MSc thesis report

Exploring how urban wilderness connects urban residents with nature

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Abstract

Urbanization is occurring at high rates in many areas of the world, with 70 % of people estimated to live in cities by 2030. Urbanization contributes to the biodiversity crisis that planet Earth is suffering from by causing habitat loss through land conversion. However, urbanization also prevents people from experiencing nature daily, resulting in people feeling disconnected from nature. This experienced disconnect from nature is problematic as it negatively impacts human well-being and environmental awareness by reducing peoples' willingness to support conservation measures. Therefore, it is essential to find ways to reconnect humans with nature. One approach is to integrate nature into cities to provide urban residents the opportunity to experience nature frequently. This can foster a feeling of connectedness with nature (CWN), a concept correlated with human well-being and pro-environmental behavior.

One type of urban green space (UGS) is urban wilderness. This term describes nature with a high degree of self-regulation and species composition that is well adapted to the urban environment. Urban wilderness potentially fosters CWN more effectively than other types of UGS due to its resemblance to non-urban protected natural areas. Studies have shown that protected areas outside the urban environment facilitate CWN more effectively than UGS. However, few studies have investigated the effect of urban wilderness on CWN. The aim of this study is to investigate the interaction of urban residents with urban wilderness and how it influences urban residents' level of CWN. It adopts a case study approach situated in the Ruhr area in Germany. Semi-structured interviews were conducted with 18 urban residents that frequently engage with urban wilderness. Other data collection methods were interviews with organizations that work in UGS management in the Ruhr area, document analysis, and observation studies.

The results from this research showed that interacting with urban wilderness had a positive influence on urban residents' CWN. Three factors were central to the positive impact on CWN: positively influencing restoration (restorative effects) and feelings (affective effects) of urban citizens, as well as providing sensations to urban residents when experiencing nature (sensory experiences). An essential characteristic of urban wilderness that contributed to these three factors was the low influence of external stimuli from the urban surrounding, such as car sounds or seeing buildings. Furthermore, it also motivated the interviewees to interact with urban wilderness regularly. This is crucial as studies have shown that regular interaction with nature correlates with higher levels of CWN. The results also indicated that urban wilderness might influence residents' CWN more strongly than other types of UGS.

Adding to the findings from other studies that have shown the ecological value of urban wilderness, this research provides the first indications that urban wilderness also offers social benefits. This can be valuable information for policymakers deciding which UGS management regime to implement. Nevertheless, further quantitative research is needed to validate the findings from this research. Comparative studies are also needed to evaluate the effect of urban wilderness, other types of UGS, and non-urban natural areas on CWN.

1. Introduction

There is growing evidence that life on earth is in the middle of a major biodiversity crisis, with many species going extinct (Dirzo, Ceballos, & Ehrlich, 2022). This crisis, also labeled the 6th mass extinction, is very worrisome as the survival of the human species depends on ecosystem services provided by natural ecosystems (Dirzo et al., 2022). Among the drivers of this crisis is growing urbanization, a trend progressing simultaneously to the loss in biodiversity levels (Bele & Chakradeo, 2021). It is estimated that about 70 % of the global human population will live in urban areas by 2050 (Totaforti, 2020). Land-cover changes accompanying urbanization threaten biodiversity resulting in habitat loss and the extinction of species associated with these habitats (Seto, Güneralp, & Hutyra, 2012). Another problematic aspect is that people experience nature less in their daily lives in cities (Colléony, Prévot, Saint Jalme, & Clayton, 2017).

This loss in regular contact with nature contributes to an 'extinction of experiences' with nature posing a severe risk to human health and biodiversity conservation (Soga, Gaston, Koyanagi, Kurisu, & Hanaki, 2016). It leads to a lack of recognition that humans are part of nature resulting in humans feeling disconnected from nature (Beery, Jönsson, & Elmberg, 2015). This is problematic for various reasons. On the one hand, it negatively impacts human health as regular contact with nature correlates with psychological well-being (Cleary, Fielding, Murray, & Roiko, 2018). On the other hand, it decreases people's valuation of natural ecosystems, which reduces the willingness to limit the consumption of natural resources and contribute to protecting nature (Church, 2018). Consequently, this decreased appreciation of nature has been described as one of the major obstacles to reversing the biodiversity crisis (Dirzo et al., 2022).

With most people projected to live in cities, the urban environment is one of the only places humans can engage with nature. There remains the possibility of traveling to natural areas. However, research has shown that people visit nature less frequently when living further away from nature (Colléony et al., 2017). Therefore, it is essential to incorporate and foster nature in cities to provide urban residents the opportunity to encounter nature daily (Soga et al., 2016). Indeed, frequent contact with urban nature has been found to positively influence well-being and appreciation of nature (Cleary et al., 2018). Annerstedt Van Den Bosch et al. (2016) define urban green spaces (UGS) as any area partially or entirely covered with vegetation. Examples are urban forests, public parks, private or community gardens, or street trees (Annerstedt Van Den Bosch et al., 2016). This broad definition goes beyond the typical association of urban parks and public green spaces (Cleary et al., 2018).

To investigate people's relationship with nature, many studies use a concept called connectedness with nature (CWN) (Zylstra, Knight, Esler, & Le Grange, 2014). This concept describes the "individual's emotional and cognitive bond to the natural world" (Wyles et al., 2019, p. 113). Following the call to reconnect society with nature, there has been a sharp increase in studies investigating CWN (Zylstra et al., 2014). These studies have shown that higher levels of CWN correlate with increased well-being and pro-environmental behavior of individuals (Martin et al., 2020).

However, mere exposure to nature does not necessarily guarantee a positive influence on CWN (Martin et al., 2020). Different factors mediate the effect of nature exposure on CWN,

such as the type of nature visited and the characteristics of the visit itself (Cleary et al., 2018; Colléony et al., 2017; Soga et al., 2016; Wyles et al., 2019). Both frequency and duration of the interaction with nature are essential factors, with more extended and frequent visits to nature having more substantial impacts on CWN (Cleary et al., 2018). Another factor is the type of activity, as not all activities in nature influence CWN equally (Lumber, Richardson, & Sheffield, 2017; Martin et al., 2020). For instance, Cleary et al. (2018) found that "appreciative" activities such as dog walking positively influenced CWN while motorized activities such as off-road vehicle driving did not (Cleary et al., 2018). Finally, it is also essential to consider the type of natural area. Wyles et al. (2019) compared visits to urban and non-urban natural areas and found that visiting nature outside cities had a more significant effect on CWN than urban green areas (Wyles et al., 2019).

