



# COVID-19 AND ITS IMPLICATIONS ON RECREATION IN THE UTRECHTSE HEUVELRUG

## Research Report

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*Regional Integration Project, BSc Global Sustainability Science, Utrecht University*

*Group: 2A – Recreation inventory*

*Supervision by: Stef Knibbeler*

*Written by: Renske de Boer (3059864), Annika Dick (7010753),*

*Tabea Dick (7010710), Rosa de Leeuwe (5562768), Michelle Ng (9909064)*

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## 1. Introduction

The COVID-19 pandemic with its global rise in 2020 has changed the world and human behaviour in many ways. Additionally, it shows how important it is to consider the human-nature relationship and, specifically, this means how people behave as a response to this pandemic (Haasova et al., 2020). In challenging times, as such or other crises, outdoor recreation serves as an important way to cope with the situation (Rice et al., 2020). This emphasises that nature plays an important role in human well-being (Young et al., 2020). Additionally, the COVID pandemic has influenced people's ways of living. For instance, nature is observed as a highly valued recreation space in contrast to working online or in home-office. Next to this, changes in leisure activities are observable due to different restrictions for indoor activities, and connected to this, nature areas are viewed as serving less exposure to the risk for infection (Landry et al., 2020). These currently developed findings underline a clear tendency of increasing connectedness to nature (Haasova et al., 2020).

However, as this is a global phenomenon, it also leads to a growing number of people visiting nature areas for recreation (Rice et al., 2020). It is already known that visitations have increased during the last year and worldwide it is getting busier in outside areas. This trend is also observable in the Netherlands and especially in nature parks (Landry et al., 2020). In our research, the National Park Utrechtse Heuvelrug is our area of study. Although the current literature presents *that* recreation in nature has increased, it is still unknown *how* it has changed with the presence of a worldwide pandemic. More specifically, our research investigates the influence of COVID-19 in the Utrechtse Heuvelrug with regard to visitation frequency, age, and recreation type. Therefore, our research project is contributing to research about this timely topic by providing extended findings.

The main question we aim to answer with our research project is: **how did the COVID-19 pandemic influence the recreation behaviour of visitors in the Utrechtse Heuvelrug?** We aim to answer this question by focusing on specific sub-questions:

1. **What is the change in the frequency of (actual and observed) visitations compared to pre-COVID times?**
2. **How did the frequency of visitations change between different age groups?**
3. **What are the types of recreation the visitors do and how did that change?**
4. **How did the change in recreation types differ between different age groups?**

With these questions at hand, we aim to add new knowledge by providing comparative research (i.e., comparing pre-COVID and during COVID) and to analyse the connectedness between the three sub-questions. Moreover, these will serve as guidance during the research paper.

Our research paper is organised as follows: the literature review aims to show how we can use current findings for our research; it helps to identify the current knowledge gap which

we aim to decrease. Additionally, the methodology will present how we will gather, analyse, and interpret our data in the light of our research questions. This section is followed by an explanation for the relevance of our research and how our results will answer the above research questions.

## 2. Literature review

This section will discuss several methods that are reported in the literature regarding the human-nature relationship and how it has been shaped by the global COVID-19 pandemic. Firstly, it will examine a case study regarding the correlation between nature and well-being. Furthermore, previous research regarding the impact of the pandemic on the recreation sector and the number of nature visits is examined. Finally, the strengths and limitations of diverse methods used to monitor visitors of nature areas such as the Utrechtse Heuvelrug are discussed.

### 2.1 Relationship people and nature

A considerable amount of literature has been published on the relationship between people and nature. Numerous studies have demonstrated that nature has a positive influence on human well-being (Taylor, 2017). For example, a recent case study in Sheffield examining the connection between urban nature and human well-being (Dobson, 2021).

Data were gathered from multiple approaches including a statistical approach and narrative approaches. Interviews were used to study how residents from diverse backgrounds (especially differentiated by age, gender, ethnicity, and mental health) experience nature in the city. The study also included workshops in which participants used art techniques to visualize their experiences and feelings about nature and well-being (Dobson, 2021). Furthermore, a smartphone application was created to gather data (McEwan, 2019). It recorded users' routes, locations, and duration of stay in natural environments. Finally, data was collected from professional knowledge from stakeholders such as green space managers, planners, and members of community groups and through literature reviews.

Significant relationships were found between better general health and larger average garden size, greater total green space cover, and greater local tree density. Also, lower levels of depression were found in areas where average garden sizes were larger and where publicly accessible green spaces were cleaner (Dobson, 2021).

### 2.2 Recreation and COVID-19

According to Van Leeuwen et al. (2020), the COVID-19 pandemic had an enormous impact on the leisure behaviour of people. In March 2020, the Dutch government implemented a lockdown; places where people tended to spend a lot of time (e.g. restaurants, bars, fitness schools) needed

to close (Dalen, 2021). Consequently, people sought other types of recreation and changed their leisure behaviour. Van Leeuwen (2020) argued that “self-organized outdoor activities such as hiking, running, and cycling became more popular”. Large increases in visitors caused the Utrechtse Heuvelrug National Park to send an urgent letter, asking the citizens of province Utrecht not to visit the nature areas during the lockdown of November 2020.

In 2021 new terms such as ‘COVID Hikers’ arose, together with increasing pressures on the environment. Verbunt and Oosterom (2021) noticed that people have less respect for nature compared to the first lockdown in 2020. Guidelines in forests and nature areas are disobeyed and warning signs are completely ignored. This causes, for example, flora and fauna to be damaged due to people walking off-road. Additionally, there was an increase in litter as more restaurants have adapted ‘To-Go concepts’ (Verbunt & Oosterom, 2021). Research still needs to be done on how the pandemic has an influence on these issues.

## 2.3 Methods for monitoring visitors

Without appropriate data from targeted visitors and impact monitoring programmes it is impossible to determine if visitation is ecologically sustainable (Haweden et al., 2007); therefore, monitoring the number of visitors is crucial. Our research aims to contribute to the data regarding the increasing number of visitors in the Utrechtse Heuvelrug. The literature has shown that the visitation numbers were already on the rise since 2007. Various protected-area managers have reported cases where tourism and recreation are threats to sustainable management as sites are showing signs of overuse (Hawden et al, 2007). Next to the frequency of visits to the Utrechtse Heuvelrug, we aim to look at the different types of recreation the visitors practice.

According to Cessford & Muhar (2003), there are four methods to obtain visitor count data:

- *Direct observations* - field observers or camera recordings
- *On-site counters* - devices recording visitor counts through physical movement, pressure, vibration, or optical sensors
- *Visit registrations* - either voluntary or compulsory self-registrations or counting fee payments to the park
- *Inferred counts* - counts of elements linked to visitors use or interviews which are interpretive aids

Table 1 shows the advantages and disadvantages each method could have. To know which approach is most appropriate, it is important to specify the management objective for the monitoring as well as the trade-off between the need for accuracy and practical capacity (Cessford & Muhar, 2003).

