of their municipality and are willing to engage in discussions that address this. A majority of residents opted for the 'environmentally friendly landscape' from the four visions, which shows how aware residents are of the environment and the challenges it faces. Based on residents' responses, it is clear that the municipality should implement greater efforts to reduce carbon-energy and make housing more sustainable, especially with regard to solar panels. This could be achieved through subsidies and financial support for residents with limited financial capabilities, also making this transformation more inclusive and equitable. Better urban planning is also needed to efficiently implement solar panels on buildings without interfering with other infrastructure. Furthermore, bicycle accessibility and public transportation should be improved to make mobility more eco-efficient; given that the majority of residents already use bicycles for transportation, it is mainly a matter for policy action and incentives. Lastly, awareness programs and the provision of information on how residents can live more sustainably should be provided, to ensure intra- and inter-generational sustainability.

7. Relevance and Integration Possibilities

The findings of the research have painted a much clearer picture of the residents' attitudes with respect to each of the four topics highlighted in this study. The implemented Likert scale corresponded to the respondents' confidence/certainty pertaining to current and future developments in each respective sector. A lack of confidence/certainty shed light on the most neglected elements that warrant the most attention, such as sustainable housing and mobility. Additionally, the respondents were asked to prioritize the most important aspects going forward, showcasing their outlook with respect to the future of the municipality. In general, these spoke in the interest of conserving nature; however, they also maintained that both recreation and tourism should continue to play a large role in the future. The open question at the end of the survey provided respondents with an opportunity to voice any explicit concerns or reservations that they may hold about the present and/or future state of the municipality. The expressed concerns were manifold, mostly regarding unsustainable housing and transportation, which goes to show that the residents are aware of ongoing problems and are willing to critically examine these in a cooperative manner.

To further integrate the findings of this research, a comparison should be made between the residents of the Utrechtse Heuvelrug and the perceptions of other stakeholders, who also play a clear role in the area. These include visitors, the forestry commission, the water and energy boards (HDSR & Heuvelrug Energie) and various other representatives of the municipality. The respective concerns and prioritizations of the stakeholders should be weighed against each other in order to create a leading frame of reference that will help guide any collegial efforts forward.

To conclude, links with other overarching topics have been made, namely topic 2, "Sustainable Recreation Management", and topic 5"Climate-neutral Heuvelrug". Since the study's scope of research addresses plausible futures, the several components of these topics should be considered and integrated in the research. More specifically, related subtopics include:

- Visitor mobility,
- Perceptions on nature,
- Mobility preferences of Heuvelrug users,
- Residents and renewables,
- Sustainable mobility in the region,
- and Sustainable mobility and residents.

Understanding mobility preferences and the perceptions on nature and renewables of residents and other stakeholders is key to predicting how sustainability will evolve, and this has been acknowledged in this study. Questions about favored modes of transport and the importance of biodiversity have been asked, and an emphasis on renewable energy has emerged from the respondents' perceptions.

Thus, the findings of these two overarching topics would complement the insights presented in this report, leading to a more detailed understanding of what the future of the Utrechtse Heuvelrug could look like.

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APPENDIX A: Questionnaire

Good morning/afternoon,
We are a group of five bachelor students at Utrecht University, studying (global) Sustainability Sciences. The focus area of our research is Utrechtse Heuvelrug and we are gathering data on the residents' perceptions of the park across four sectors, namely: recreation & sports, mobility, nature & biodiversity, and recreation. We are interested in both the present and the future state of the park, but first and foremost we want to hear what its residents think!
In order to gather the data we need, we prepared a survey that will take 10-15 minutes to complete. The questionnaire is voluntary, so you can opt out at any time and for any reason.
The data we are collecting could be published. However, we will anonymize your personal data and this will remain confidential at all times.
Do you give you explicit and informed consent for us to process the data we receive from this survey?

- Yes
- No

We are very grateful for your participation if you choose to help us fill out this questionnaire.

Background

1 - Are you a resident of the Utrechtse Heuvelrug National Park?*

Yes ____
No ____
*If they answer no, stop the survey.

2- How long have you lived in the municipality for?

_____

3 - Are you an active member that is engaged in the welfare/maintenance/development of the national park?

- Yes, in the welfare of the national park.
- Yes, in the maintenance of the park.
- Yes, in the development of the park.
- Yes, other. Please specify: ____
- No

4- Which of the following visions concerning the future of the Heuvelrug national park sounds the most realistic to you? These visions were created by the Envision project, a conservation initiative.

- Inclusive cultural landscape for sustainable living
- Productivity-oriented landscape
- A peri-urban landscape of convenience
- Environmentally-friendly landscape

Housing

5- The municipality of Utrechtse Heuvelrug is encouraging and supporting sustainable housing efforts in the area.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

6- You are encouraging and supporting sustainable housing efforts in the area.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

7- The inhabitants of Utrechtse Heuvelrug are sustainability and energy conscious.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

Biodiversity

8- It is important to protect the biodiversity of the Utrechtse Heuvelrug to me as an individual.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

9- In a *land sparing* approach production and conservation are separated, as one part of the land is intensively used for agricultural production and the other part for conservation. In a *land sharing* approach production and conservation are integrated, as land is used less intensively for agricultural production so that biodiversity can be simultaneously maintained.
What do you think would be the best way to protect biodiversity in the forest?

- Land sharing (combining forests/other natural areas with agricultural land)
- Land sparing (protecting certain parts of forests/other natural areas from being used as agricultural land and using the non-protected parts for agriculture)

10- I believe that some recreational activities need to be changed for the purpose of conserving biodiversity.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

11- I am in favor of creating food or climate forests as a strategy for protecting biodiversity.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

Mobility

12- An increase in recreational opportunities, and therefore reduced road traffic, would negatively affect my mobility within the area.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

13- I would be in favor of making more car-free areas in the municipality.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

14- What is your preferred mode of transport?

Car	Bike	E-bike	OV	Other

15- What would you consider to be most important for improved mobility in the future? (max. 2)

- Greater spread of the A12 highway connections
- High-frequency train transport
- Bike/E-Bike accessibility
- Good transfer options between bike, car, and OV

Recreation

16- I believe that the Heuvelrug national park experiences a healthy level of tourism.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

17- I believe that tourism should continue to play an important role in the future of the Heuvelrug national park.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

18- I believe that the Heuvelrug national park experiences a healthy level of recreational activities.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

19- I believe that recreational activities should continue to play an important role in the future of the Heuvelrug national park.

1 - Completely disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Completely agree

Conclusion

20- Which of these do you think is currently least sustainable?

- Recreation and Sports
- Mobility (transport and access)
- Nature & biodiversity
- (Sustainable) Housing + energy

21- What do you think the municipality of the Utrechtse Heuvelrug should prioritize regarding future sustainability?

_____