The type of urban green space could be another factor in the extent to which CWN can be fostered. In the study by Wyles et al. (2019), they found that urban green spaces with designated protection status had a more substantial influence on CWN than UGS without protection status. The authors explained this with the higher ecological quality associated with protected areas and the human evolutionary preference for areas of higher ecological quality as they signal higher food availability (Wyles et al., 2019). This is supported by Restall et al. (2021), providing evidence that interacting with urban conservation areas contributes significantly to urban residents' CWN. However, many studies investigating the effect of urban green spaces on CWN do not compare different types of UGS (Kruize et al., 2019; Restall et al., 2021; Thompson et al., 2019). Consequently, it is challenging to determine whether different types of urban green spaces influence CWN equally.

One approach in planning urban green spaces is fostering a type of nature called urban wilderness (Rink, 2009). The term urban wilderness might seem paradoxical as both wilderness and urbanization appear mutually exclusive. In western cultures, the term "wilderness" brings strong associations of an untouched and pristine form of nature located very far from any human settlement (Kowarik, 2013). However, this is based on the discourse of a human-nature dichotomy where true nature cannot persist in the presence of human existence (Myers, 2020). What is considered wilderness depends on how it is defined. Wilderness in the context of urban nature is not the same as nature labeled as traditional wilderness from a mainstream European viewpoint (Kowarik, 2005). Urban wilderness is characterized by a high degree of self-regulation and species composition that is well-adapted to the urban conditions (Kowarik, 2005). The determining factor is not the degree to which an area is anthropogenically influenced but whether human intervention is required to maintain ecosystem functioning and species composition intervention (Kowarik, 2005).

Urban wilderness is an interesting type of UGS to examine in the context of fostering CWN. As already mentioned, the designated protection status of a UGS, potentially indicating higher ecological quality, has a more significant influence on CWN (Restall et al., 2021; Wyles et al., 2019). This is relevant when considering the effect of urban wilderness on CWN, as some types of urban wilderness can harbor high levels of biodiversity (Bonthoux, Brun, Di Pietro, Greulich, & Bouché-Pillon, 2014). The biodiversity does not necessarily resemble the species composition of the original ecosystem but can result in a novel ecosystem with a high proportion of non-native species (Kowarik, 2018). One example of urban wilderness is industrial nature, where vegetation is allowed to grow freely in areas of former industrial

production (Kowarik, 2005). Therefore, this type of nature could foster CWN more strongly than other forms of urban nature.

While urban greening, in general, is supported by residents (Fischer et al., 2018), wilder forms of urban nature evoke more mixed feelings among urban residents (Buijs, Elands, & Langers, 2009; Danford, Strohbach, Warren, & Ryan, 2018). Recent research observed appreciation by urban residents for urban wilderness (Unterweger, Schrode, & Betz, 2017; Vierikko et al., 2017). However, spontaneous and uncontrolled growth of nature in abandoned sites can also be associated with economic decline and neglect by residents (Rink, 2009). Acceptance can be enhanced if signs of care are present such as incorporating artistic elements or trimming certain plants (Botzat, Fischer, & Kowarik, 2016; Rupprecht, Byrne, Ueda, & Lo, 2015), but this should only occur to the extent that nature remains mainly shaped by self-regulation. While the perception of a natural area does not determine the degree to which it can foster CWN, strongly negative perception will likely prevent residents from visiting this natural area. Observing an acceptance of urban wilderness indicates that residents interact with it and, consequently, that urban wilderness has the potential to influence CWN positively.

While various studies have investigated urban residents' perception of wilder forms of UGS (Botzat et al., 2016; Mathey, Arndt, Banse, & Rink, 2018; Rink & Emmrich, 2005), the relationship between the type of urban nature and CWN of urban residents has received comparably little attention. Research on the potential of urban nature for fostering CWN has mainly focused on common types of urban nature that require a high degree of maintenance, such as public parks (Berto, Barbiero, Barbiero, & Senes, 2018). With the type of nature being a relevant factor in the relationship between exposure to nature and CWN (Wyles et al., 2019), the degree of wilderness in urban nature can be expected to impact CWN positively. Furthermore, not only is the type of nature likely important for influencing CWN, but also the characteristics of the interaction with nature. While frequency and duration are important factors (Cleary et al., 2018), the type of activity can also influence the impact on CWN (Lumber et al., 2017; Martin et al., 2020). Hence, the presence of urban nature alone cannot predict the effect on CWN, but the characteristics of the interaction itself should also be investigated. This can also contribute toward understanding the relevant mechanisms between exposure to nature and influence on CWN.

1.1. Research objective and questions

Responding to the knowledge gaps outlined in the introduction, the aim of this research is to investigate the relationship between exposure to urban wilderness and CWN of urban residents. Furthermore, another goal is to examine the moderating role of activities to reveal mechanisms between the interaction with urban wilderness and its influence on CWN.

This research aims to answer the following research question:

"*How does exposure to urban wilderness influence CWN of urban residents?*"

Based on this research question, the following specific research questions have been defined:

1. *How does the chosen case study relate to the concept of urban wilderness applied in policy documents issued by official planning agencies?*
2. *How do urban residents interact with urban wilderness?*

3. *How do urban residents experience their interactions with urban wilderness?*
4. *How do these interactions with urban wilderness influence urban residents' CWN?*

This thesis is organized into different chapters. Following the introduction, I will outline the theoretical framework that provides the lens through which I will investigate urban residents' interaction with urban wilderness and its contribution to CWN. Then, I will present the methodology that I adopted in this research. This is followed by the results section, where I will describe the research findings to answer the four specific research questions. Next, I will provide the discussion where I will present an interpretation of the findings in the context of broader literature and reflect on the limitations and societal relevance. Finally, I will end the thesis with the conclusion.