A tick '✓' = a direct Yes; a question mark '?' = an indirect Yes (if hardware and software are specifically configured and calibrated to do so, and a specific sampling approach is taken), a dash '-' means No – this method cannot normally collect this.

Count methods	Visitor no's	Date & time	Travel direction	Route taken	Spatial distribution	Group size	Visitor features	Visitor behaviour
Observations								
– Roaming observers	?	✓	✓	?	?	✓	✓	✓
– Fixed observers	✓	✓	✓	?	?	✓	✓	✓
– Video recordings	✓	✓	✓	–	?	✓	✓	✓
– Time-lapse photo/video	✓	✓	✓	–	?	✓	?	?
– Aerial/satellite imagery	?	✓	–	–	?	?	–	–
On-site count devices								
– Mechanical	✓	?	?	–	?	?	–	–
– Pressure	✓	?	?	–	?	?	–	–
– Seismic/vibration	✓	?	?	–	?	?	–	–
– Active light beam	✓	?	?	–	?	?	–	–
– Passive IR sensor	✓	?	?	–	?	?	–	–
– Magnetic field	✓	?	?	–	?	?	–	–
– Microwave beam	✓	?	?	–	?	?	–	–
Visit registrations								
– Voluntary registers	?	?	?	?	?	?	?	–
– Compulsory registers	✓	✓	?	?	?	?	?	–
– Permits/bookings/fees	✓	?	?	?	?	?	?	–
Inferred counts								
– Indicative counts	?	?	?	?	?	?	?	?
– Interview counts	?	✓	✓	✓	?	✓	✓	✓

Table 1: Coverage capacities of the different monitoring methods – what kinds of data they can normally collect (Cessford & Muhar, 2003)

### 3. Methodology

As discussed in the previous chapter, there are different methods to monitor visitors in nature parks. For our research it is important to know the characteristics and features of the different visitors; this is to say, different types of recreation the visitors practice and data to answer the question about the age distribution need to be obtained. According to Table 1, roaming and fixed observers, video recordings, and interview counts are appropriate methods to examine visitors' characteristics and features. Considering our limited resources and time, we chose to engage in the observer's method; visitors were monitored at different places at the Utrechtse Heuvelrug, with the use of survey counts.

#### 3.1 Data Collection

Our fieldwork took place on three days, from 01.06.2021 till 03.06.2021. To find answers to our research questions we conducted a survey in our research area, i.e., the National Park Utrechtse Heuvelrug. Within this area, we decided to choose three different locations, namely Heidestein, Beauforthouse, and Laage Vuursche. By that, we aimed to gain variation in our findings which allows for a more general representation of the Utrechtse Heuvelrug.

We collected data in two ways via the online platform ArcGIS Survey123 (link to the questionnaire: <https://arcg.is/1PnC500>). Visitors were either asked to verbally answer the questionnaire (to avoid unnecessary touch screen contact concerning the COVID-19 pandemic), or they made use of QR-codes which we provided. By applying both methods of data conduction, we hoped to receive a large number of respondents to the survey to have representative results.

Furthermore, the selection followed randomly among the visitors. They have been asked in person to take part in our research project, their participation and data contribution were voluntary, and their data was conducted anonymously (see Appendix I: Data management plan). Additionally, the survey, and therefore, the personal contact with the visitors, was planned to happen in English. However, as we assumed to meet different age groups and people with different language skills, the Dutch-speaking members of our research group took the lead in the conversation in case it was necessary.

In total, the questionnaire was structured in three thematic parts following our sub-research questions and entailed 10 questions; how the different survey questions helped to answer our sub-research questions is identified in Appendix II. All questions were closed-ended questions; this is to say, the participants chose from a given set of answers, including binary questions (e.g., yes/no), option selections (e.g., type of recreation), and Likert scales (e.g., visit less often to visit more often).

Important to consider is that our research was not based on previous research in the Utrechtse Heuvelrug. As there was no data available about, for instance, the frequency, age structure, and recreation type of visitors, we did our research without any pre-COVID findings. Although the data we obtained does not reflect hard facts but rather visitors' perceptions, we are still convinced that this was a successful way of receiving important information considering our research questions.

### 3.2 Data Analysis

For the analysis of the quantitative data we acquired, the analytical tool SPSS was used. This software enabled us to visualise and analyse the data with a large variety of possible analysis. All our sub-research questions were analysed and visualised separately.

The *first sub-question* focuses on the frequency of visitations compared to pre-COVID times. We created a bar chart depicting the five categories from the Likert scale (1-5) about frequencies of behaviour (i.e., from 'A lot less often' to 'A lot more often') on the x-axis. The y-axis shows the corresponding percentages. This allows us to see any changes in visitation behaviour. Next to that, it was tested whether the data is normally distributed by applying the Kolmogorov-Smirnov test; the result determines which tests to use for later data analysis.

Additionally, we made a bar chart with on the x-axis the groups from the Likert scale about the perception of the number of visitors and on the y-axis the corresponding percentages. This

allows to measure the business following the perception of other visitors, as frequent visitors are the ones that notice differences. This helps in answering the first sub-question, as it gives more information about the total amount of visitors in the Utrechtse Heuvelrug.

Moreover, we aimed at analysing the difference between the observed and the actual change in visitation frequency. Therefore, a Wilcoxon signed-rank test was applied as this is a paired sample test. It showed the positive and negative ranks as well as mean ranks.

To answer the *second sub-research question*, which focuses on the changes in the frequency of visitations between different age groups, we first analysed the age distribution. For that, the 146 survey participants were split into three age groups; respondents aged 30 and younger count as “young adults”, those aged between 31-60 count as “adults”, and those aged 61 and older count as “elderly people”. A pie-chart was used to visualise the age distribution and the exact numbers are shown in a table. Moreover, a histogram with the ages of the respondents was made; this shows how the age varies among the respondents.

Furthermore, we compared how the frequencies of visits differ between the different age groups. This is visualised in a bar graph. On the x-axis the three age groups, as well as the five categories of the Likert scale about frequencies of behaviour, are depicted; the y-axis shows the corresponding percentage. Additionally, the normal distribution of the dependent variable (i.e., frequency of visits) allows for applying the one-way ANOVA test. Thereby, the null hypothesis “there is no significant difference between the change in frequency of visits compared to pre-COVID times and the age groups” was tested.

Additionally, the Spearman’s R test was performed to test the correlation between the age groups and the change in frequency of visits. The null hypothesis “there is no correlation between age group and change in frequency of visits” was tested.

The *third sub-question* concerns the types of recreation of the visitors and possible changes. This is depicted with multiple pie charts. Two depict the different categories of recreation which separately show the percentual distribution before and during the pandemic. Moreover, a third pie chart shows whether a change in the type of recreation was experienced. By comparing these pie charts, we look at whether the most practiced types of recreation have changed and what has changed.