2. Theoretical framework

In this part, I explore the different constructs from the research questions and the pathways that moderate the relationship between the constructs. First, I discuss the terms 'nature' and 'urban nature' that are not key constructs of my research but are helpful to understanding the concept of urban wilderness. This is followed by a section about CWN and the pathways from interaction with nature to CWN. Finally, I present the conceptual framework that is used in this research.

2.1. Nature

Exploring nature as an overarching term helps understand the concept of urban wilderness better. Furthermore, as the concept of CWN aims to reconnect humans with nature, it is relevant to understand the operationalization of nature. Nature is a social-cultural construction whose meaning varies by context and culture (Zylstra et al., 2014). In the modern Western worldview, nature is frequently seen as the opposite of culture, creating a conceptual dichotomy between the two terms (Fletcher, 2017). What is described as nature excludes the human species implying nature to be an external entity (Fletcher, 2017). However, this sharp divide between humans and nature cannot be found in all cultures, with many indigenous cultures not having a concept of nature as separate from humans (Ducarme, Flipo, & Couvet, 2020; Reddekop, 2014). For instance, the Northwestern Amazonian culture considers all living beings to be persons, either human or non-human (Reddekop, 2014).

Nevertheless, as this research is placed in the context of traditional Western worldview, it is essential to clarify what I understand by the term nature. This is not done by all studies researching CWN. Ives et al. (2017) found that around 30 % of the papers in the multidisciplinary review of human-nature connection studies do not clearly define nature. In this research, I will follow the use of the term nature by Zylstra et al. (2014) where they "refer to any element of the biophysical system which includes flora, fauna, and geological landforms occurring across a range of scales and degrees of human presence" (p.121). Humans are excluded from this definition of nature, but nature does not necessarily need to be devoid of human influence.

2.2. Urban nature

Urban nature is nature in the urban environment, mainly described as urban green spaces (UGS) in the literature (Duvernoy & Gambino, 2021; Toni & Duinker, 2015; Vierikko et al., 2017). Urban nature has also been labeled as mundane or nearby nature that contrasts strongly with natural landscapes that contain waterfalls, lakes, and woodlands (Nisbet & Zelenski, 2011; Richardson, Hallam, & Lumber, 2015; Thompson et al., 2019).

As discussed in the introduction, UGS are spaces in the city partially or entirely covered by vegetation (Annerstedt Van Den Bosch et al., 2016). However, the definitions in the literature focus on different aspects in their definition. For instance, while one study only included public UGS (Soga et al., 2015), another study included both public and private UGS (Cleary et al., 2018). Other studies specified their definition of UGS to open and undeveloped land (Mitchell & Popham, 2008; Soga et al., 2015), but without further elaborating on the terms open or undeveloped. Finally, Cleary et al. (2018) provided a broad definition of urban nature where all plants and wildlife found in the city are included. In this thesis, I define UGS as public

areas covered by varying degrees of vegetation. I only include public UGS as all urban residents can access these UGS. The studies provide different examples of UGS, depending on how they defined it. For instance, Mitchell and Popham (2008) excluded private gardens but mentioned forests, parks, playing fields, and river corridors. Cleary et al. (2018) also listed street trees, sports fields, and private gardens.

2.3. Urban wilderness

The term urban wilderness describes wilderness that occurs in the urban environment. Therefore, it is helpful to elaborate on the term wilderness before reflecting on the meaning of urban wilderness. Even more than the term nature, wilderness presents the counter-world to the modern human lifestyle, describing nature that is empty of any influence from humans (Cronon, 1996). However, the meaning of wilderness has also changed over time. 250 years ago, it was used to describe deserted, savage or desolate land lacking its current positive association (Cronon, 1996). In the traditional Western worldview, wilderness describes untouched, "pristine" nature that needs to be protected from human use (Kowarik, 2013). Traditional wilderness areas are usually large and frequently protected as national parks (Rink, 2009). For instance, wilderness areas, as described by the European Union, are areas larger than 1'000 ha (LANUV, 2017a).

Nature described as urban wilderness is very different from traditional wilderness. Encountering wilderness in the urban environment might appear antithetical as wilderness is typically associated with areas remote from human settlements (Cronon, 1996). Urban wilderness does differ from traditional wilderness in several regards. For one thing, it is situated in the urban environment and thus, is potentially influenced by the urban conditions. Urban wilderness also does not necessarily resemble the original species composition of an area before human settlement (Kowarik, 2005). However, several aspects support the claim that wilderness can also occur in an urban context. On the one hand, since wilderness is a social-cultural construct whose meaning has evolved in the past, its meaning can also change in the current context. On the other hand, scholars have also described wilderness as an experience in nature that centers around feelings of freedom from the civil order (LANUV, 2014). The determining factor for an area to be considered as wilderness is, therefore, the experience and not the characteristics of the nature in the area. For instance, uncontrolled vegetation growth on a brownfield can be experienced contrastingly to the surrounding urban environment (LANUV, 2014).

Literature has defined urban wilderness mainly based on the characteristics of nature while focusing less on the social aspects of wilderness. Myers (2020) defines wild urban nature as "the continued habitation of unmanicured, uncultivated, spontaneous vegetation, and non-domesticated animals, in cities, buildings, and urban spaces" (p. 53). In the introduction, urban wilderness was defined by a high degree of self-regulation where the species composition is well-adapted to the urban conditions (Kowarik, 2005). Both definitions emphasize the high degree of self-regulation of the species composition. The second definition also includes that species should be adapted to the urban surroundings. Henne (2005) follows a cultural definition of this "new wilderness" where an area must have a wild appearance to be considered wilderness. Vegetation management can be implemented as long as people perceive the area as wild (Henne, 2005). In practice, it is difficult to determine which areas are perceived as wild as this requires knowing people's perception of wilderness

well. Therefore, I do not use this definition to determine whether an area classifies as urban wilderness but take more objective measures such as the degree of human management. I will elaborate on this further in the following paragraphs.

Urban wilderness areas can vary in size, ecosystem, and tenure and can exist within different types of land use (Threlfall & Kendal, 2018). Examples are remnants of traditional wilderness areas, large old trees, abandoned agricultural and industrial land, fringes of railway tracks, and other informal greenspace areas (Henne, 2005; Threlfall & Kendal, 2018). When urban wilderness grows in areas where former human use has ceased, it can also be classified as a novel ecosystem. Several factors distinguish novel ecosystems from other natural ecosystems. New species combinations prevail, ecosystem functioning is potentially altered, and humans are a dominant influence (Hobbs et al., 2006).

The naturalness of an ecosystem is another interesting concept for discussing urban wilderness. Myers (2020) describes urban wilderness areas as a natural type of nature where a higher degree of naturalness depicts wilder ecosystems. Therefore, it is helpful to consider Kowarik's (2005) framework on the naturalness of urban woodlands. This framework can be applied for determining the naturalness of other urban vegetation than woodlands (Hofmeister, 2009). The naturalness is evaluated from a retrospective or prospective viewpoint depending on what is considered natural. Naturalness from the retrospective viewpoint describes nature whose structure and species assemblage have not been influenced by human activity (Kowarik, 2005). An example of this type of urban wilderness would be remnants of old-growth forests that have not been used for timber production (Kowarik, 2005).

The point of reference for the prospective viewpoint is the current condition of the site and the degree of self-regulation of biotic and abiotic factors (Kowarik, 2005). It does not consider whether the site has been anthropogenically influenced but instead focuses on the processes that shape the current species composition. Such areas can harbor various non-native species (Kowarik, 2005). One example of urban wilderness from the prospective viewpoint is the growth of nature on formerly industrial sites. The biotic and abiotic factors have been strongly altered by former industrial activities resulting in novel species communities (Kowarik, 2005).

In this thesis, I investigate urban green spaces that classify as urban wilderness from a prospective viewpoint. I expect urban wilderness areas from the prospective viewpoint will become more frequent while urban wilderness from the retrospective viewpoint will decline. Worldwide, there is an intensification of human access and use of natural ecosystems that have been little used (Liu et al., 2021). Simultaneously, the use of other areas is abandoned, for example, in areas where industrial production is not viable anymore (Kowarik, 2005). Therefore, it is particularly interesting to investigate urban wilderness from the prospective viewpoint as I expect this type of UGS to be increasingly important in future UGS management. I follow Kowarik's (2005) definition where central aspects of the urban wilderness areas are a low degree of human management interventions but a high degree of self-regulation of biotic and abiotic factors. This can entail human influence on site conditions providing that biotic and abiotic factors are not regulated.

2.4. Connectedness with nature

Various related terms in the literature refer to the concept of feeling connected to nature, such as connectedness with nature, connection to nature, connectedness to nature, connectivity to nature, nature connection, or nature relatedness (Zylstra et al., 2014). In this research, I use the term connectedness with nature (CWN) as it implies that humans and nature are already reciprocally connected. While humans are not actually disconnected from nature, the experienced disconnect from nature stems from human's inability to access this feeling of CWN (Zylstra et al., 2014). The concept of CWN has been described both as a stable personality trait that evolves over time and as a situational feeling of strong emotional connection within a given context (Wyles et al., 2019). Consequently, different definitions and concepts can be found in the literature. One of the definitions is from Zylstra et al. (2014), stating that "CWN is a stable state of consciousness comprising symbiotic cognitive, affective, and experiential traits that reflect, through consistent attitudes and behaviors, a sustained awareness of the interrelatedness between one's self and the rest of nature." (p. 126). While this definition emphasizes the stability of this feeling of connectedness, CWN can also be defined more broadly to encompass situational feelings. For example, Cleary et al. (2020) described it as the following: "Nature connection refers to individuals' subjective sense of their relationship with nature and encompasses the affective, cognitive, and experiential aspects of that relationship" (p. 2).

CWN has been studied differently depending on its conceptualization as a more stable trait or flexible sense. Some studies investigated people's CWN after a recent visit to natural areas (Hoyle, Jorgensen, & Hitchmough, 2019; Wyles et al., 2019), while other studies evaluated the importance of specific natural areas for overall CWN (Duvernoy & Gambino, 2021; Restall et al., 2021). However, these different aspects are not independent of each other. If nature is frequented regularly, the situational emotional bonding with nature contributes to higher CWN, which is expressed as a stable personality trait over time (Cleary et al., 2018; Soga et al., 2016). In this research, I follow the definition by Cleary et al. (2020) as I am interested in the stable and situational aspects of CWN. This allows me to investigate CWN as both a stable trait and flexible sense.

Different theories explain the human feeling of a connectedness with nature based on an innate human preference for natural ecosystems. The Attention Restoration Theory explains the human affinity for natural over built environments with the restorative potential of nature for psychological and physiological human functioning (Rickard & White, 2021; van den Berg, Koole, & van der Wulp, 2003). Another theory is the biophilia hypothesis. This theory states that human evolutionary adaptation to nature resulted in humans feeling an inherent capacity to connect with other species and the natural environment emotionally. Consequently, humans strive toward a harmonious co-existence with the natural world (Barbiero & Berto, 2021; Totaforti, 2020). However, not every person necessarily develops a biophilic personality. This feeling of intense emotional connection with the biosphere can change over time as it is influenced by personal life experiences and the surrounding environment (Barbiero & Berto, 2021). Finally, the Topophilia Hypothesis builds upon the Biophilia Hypothesis. It emphasizes the importance of genetic predisposition and human interactions with the surrounding environment to enable humans to bond with local places. This connection with local places then leads to connections with the natural world (Beery et al., 2015).