The *fourth sub-question* aims to see whether the changes in recreation types differ between the different age groups. To visualize this, a stacked bar graph is used. The three age groups are depicted on the x-axis and the y-axis shows the two different categories (yes/no) concerning whether they changed their recreation in percentages.

Thereafter, a statistical test was used to see if these differences are significant. The Chi-square test was applied because the data about changes in recreation (yes/no) is nominal. By that we tested the null-hypothesis “there is no significant difference between the changes in recreation type and the three age groups”.

The outcomes of the different analytical methods are presented in the following section.



## 4. Results

The results of the survey are reported following the structure of the sub-research questions which have been introduced in the introduction section of this research report. These four sub-questions are therefore presented separately, in order to make a coherent analysis according to the data we gathered.

### 4.1. What is the change in the frequency of (actual and observed) visitations compared to pre-COVID times?

When observing the individual change of the survey respondents, the majority indicated that the frequency of their visits to the Utrechtse Heuvelrug has “not changed” compared to pre-COVID times. This makes up 58% of the participants. Additionally, 1% responded to visit the area “a lot less often” and 5% “less often”. Furthermore, 22% indicated to visit the area “more often” and 14% “a lot more often”. These findings are visualised by the bar chart in Figure 1.

To test whether the frequency of visitations is normally distributed, a Kolmogorov-Smirnov test is applied. The relevant data is presented in Table 2 and the results conclude that the age distribution is normal.

Regarding the observed change in the number of visitors, the gathered data deviates. None of the respondents viewed that there are “a lot less visitors”, whereas 7% perceived that there are “less visitors”. Additionally, 14% indicated that they observe “no change” in the number of visitors. Lastly, 43% recognised “more visitors” and 36% “a lot more visitors”. These findings are represented by the bar chart in Figure 2.

The two datasets of the actual and observed visitation frequency are tested by a Wilcoxon signed-rank test. The results in Table 3 show that 21 times, respondents indicated a lower observation than their individual visitation frequency (negative rank). Additionally, 76 times participants indicated that they themselves are on average not visiting more frequently but perceive the area as busier (positive rank). The test proves that the average perception was higher than the actual visitation frequency (mean rank: 51,25).

Change in number of visits	
N	140
Mean	3.45
Standard Deviation	0.808
Asymp. Sig. (2-tailed)	0.347

Table 2 - Kolmogorov-Smirnov test for the frequency of visitations

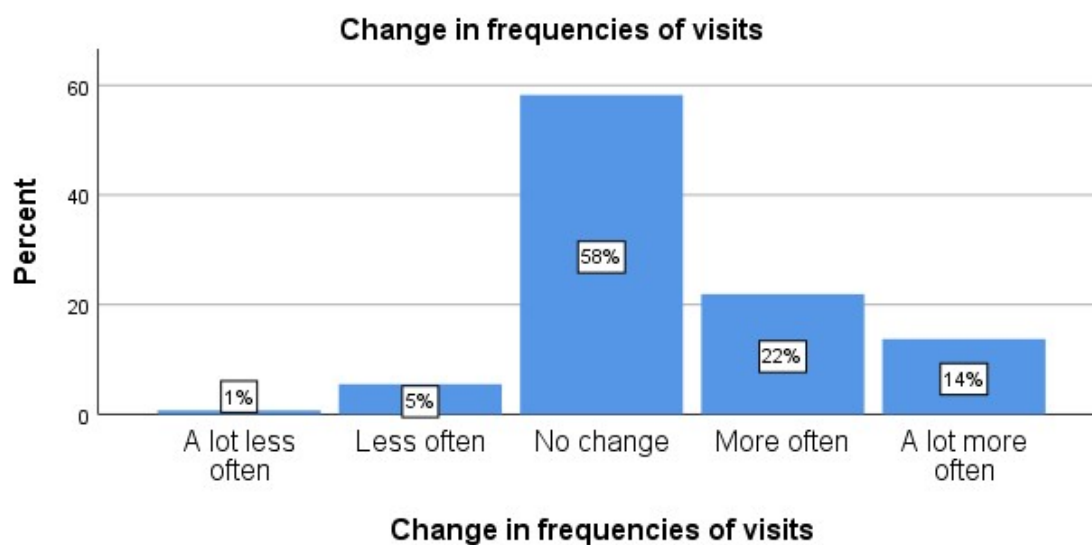


Figure 1 - Percentual change in the frequency of visits

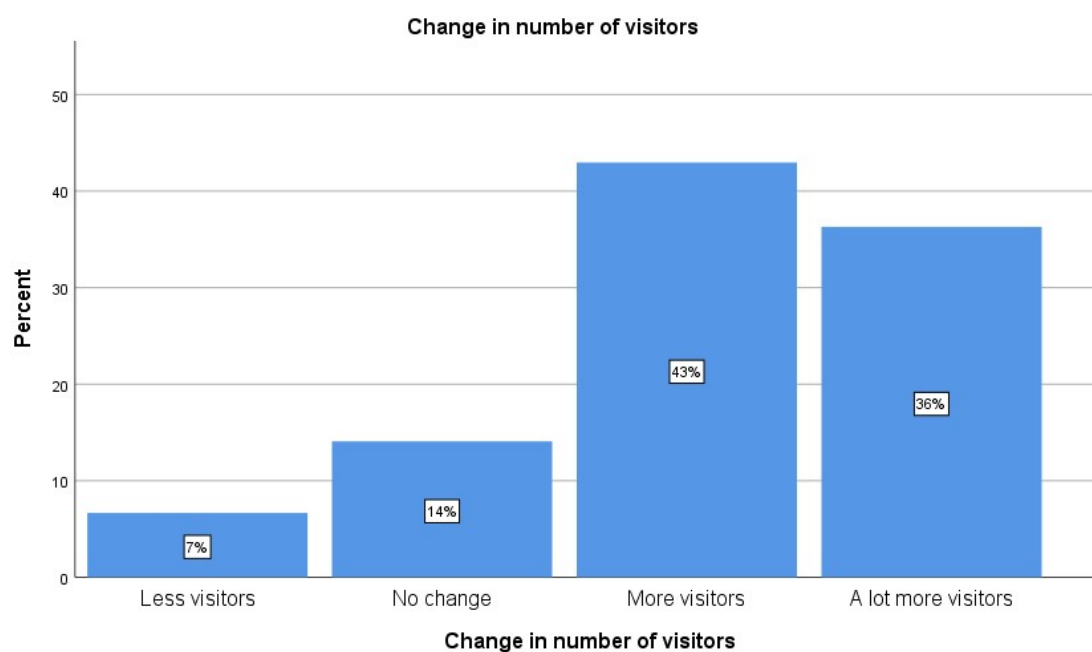


Figure 2 - Percentual change in the observed number of visitors

	N	Mean Rank
Negative Rank	21	40,86
Positive Rank	76	51,25
Ties	36	

Table 3 – Wilcoxon signed-rank test

#### 4.2. How did the frequency of visitations change between different age groups?

The answers to the survey showed that the 146 respondents could be distributed into three age groups. Table 4 and the pie chart in Figure 3 represent the number of participants divided into the three age groups as well as the percentual contribution to the total number of respondents. It shows that 23 visitors were “young adults” who make up 16%; 82 visitors were “adults” who make up 65%; 41 visitors were “elderly people” who make up 28% of the total number of participants.