2.5. Pathways from urban wilderness to CWN

Guided by the biophilia hypothesis, Lumber, Richardson, and Sheffield (2017) developed the framework "pathways to nature connectedness" to determine possible pathways for increasing CWN. The authors found that activities that address and involve contact, emotion, meaning, compassion, and beauty were ways to foster CWN. Activities focusing purely on knowledge generation and superficial contact with nature did not foster CWN (Lumber et al., 2017). Contact describes the experience of nature through the senses; emotion describes an affective state from engaging with nature; meaning depicts the use of nature to communicate; compassion describes the care for natural ecosystems; and beauty describes the perception of aesthetic qualities (Lumber et al., 2017). In a study with participants in focus groups, the most effective activities for fostering CWN were scientific inquiry of nature, engaging the senses, creating idyllic nature, noting nature through artistry, conserving nature, growing food, and engaging with wild nature (Lumber, Richardson, & Sheffield, 2018). Contrary to the study by Lumber et al. (2017), scientific inquiry of nature is mentioned as facilitating CWN as it does not purely focus on knowledge generation. It invites people to engage with their natural curiosity and produces a deep awareness of the interconnectedness of all elements of life, including humans (Lumber et al., 2018). Furthermore, engaging the senses when interacting with nature does not mean mere exposure but results in a physical experience of nature with the senses of touch and smell (Lumber et al., 2018).

Studies have identified different specific activities for fostering CWN. Interactions with nature should be intentional to facilitate CWN, as the mere presence of nature is not effective enough (Martin et al., 2020; Zylstra et al., 2014). Focusing on the restorative potential of nature, urban residents mentioned encountering wildlife, being grateful for trees, and marveling at colorful and impressive skies and views as meaningful daily interactions with urban nature (McEwan, Ferguson, Richardson, & Cameron, 2020). Both passive activities, such as sitting in or looking at nature, and active activities, such as walking or gardening, have been found to promote CWN (Church, 2018). Furthermore, the type of outdoor activity is also relevant. "Appreciative" activities such as dog walking, cross-country skiing, or sailing are associated with higher CWN, while motorized activities such as jet skiing or off-road vehicle driving are not (Cleary et al., 2018).

Finally, an aspect frequently discussed as critical for fostering CWN is residents' age when being in contact with nature. Several studies have suggested that frequent contact with nature is especially important during childhood (Beery et al., 2015; Lumber et al., 2018; Soga et al., 2016). However, others found that exposure to urban nature as an adult is equally effective for reconnecting humans with nature as childhood interactions with nature (Cleary et al., 2018; Rosa, Profice, & Collado, 2018). Hence, fostering interactions with nature across all human life stages is likely essential to achieve positive effects on the CWN of urban residents (Cleary et al., 2018). My research focuses on investigating the CWN of adult urban residents as I am interested in evaluating the potential to foster CWN in the urban environment at a later life stage.

2.6. Conceptual Framework

Figure 1 depicts the conceptual framework of this study. Central to this is the relationship between the type of urban green space and CWN of urban residents with variables that potentially influence the relationship. With the type of urban green space, I distinguish

between urban wilderness and other types of urban nature such as manicured parks or urban gardens. As outlined before, the framework from Kowarik (2005) is used to identify urban wilderness from the prospective viewpoint. Criteria are a low degree of human management intervention of biotic and abiotic factors but potentially anthropogenic influences from the surrounding urban environment. The effect of the type of urban green space on urban residents' CWN is mediated by the experiences that urban residents have in the urban green spaces. This refers to the pathways described by Lumber et al. (2017) that foster CWN, namely contact, emotion, meaning, compassion, and beauty. The type of activity moderates the experiences that urban residents make in green spaces. They can vary in aspects such as activeness, duration, or the use of a vehicle (Church, 2018; Cleary et al., 2018).

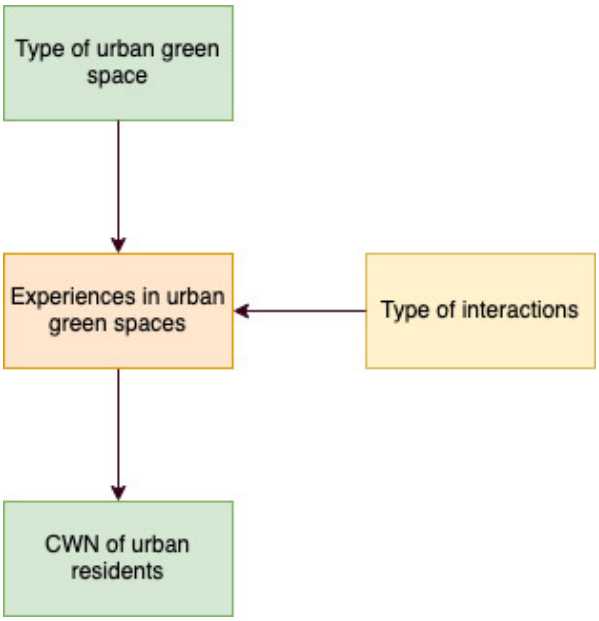

Figure 1: *Path diagram of the relationship between the type of urban green space and CWN of urban residents.*

3. Methodology

In the following section, I elaborate on the methodology used in this study. First, I present the general research design, including a description of the case study. Then, I describe the methods of data collection: interviews with urban residents and organizations, document analysis, and observations. Finally, I present the data analysis and the ethical considerations.

3.1. General research design

This research adopts an embedded single case study design to answer the research question, "*How does exposure to urban wilderness influence CWN of urban residents?*". The case study design is particularly suited for research investigating the how, as well as focusing on a contemporary phenomenon and having little control over behavioral events (Yin, 2014, p. 16). According to Yin (2014), a case study design allows the research to investigate "a contemporary phenomenon ("the case") in depth and within its real-world context" (p. 16). In this research, the contemporary phenomenon to be investigated is the occurrence of urban wilderness and its influence on the CWN of urban residents in the context of the Ruhr in Germany.

I used a single case study design instead of a multiple case study design. In my opinion, the Ruhr is an unusual example for studying the influence of urban wilderness on the CWN of urban residents. Industrialization was particularly intensive in the Ruhr, with lasting effects on the region's current image and regional identity (Souto, 2011). The industrial past remains present as remainders of the industrial constructions have been incorporated into modern urban infrastructure. Furthermore, there is a strong touristic and cultural narrative that builds upon the image of the Ruhr as a post-industrial region (Souto, 2011). Especially urban wilderness sites harbor many remainders of the coal and steel production infrastructure (Weiss et al., 2005). I argue that investigating this case is also relevant for understanding the social implications of urban wilderness in other areas. In the Ruhr area, urban wilderness is strongly connected to human agency and the regional identity. The concept of urban wilderness is already contrary to the traditional concept of wilderness which describes nature free of human influence. However, in this case, the origin and very identity of the urban wilderness are connected to humans. Hence, it allows determining whether there is a threshold to the influence of human agency for an area to be still experienced as wilderness and to foster CWN.

I have chosen an embedded single-case design, meaning I studied more than one unit of analysis. I focused on two embedded units of analysis, namely the former coal mines site Alma and site Rheinelbe in Gelsenkirchen. Furthermore, I investigated the Ruhr area as the overall case unit.

3.2. Case study: Ruhr area

Named after the river Ruhr that demarcates the area's southern boundary, the Ruhr area is located in the constituent state (*Land*) of North-Rhine Westphalia (NRW) in the west of Germany (Wrede & Mügge-Bartolović, 2012). Currently inhabiting around 5.1 million people and covering an area of 4,438.69 km^2, it is the biggest conurbation in Germany both in size and population (Souto, 2011; Zepp, Groß, & Inostroza, 2020). The cities expanded individually and grew into each other, resulting in a polycentric structure where the boundaries between

the cities are hardly visible (Wiegandt, Osterhage, & Haunstein, 2015). The region consists of the 4 districts (Kreise) Ennepe-Ruhr, Recklinghausen, Unna und Wesel and the 11 cities Bochum, Bottrop, Dortmund, Duisburg, Essen, Gelsenkirchen, Hagen, Hamm, Herne, Mülheim an der Ruhr and Oberhausen (LANUV, 2017b).

The provision of urban green areas, which currently amounts to 8.7 %, and when adding forests and water to 19.7 % in the Ruhr (Zepp et al., 2020), is closely tied to the area's history. In the 19th century, the Ruhr was Germany's industrial production center due to large coal reserves and the increasing demand for coal and steel production (Souto, 2011; Zepp, 2018). This intensification of industrial production attracted many workers to the Ruhr area, resulting in rapid population growth and vast urban expansion. The mining sector played a pivotal role in the economy of the Ruhr as it was the most important provider of employment. For instance, 475,000 people worked in the mining sector in 1957 (RVR, 2018b). However, the process of rapid industrialization was initially little regulated, with detrimental consequences for the environment and the health of people in the Ruhr. This highlighted the need for regional planning, including the provision of urban green spaces (Zepp, 2018). One of the goals was the establishment of a regional green belt in the Ruhr. It is a term that describes continuous green urban spaces dedicated to ecological and recreational purposes on the perimeter of cities (Zepp, 2018; Zimmermann & Lee, 2021).

Another incentive to focus on managing urban green spaces was provided by the industrial crisis that hit the Ruhr in 1958 (Zepp, 2018). Initiating a steep decline in coal and steel production, the industrial crisis caused a loss in around 660,000 workplaces between 1958 and 2000 and resulted in about 10,000 ha of abandoned brownfields (Zepp, 2018). To facilitate the necessary structural changes, the state government of NRW initiated the International Building Exhibition (IBA) Emscher Park from 1989 until 1999 with the goal of restructuring the area socially, economically, and ecologically (Zepp, 2018). The IBA Emscher Park fostered the implementation of projects from actors such as companies, towns, and individuals that took into account social, economic, and ecological aspects. Projects that the IBA Emscher Park selected received funding priority from the government to support the initiation of the projects (Shaw, 2002).

One of these projects from the IBA Emscher Park was the Emscher Landscape Park. This park focused on restoring ecologically impoverished industrial sites resulting in a regional network of urban green spaces (Zepp, 2018). It included different elements such as parks, bicycle paths, land-marks, and tourists attractions (Zimmermann & Lee, 2021). One of the sub-projects of the Emscher Landscape Park is the project “Industrial forests” (*Industriewaldprojekt*). This project focused on fostering natural selection of the vegetation on industrial fallow land by allowing it to develop spontaneously and unmanaged (Gausmann, 2012). Due to this high degree of self-regulation of biotic and abiotic factors, the project meets the criteria to be considered as wilderness from the prospective viewpoint within the framework by Kowarik (2005). Classifying as urban wilderness, I chose this project as my case study.

The district forestry office (Landesbertrieb Wald und Holz) of NRW is currently responsible for managing the project “Industrial forests”. The areas are secured by cooperation agreements between the district forestry office and different private and municipal partners (Landesbetrieb Wald und Holz NRW, 2012). In 2012, the project consisted of 16 areas of in total 223 ha (Gausmann, 2012). However, according to one of the interviewees [O2] from the

organizations I have interviewed, it now only consists of 9 areas of in total 180 ha. I chose the two former coal mines Rheinelbe (42 ha) and Alma (26 ha) in Gelsenkirchen (Weiss et al., 2005) as the embedded units of analysis. Both are located in the city district Ückendorf in close vicinity of (Gausmann, 2012). Hence, I expect the social circumstances to be similar.

I chose these two sites as they differ in some respects, which is interesting for this study. On both sites, nature is not intentionally managed but allowed to grow freely. However, on site Rheinelbe, more human elements are deliberately incorporated into nature. For instance, there is a forest station with a forester offering environmental education (Landesbetrieb Wald und Holz NRW, 2009) and a sculpture forest with sculptures built by the artist H. Prigann (Henne, 2005). Another advantage is that social research has been conducted on site Rheinelbe, which I can use to put my research into context and to compare my data. The study of Keil (2005) identified urban residents' perception and use of site Rheinelbe, while the study of Franz, Güles, & Prey (2008) discussed urban residents' place-making of an abandoned brownfield with the example of site Rheinelbe. On site Alma, there has only been ecological research conducted with one study monitoring biodiversity on site Alma and Rheinelbe determining their importance for biodiversity conservation (Weiss et al., 2005). Hence, it might be interesting to expand the research conducted on site Alma by a social component.