To test whether the age of the respondents is normally distributed, a Kolmogorov-Smirnov test is applied (see Table 5). Its outcomes prove that the age distribution is normal which is also depicted in Figure 4. Moreover, it can be concluded that the average age of participants is approximately 49 years, and the standard deviation is 17,37.

To answer the second sub-research question, we combined the presented data with the outcomes from the first sub-question which focused on the frequency of visits. The results are visualised in Figure 5 which depicts a bar graph and presents the percentual change in the frequency of visits and divides the three age groups. It shows that within all age groups the majority did not change their frequency of visits.

To see whether these findings are significant, a statistical test was applied. Therefore, we formulated a null hypothesis: “There is no significant difference between the change in frequency of visits compared to pre-COVID times and the three age groups”. The statistical test to be used is the One-Way ANOVA test, as we proofed that the variables are normally distributed. The outcomes of this statistical test present that the p-value of 0,082 is greater than 0,05. This means, that H0 can be accepted, which proofs that there is no significant difference between the change in frequency of visits and the age groups.

Additionally, a correlation test was performed. The Spearman’s R test gives a correlation value of -0,764 with a p-value of  $p=0,033$  (see Table 6). Therefore, it can be concluded that there is a weak negative correlation between the age group and the change in frequency of visits.

Age group	Young adults (<31)	Adults (31-60)	Elderly people (>60)
Number of respondents	23	82	41