3.3. Data collection

As data collection methods, I used semi-structured interviews with urban residents (answering sub-RQs 2 – 4) and content interviews with organizations that work with and are involved in managing urban wilderness (answering sub-RQs 2 and 4). I also analyzed policy documents (answering sub-RQs 1 and 2), and activity observations (answering sub-RQ 2). Figure 2 depicts the methods and code categories used to answer the four specific research questions.

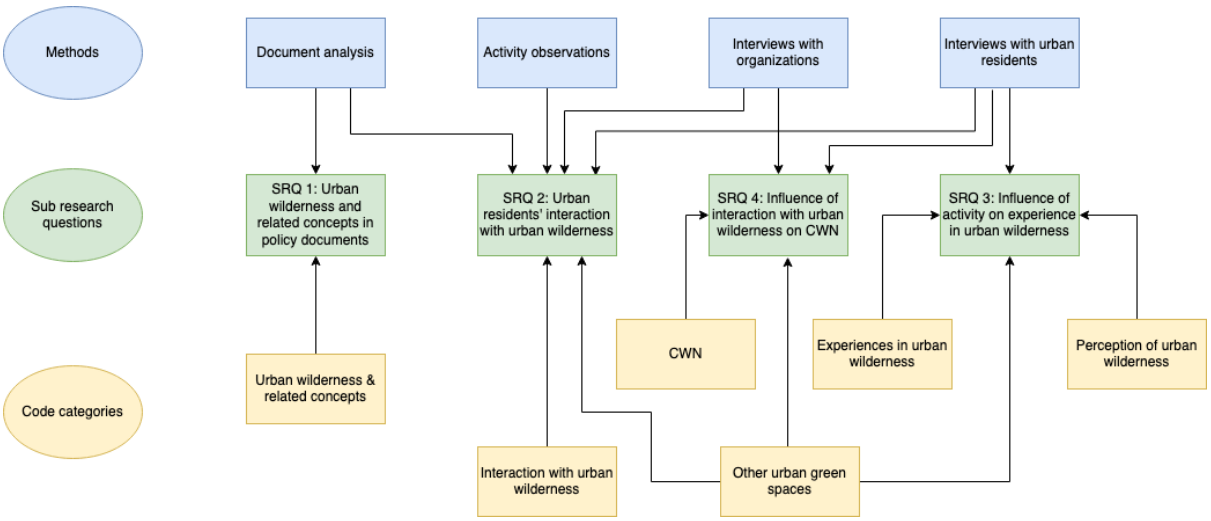

***Figure 2**: Specific Research Questions and the corresponding methods and code categories*

3.3.1. Interviews with urban residents

I conducted the interviews with the urban residents to answer the second, third, and fourth specific research question. Hence, the aim was to investigate their activities on the urban wilderness sites, how they experienced them and how the interaction with urban wilderness influenced their CWN. I chose to conduct semi-structured interviews as this enabled me to

obtain the necessary depth in information to answer the research questions. Semi-structured interviews allow the respondent to clarify questions, and I can ask them to elaborate on some answers further. Furthermore, it allows me to discover aspects of their interaction with urban wilderness that are not covered in the theoretical framework.

Before conducting the interviews, I developed an interview guide (see appendix 8.1.) with five main questions and several sub-questions. Depending on the answers to the main questions, I also asked follow-up questions that were not covered in the interview guide. The five main questions covered the specific research questions 2-4, namely their activities on the site, the experience of urban wilderness, and the influence on CWN. The other two main questions covered the interviewee's level of CWN and temporal change in CWN. I used the three elements of the Nature Relatedness Scale (NR-Scale), namely NR-Self, NR-Perspective, and NR-Experience (Nisbet, Zelenski, & Murphy, 2009), as a guide to formulate the questions concerning the level of CWN. I chose the NR-Scale because it is a valid and internally consistent method to measure CWN (Zylstra et al., 2014).

For the sampling of the interviewees, I developed a set of inclusion criteria. The interviewees needed to have a good level of German, regularly interact with the studied urban wilderness sites (on average at least once per month), and be older than 18. I chose the first criterion as most interviewees were German native speakers and wanted to do all the interviews in the same language. The second criterion I included as I wanted to investigate the effect of regular interaction on CWN, and the third as I focused on adults in my research. One interviewee fulfilled the criteria but had only started visiting the site one month ago. However, visiting it daily, she had developed a relationship with the site, and the insights from the interview proved relevant for my research.

Concerning the sampling method, I decided to use mainly purposive sampling to recruit the interviewees. To my knowledge, there were no associations or organizations that represented my target group for the two sites. Hence, I had to find other ways how to approach them. There were different Facebook groups of which I assumed that my target population could be members, such as the hiking, cycling, or excursion groups for the Ruhr area. I joined the various groups and posted a call for voluntary participation in my study for people that regularly visited urban wilderness sites. One interviewee reached out to me after reading the post in a hiking group (*Wanderlust Ruhrgebiet*). That interviewee then connected me to another person who fit the study's inclusion criteria and was willing to be interviewed. As the recruitment rate of this method was low, and I suspected that only highly motivated individuals would answer the post, I also decided to use other sampling methods.

The second method was to recruit interviewees by approaching them directly on the urban wilderness site. I approached people that were alone as I did not want their answers to be influenced by the presence of another person. I asked about the frequency of their visit to the location, and whether they would be willing to talk to me. Initially, the interviewees seemed surprised and sometimes suspicious of being approached directly. However, once I mentioned that the data collection was for my Master thesis and that I wanted to ask them about their relationship with the site, people seemed more relaxed and willing to talk to me. I conducted all interviews in person and interviewed 18 urban residents until I observed data saturation.

To document the interviews, I asked the interviewees whether they agreed to me recording our conversation. All interviewees gave me their consent to do so. I recorded the interviews with the app *Voice memos,* an internal iOS app, and took notes in case something went wrong with the recording. During one interview, there were technical issues with the app, so I could not record it but only took notes. At the end of the interview, I asked whether they would like to receive the interview transcript or the final version of my Master thesis.