Table 4 - Number of respondents grouped into age groups

N	140
Mean	49.36
Standard Deviation	17.374
Asymp. Sig. (2-tailed)	0.010

Table 5 - Kolmogorov-Smirnov test on age distribution

Age distribution

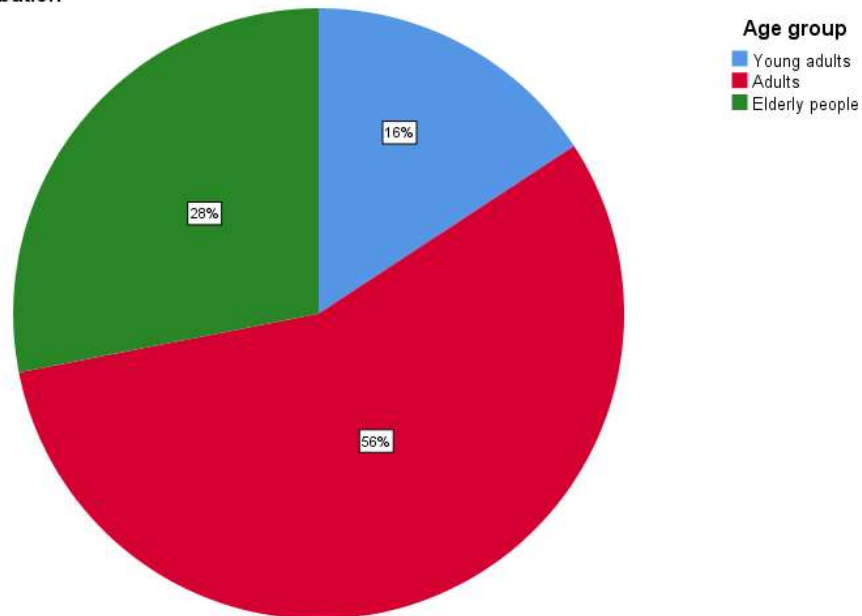


Figure 3 - Age distribution into three groups given in percent

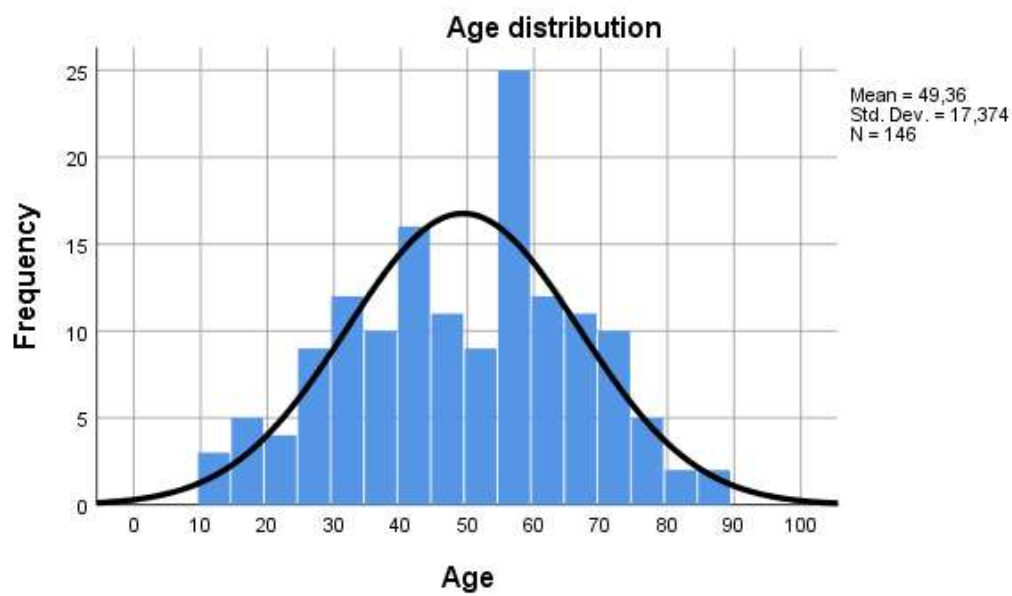


Figure 4 - Age distribution in years

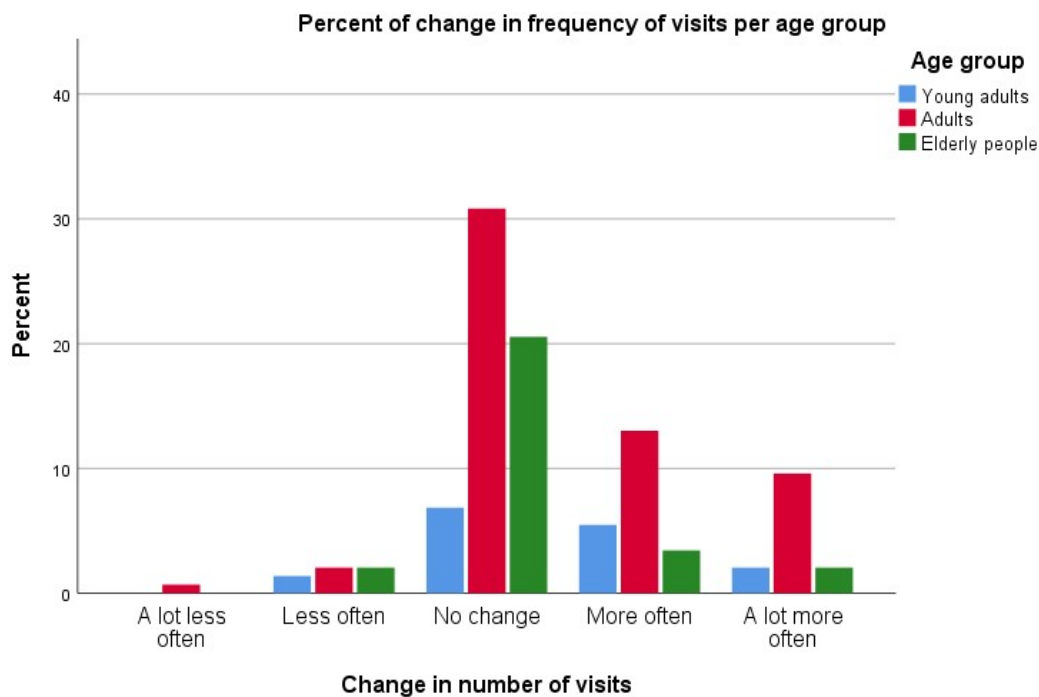


Figure 5 - Percentual change in frequency of visits per age group

	Age group	Change in frequency of visits
Correlation Coefficient	1,000	-0,176
Significance (2-tailed)	0,033	0,033

Table 6 – Spearman's rho correlation test between age groups and change in frequency of visits

#### 4.3. What are the types of recreation the visitors do and how did that change?

The distribution of the types of recreation is visualised by different pie charts. Figure 6 shows the types of recreation before the pandemic, whereas Figure 7 illustrates the according data during the pandemic. Regarding the former data set, walking was pursued by 37% of the respondents, cycling by 23%, and mountain biking by 14%. Regarding the latter, 40% visited the Utrechtse Heuvelrug for walking, 22% for cycling, and 16% for mountain biking.

Next to these two pie charts, another pie chart represents whether the type of recreation differs between the two considered times. According to Figure 8, 18% of the visitors changed their type of recreation within the presence of the pandemic, whereas it remained the same for 82%.

Recreation before COVID-19

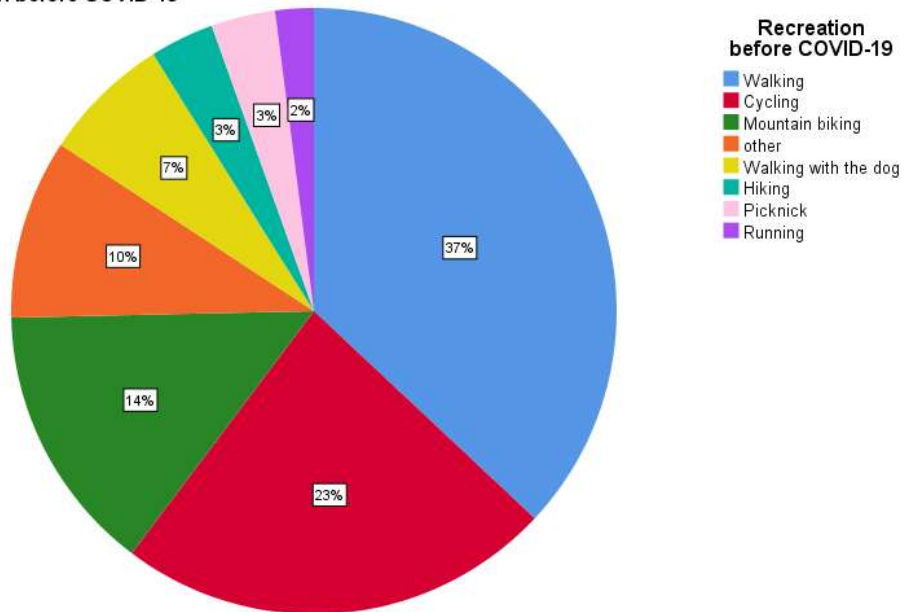


Figure 6 - Recreation before COVID-19

Recreation during COVID-19

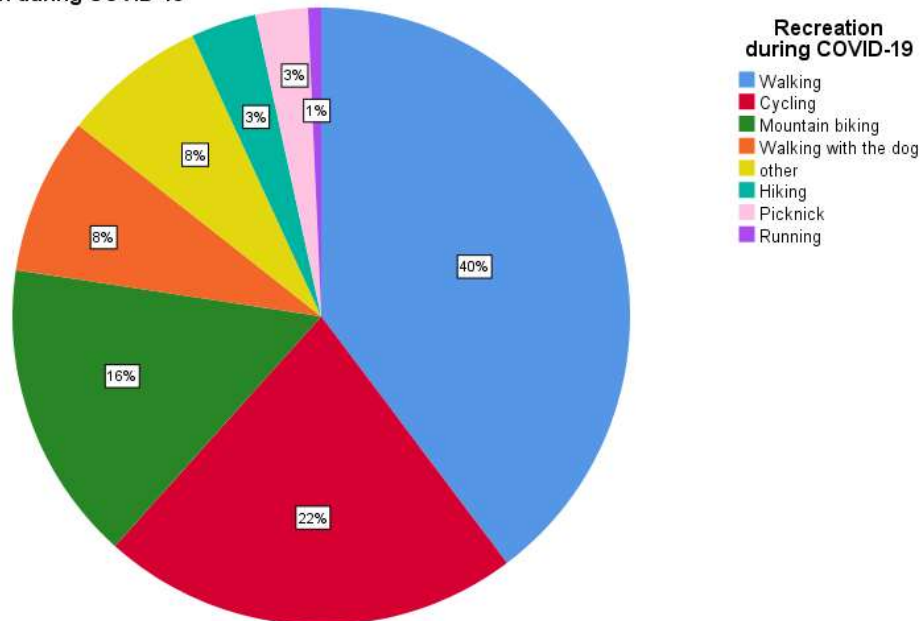


Figure 7 - Recreation during COVID-19

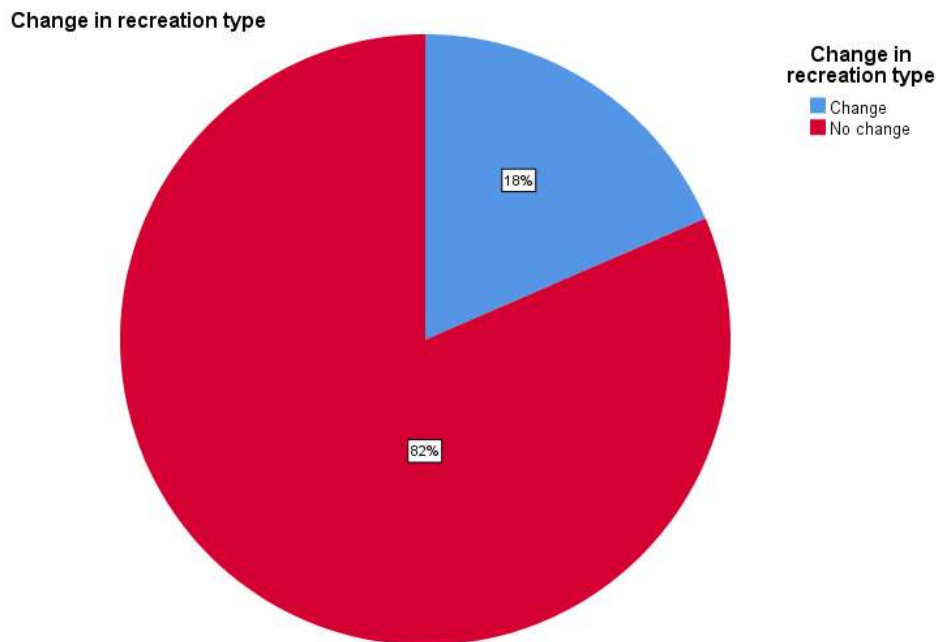


Figure 8 - Percentual change in recreation type

#### 4.4. How did the change in recreation types differ between different age groups?

The connection between sub-research questions 2 and 3 can be made by looking at the age structures and whether the type of recreation has changed. The stacked bar graph in Figure 9 illustrates this by dividing the data into the three age groups. 39% of the young adults did change their recreation type during the pandemic, whereas 61% continued to proceed with the same type. The data for the adult participants presents that 16% changed their recreation while 84% remained the same. 12% of the elderly people did change their type of recreation whereas 88% continued with the same.

To see whether these findings are significant, a statistical test was applied. Therefore, we formulated a null hypothesis: "The change in recreation types is not dependent on the age group" and an alternative hypothesis: "The change in recreation types do depend on the age group". The results from the Chi-Square test are represented in Table 7. The p-value is 0.019 which is lower than 0.05; thus, we can reject H0. So, the alternative hypothesis is accepted, which proves that the change in recreation types is dependent on the age group.

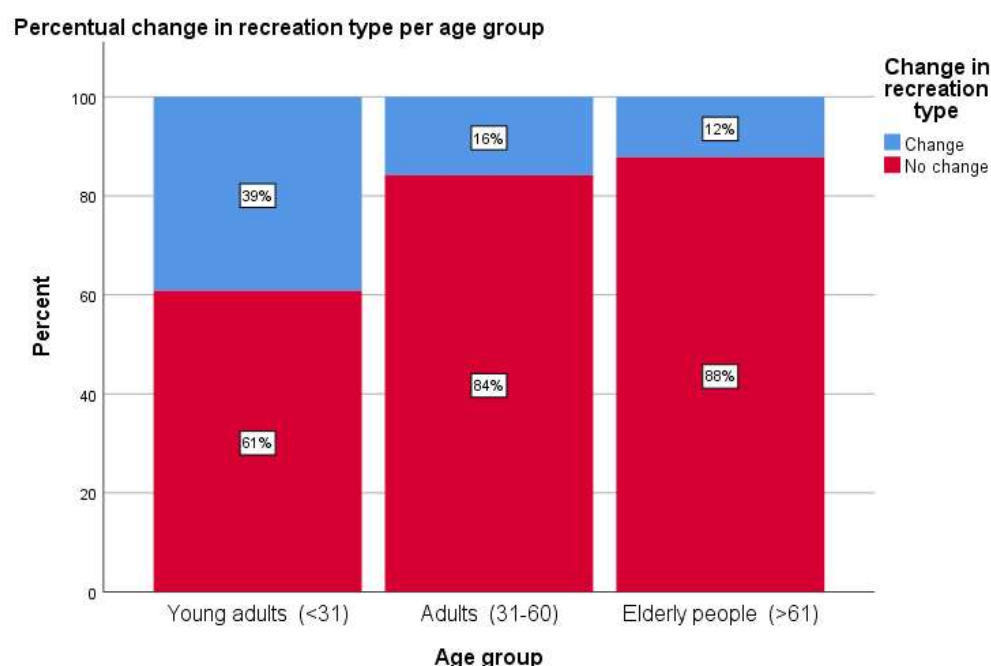


Figure 9 - Percentual change in recreation type per age group

	Asymptotic Significance (2-sided)
Pearson Chi-Square	0,019

Table 7 - Pearson Chi-Square test for age groups and change in type of recreation

## 5. Discussion

Following the results, a lot can be said about the collection of the data, the interpretation thereof, and the implications for our research. In the following section, we will discuss this per sub-research question. Then we will conclude with the limitations of our research and the recommendations for further research about recreation and COVID- 19 in the Utrechtse Heuvelrug.

### 5.1 What is the change in the frequency of visits compared to pre-COVID times?

The number of nature visitors increased rapidly during the pandemic and new phenomena such as 'COVID Hikers' arose. Van Leeuwen (2020) argued that "self-organized outdoor activities such as hiking, running, and cycling became more popular". A similar conclusion can be drawn from our findings.

Our results demonstrate that there is a change in visitation behaviour in the Utrechtse Heuvelrug since the pandemic. On average, people visit the area more frequently (mean: 3.45, standard deviation: 0.808) during the pandemic compared to pre-COVID times. Common reasons for this increase in visitation were an increase in free time, the wish to be more in nature, or



exercising and spending breaks between work outside. Furthermore, the highest percentage (58%) of respondents have not changed their visitation behaviour during the pandemic. Due to the COVID-measurements, a lot of people experienced more free time. For example, working from home and less other activities saved travel time. However, a large part of the respondents of our research consists of elderly people. This might have affected our results since they are experiencing less extra free time, and therefore, have not changed their visitation behaviour. Thus, a limitation to our research is that we did not have an even age distribution of respondents.

A recent case study has shown that spending time in and engaging with nature can improve human health and wellbeing during the COVID-19 pandemic (Robinson, 2021). Another study conducted in Tokyo, Japan, has suggested that visiting nature areas regularly can contribute to the improvement of wide range of mental health issues (Soga, 2020). Visiting nature areas such as the Utrechtse Heuvelrug plays a role in mitigating mental health outcomes due to the pandemic. Especially during this time, visiting nature helps coping with important issues such as anxiety, depression, and loneliness (Soga, 2020). The increased frequency of nature visits to the Utrechtse Heuvelrug might have to do with the potential negative impacts that the pandemic has on people's mental well-being, and its role in mitigating mental health issues.

In section 4.1 Figure 1 and Figure 2 show the change in frequencies of visits and observed changes in busyness. As previously mentioned, 36% of the respondents visited the area more often/a lot more often, whereas 79% of the respondents observed more/a lot more visitors in the area. The difference between the change in people's own visitation behaviour and the perceived change in busyness is an interesting investigation. This change could be a result of an increase in the number of tourists during the weekends. Moreover, the perception of busyness, in general, might have changed because of the COVID-19 measurements. However, no research has been published about this topic yet.

The Wilcoxon signed-rank test was performed to test the difference between the actual frequency of visits and the observed number of visitors, showed that people perceived a bigger increase in number of visitors around them than the increase of their own number of visits. This is interesting, because that would mean that visitors thought that other recreationists increased their number of visits more than they did themselves.

## 5.2 How did the frequency of visitations change between different age groups?

The one-way ANOVA test that was performed on the variables "change in number of visits" and "age group" had a p-value of 0.082. Therefore, the null-hypothesis could not be rejected. It was expected that mostly younger people would increase their frequency of visits, as they are the ones that experienced more free time during the pandemic due to closing of other recreation possibilities and working from home. Based on the results from the conducted survey, this expectation cannot be confirmed.

Additionally, a Spearman's R test was performed to test the correlation between the change in the number of visits and the age groups. This resulted in a slightly negative correlation. This correlation is significant and is more in line with the expectations. It shows that the lower age groups tend to have visited the Utrechtse Heuvelrug more often during the pandemic, whereas older respondents visited less often. However, this correlation is very weak, where we expected it to be stronger.

When analysing these results, it is important to consider the previously mentioned unequal age distribution in the number of participants, as only 16% of participants were young adults. This can be caused by the times of collection of data, as all data was collected during weekdays in the middle of the day. This group has the least free time in general (SCP, 2018), and thus, might visit more in the weekends. Therefore, the research is based on underrepresentation of young people in the obtained data.

In further research on the topic, we recommend collecting data in the weekend. By that, the exclusion of certain groups from the research can be minimised. Another way to solve the issue of age group representation is to apply a specific sampling technique. By using stratified sampling, it can be ensured that each group is represented equally. When using this method more data would need to be collected to gain representative results.

### 5.3 What are the types of recreation the visitors do and how did that change?

Prior studies have shown that COVID-19 restrictions caused people to change their leisure behaviour and to seek other types of recreation than before (Rice et al., 2020). From our results we can draw the conclusion that there are very little changes in the types of recreation the visitors did before and during the COVID-19 pandemic. The three most popular activities (i.e. walking, cycling, and mountain biking) have remained the same before and during the pandemic. The percentages have slightly changed but the order has not altered. A reason for this might be that people have been practicing their preferred type of recreation more, because of the social restrictions associated with the COVID-19 virus, but not started much new activities.

Furthermore, our results show that 18% of the respondents changed their main type of recreation during the pandemic, compared to pre-COVID times. Based on our literature review, we had expected this percentage to be even higher because of people starting new activities during the lockdowns. However, this survey question is concerned with the type of recreation that someone practiced the most; thus, certain activities might not have been included in the results.

#### 5.4 How did the change in recreation behaviour differ between different age groups?

Based on the survey results, it can be concluded that the amount of people that changed their type of recreation differs per age group. Young adults changed the type of recreation they did the most significantly more than adults and elderly people. Adults also changed a little bit more than elderly people, but that difference is not decisive. In the survey it was not asked why this change occurred, but many participants that did not change their behaviour indicated that they have been doing the same type of recreation for years and that the COVID-19 pandemic had no influence on this. It also suggests that young adults are in general more flexible in changing their behaviour and are more likely to try new types of outside recreation, especially in a time of lockdown.

A limitation to answering this question is that only the most performed recreation activity was asked. Consequently, no data about all types of activities the participants did was collected. This data could change the answer to the sub-research question, as it is possible that more people did try new activities. In further research, this could be asked to get a more complete picture. However, we expect that this will not change the result that young adults change their behaviour more than adults and elder people, as younger people can still be expected to be more flexible and willing to try new things.

#### 5.5 Limitations and further research

One concern about our findings was that the unequal age distribution of the respondents has influenced our results. At the time of interviewing, mostly people of over 50 years were present at the location. Our research lacks data from young adults since only 23 participants were under the age of 31. Regarding this limitation, it could be argued that our results are not representative. To improve this aspect, further research could take place on the weekend or during holidays to gather more information from younger generations.

Another limitation involves the issue of language. Although we set up the survey in English, most of the time the questions were asked in Dutch. This might have influenced the results since the question might have been posed in a slightly different way. This is an issue for further research to explore.

Furthermore, we have conducted surveys at three different locations in the Utrechtse Heuvelrug, but we have not taken the different locations into account while analysing our results. Future research should consider the potential effects of conducting surveys at different times and locations more carefully. Certain locations in the Utrechtse Heuvelrug might attract different types of recreationists and different age groups.

Lastly, the time period our research needs to be considered. Our study aimed to examine how the COVID-19 pandemic influences the recreation behaviour of visitors. In March 2020, the

World Health Organisation officially declared COVID-19 a pandemic; since then, the pandemic has had many phases, which might make it hard for people to answer our survey questions. For example, people answered that during the first lockdowns they visited the Utrechtse Heuvelrug much more often, but this changed from the moment that restaurants and shops were allowed to open again. Therefore, further research could examine how the behaviour of visitors changed during the different lockdowns and periods in between and investigate the relationship between the different COVID-19 restrictions and the number of visits in the Utrechtse Heuvelrug.

## 6. Conclusion

This research studied the influence of the COVID-19 pandemic on recreation behaviour in the Dutch national park Utrechtse Heuvelrug. The aim of conducting a survey in this research area, was to gain findings about recreation during the pandemic compared to pre-COVID times. Thereby, the research focused on the frequency of visits, the age distribution, and the type of recreation.

Although nature areas were one of the only places possible to visit, with regards to the national restrictions, the frequency of visits was not affected by that. The survey results have shown that most recreationists did not change their frequency of visits; nevertheless, there is a slight trend to more visits during the pandemic, compared to pre-COVID times. Furthermore, the research has shown that the frequency of personal visits differs from the observed number of total visitors in the national park. Most recreationists experienced significantly more visitors in the Utrechtse Heuvelrug during the pandemic; this implicates that, overall, the national park has become busier and more crowded.

Next to the frequency of visitation and the observed number of visitors, the study analysed the age distribution among the visitors in the Utrechtse Heuvelrug. Moreover, the change in the frequency of visits between the different age groups has been examined. The results show that there is no significant difference between the different age groups and their frequency of visits. Nevertheless, research has examined that most visitors were adults between 31 and 60 years, followed by elderly people older than 60 years. Young adults until the age of 30 visited the Utrechtse Heuvelrug the least.

Our third sub-research question deals with the type of recreation the visitors did before and during the pandemic. The findings lead to the conclusion that recreationists did not change their (main) activity in the national park significantly. Most visitors continued their recreational practices from pre-COVID times. The most followed activities are and have been walking, cycling, and mountain biking.

Although the study showed that there were only slight changes in recreation behaviour, we also analysed to what extend the different age groups changed their practices and how these

changes differ between age groups. Hereby, it can be examined that young adults changed their behaviour more often than adults or elderly people.

With the answers to our sub-research questions at hand, we can give a concrete answer to our main research question, namely, how the COVID-19 pandemic influenced the recreation behaviour of visitors in the Utrechtse Heuvelrug. We can conclude that changes in recreation, both in frequency and activities, are visible. Moreover, these changes differ between age groups. Nevertheless, changes are not as significant as expected with respect to the national lockdowns. The research has shown that, although people did not change their frequency of visits, their perception of the total number of visitors did change, it is observed that the overall number of visitors has increased significantly. With this study, the effects of the COVID-19 pandemic on recreation behaviour were clearly examined. By that, the research contributes to further knowledge about *how* visitors changed or not changed their recreation, and how this differs between different age groups.

## 7. Relevance and integration possibilities

The findings of the research about recreation in the Utrechtse Heuvelrug before and during the worldwide COVID-19 pandemic are highly relevant. This is because they provide necessary information about managing recreation in the national park in a sustainable way. To achieve a sustainable Utrechtse Heuvelrug, recreation needs to be considered from several perspectives:

Firstly, the research analysed that visitors practice multiple types of recreation. However, these have different implications on the natural environment and has even increased with more dense recreation areas. More specifically, the findings present that walking, cycling, and mountain biking are practiced the most, which ask for specific trails, and thus, increase pressure on the environment. Secondly, the overall number of visitors was observed to have increased. This also implies that irresponsible behaviour is emerging, leading to growing litter presence. Thirdly, our research is important to consider when imagining sustainable mobility in the national park. The study has shown that most recreationists engage in cycling and mountain biking. However, many visitors arrive at the locations by car. Lastly, the results about an increasing frequency of visits reveal information about the perceptions on nature and presents new questions such as: have visitor's perceptions on nature changed with the pandemic? By considering these different topics, it is possible to manage recreation in the Utrechtse Heuvelrug more sustainably.

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## 9. Appendix

### 9.1 Appendix I: Data management plan

Our method of collecting data includes a survey for the visitors of the Utrechtse Heuvelrug. The visitors participated voluntarily and by their own choice and were not influenced by any external factors. Interviews are held privately and all participants' information remains anonymous. Therefore, respondents do not have the possibility to withdraw their data.

The surveys were carried out solely with the written or spoken consent of the survey participants. The participants were informed of the purpose of our survey and the data collection process. In specific cases, personal data could be obtained (e.g. as an unstructured interview), however, alone with the permission of the actor.

The data will only become available within the Geoscience Faculty of the Utrecht University. Moreover, data might be shared with an external organisation, the foundation National Park Utrechtse Heuvelrug.

### 9.2 Appendix II: Survey

Link to the questionnaire: <https://arcg.is/1PnC5O0>

Survey questions relating to:

- Sub-research question (1) – ●
- Sub-research question (2) – ●
- Sub-research question (3) – ●

#### **Recreation inventory in the Utrechtse Heuvelrug**

Thank you for participating in our survey!

With this survey we conduct data for our research project in the Utrechtse Heuvelrug which is part of our study at Utrecht University.

By that, we aim to answer the research question: how did the COVID-19 pandemic influence the recreation behaviour of visitors in the Utrechtse Heuvelrug?

The survey entails 10 questions and takes approximately 2-5 minutes.

*Data collection and privacy:*

*The process of data collection is based on voluntary participation and participants' information will remain anonymous. Therefore, it is not possible to withdraw respondents' consent.*

*The outcomes of the research will only become available within the Geoscience Department of Utrecht University and will be shared with the foundation National Park Utrechtse Heuvelrug.*



## PART I – Personal data

Date:

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*Group size\** ●

With how many people do you visit the Utrechtse Heuvelrug today (excluding yourself)? Please indicate a number ("0" when visiting alone).

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*Travel distance\** ●

How far did you travel to come here? Please select the box that fits your situation.

- ☐ < 5 km
- ☐ < 15 km
- ☐ < 30 km
- ☐ > 30 km; within the province of Utrecht
- ☐ > 30 km; outside the province of Utrecht

*Age\** ●

How old are you? Please indicate your age in numbers.

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## PART II - Questions regarding the number of visits

*Number of visits - before pandemic\** ●

How did your number of visits to the Utrechtse Heuvelrug change compared to pre-COVID times? Please click the box that fits your situation.

Likert scale: A lot less often - Less often - No change - More often - A lot more often

*Change in number of visitors\** ●

What changes in number of visitors in the Utrechtse Heuvelrug did you observe over the past year? Please click the box that fits your situation.

Likert scale: A lot less visitors - Less visitors - No change - More visitors - A lot more visitors

### *Reasons for change* ●

In case you changed the overall number of visits to the Utrechtse Heuvelrug, why do you think this change occurred? \*Please only answer if you number of visits has changed

[Multiple answers possible]

- ☐ I have more free time
- ☐ I use it for breaks between work
- ☐ I want to be more in nature
- ☐ Nature areas are the only places open to meet with people
- ☐ I use it to exercise
- ☐ Other

### *Change in visitation behaviour\** ●

How did busyness in the Utrechtse Heuvelrug affect your visitation behaviour (e.g., number of visits, location, time)? [Multiple answers possible]

- ☐ I didn't take busyness into consideration
- ☐ I went to a different location
- ☐ I went at different times
- ☐ I visited less often
- ☐ I visited more often
- ☐ Other

### *Druktemonitor\** ●

Did you check the 'Druktemonitor' (online map giving information about busyness at different locations) before coming to this location?

- ☐ Yes
- ☐ No

## **PART III - Questions regarding the type of recreation activity**

### *Recreation before COVID-19\** ●

What type of recreation activities did you *practice the most before* COVID-19 in the Utrechtse Heuvelrug (e.g., in 2019)? Please click the box that fits your situation.

- ☐ Walking
- ☐ Walking with the dog
- ☐ Hiking
- ☐ Running

- ☐ Cycling
- ☐ Mountain biking
- ☐ Horseback riding
- ☐ Water sports
- ☐ Picknick
- ☐ Other

*Recreation during COVID-19\** ●

What type of recreation activities did you *practice the most during* COVID-19 in the Utrechtse Heuvelrug (e.g., in 2021)? Please click the box that fits your situation.

- ☐ Walking
- ☐ Walking with the dog
- ☐ Hiking
- ☐ Running
- ☐ Cycling
- ☐ Mountain biking
- ☐ Horseback riding
- ☐ Water sports
- ☐ Picknick
- ☐ Other