3.3.2. Interviews with organizations

I conducted interviews with organizations to interview them about their expertise on urban wilderness and the urban residents' interaction with it. Furthermore, I consulted them on which policy documents are relevant in the field of managing urban green spaces and how to reach my target group of urban residents. The selection criteria were organizations working with urban green spaces in the Ruhr. Their work could be focused on urban wilderness areas but was not necessary. I used Purposive Sampling by identifying suitable organizations through an internet search and accessing my supervisor's network as he had conducted research in the Ruhr area before. Once I was in contact with organizations, I used Snowball Sampling to identify and contact other organizations. In total, I interviewed five organizations working in the fields of education, research, and governmental and regulatory agencies.

I formulated a set of questions before the interviews (see appendix 8.3.) and adapted them depending on the role and expertise of the organization I interviewed. The questions covered the definition of urban wilderness, where it occurs in the Ruhr, the interaction of urban residents with it, and the contribution of this interaction to their CWN. Furthermore, I asked about how their organization takes the social aspects of managing urban wilderness and other UGS into account. I conducted four interviews online via the MS Teams or Zoom platform and one in-person interview. I was only taking notes during two interviews, and the other three, I was recording with MS teams or the *Voice memos* app.

3.3.3. Document analysis

I conducted the document analysis to verify whether my assumptions of the case study classifying as urban wilderness corresponds to the concept of urban wilderness applied in policy documents for the Ruhr area. Therefore, I investigated the application of the concept of urban wilderness in policy documents and compared it to my case study. However, I found that only a few documents mention urban wilderness. Hence, I decided to include related concepts to urban wilderness in the document analysis. I included wilderness as a concept that is not specified to the urban context and industrial nature as it is a frequent type of urban green space in the Ruhr area (Keil, Hering, Schmitt, & Zepp, 2021). Furthermore, my chosen case study is an industrial forest (Keil et al., 2021), which classifies as a type of industrial nature. Hence, it is interesting to evaluate how my case study relates to the application of industrial nature in policy documents and whether it is considered urban wilderness.

Regarding the types of documents that I analyzed, I based my inclusion criteria on policy documents about urban green space management that were issued or funded by governmental agencies. The documents could be official planning documents or have more of a recommendatory character used for informing policy actors. My search strategy for documents was to start with the documents the interviewed organizations recommended to

me and then use snowball sampling to analyze documents from the literature list in the initial documents. Furthermore, I conducted an internet search and searched the websites of relevant government agencies such as the Regional Association Ruhr (RVR) or the State Office for Nature, Environment and Consumer Protection North Rhine-Westphalia (LANUV). The official planning documents are arranged hierarchically depending on the region they are valid for. The planning documents that I have analyzed are valid for three levels: the constituent state of NRW, the regional level of the Ruhr, which consists of the governmental districts Arnsberg, Münster, and Düsseldorf, or the communal level, which are 11 cities and districts (LANUV, 2022).

3.3.4. Observations

I used the activity observations to collect background information on the type of activities people carry out on urban wilderness sites. In total, I conducted four observations at different locations for a varying amount of time, once two hours and twice one hour. I chose to carry out the observations on site Rheinelbe as I could compare the results to other studies that have documented the activities of adults on site Rheinelbe (A. Keil, 2005). Per observation, I was staying at the same location and noted the type of activities people carried out. I did not use a list of possible activities but defined them myself. I focused on the kind of activity but not the proportion of people carrying out one specific activity, as I was interested in determining the variety of activities. All observations took place between 12:00 and 16:00. I gathered four hours of observation data: two hours were with sunny and relatively warm weather, and two hours were with cloudy and colder weather.

3.4. Data analysis

I transcribed the interviews with urban residents non-verbatim. I used the transcription option in the online Word Document of the OneDrive business version, where I could manually check the transcription by listening to the audio and correcting transcription mistakes. After I prepared the transcripts, I coded the data with a mixed approach of inductive and deductive coding. I defined a set of codes based on the research questions and my theoretical framework. To conduct the coding, I used the software Atlas.ti version 22.0.2. In the first round of coding, I applied the predefined codes to the transcripts and developed new codes that emerged from the data. In the second round of coding, I checked the applicability of the defined codes, deleted some existing codes, merged similar codes, defined new codes, and arranged the codes which belonged to the same topic in groups. This resulted in 34 codes grouped into five categories (see Figure 1 for SRQ 2-4). The categories were *Interaction with urban wilderness*, *Perception of urban wilderness*, *Experiences in urban wilderness*, *Other urban green spaces*, and *CWN*. After I finished the second coding cycle, I looked at every code and its quotes individually to identify common themes across the interviews. Based on this, I looked over some codes again or rearranged some categories.

The data analysis of the interviews with the organizations was similar to the data analysis of the interviews with the urban residents. First, I transcribed the interviews that I recorded with the transcription option in the online Word Document of the OneDrive business version. I revised the notes of the interviews that I did not record directly after the interview to organize them clearly and to write clarifying comments. Second, I prepared a set of codes based on the information I wanted to obtain from the interviews. The codes were partially the same as

those used for the interviews with the urban residents, such as interaction with urban wilderness and CWN. However, I did not use some codes, for example, experience in urban wilderness. I read through the transcripts and interview notes to apply the codes. Finally, I extracted the relevant information from the interviews.

For the document analysis, I defined search terms (see appendix 8.4.) based on the information I wanted to extract from the documents. The search terms were *definition*, *form,* and *examples* of the three concepts *urban wilderness*, *wilderness,* and *industrial nature*, as well as the *activities of urban residents in urban wilderness*. I also formulated the search term *project Industrial forests* to determine whether my case study was mentioned. I extracted the relevant text fragments to a Table in Microsoft Excel for Mac Version 16.6 (see appendix 8.4.). For the observations, I did not have to analyze the collected data further as the raw data already generated the necessary background information on residents' activities on urban wilderness sites. However, I analyzed it by displaying it in graphical form.

3.5. Ethical considerations

Even though the content of the interviews with urban residents was not sensitive data, I decided not to record the interviewees' names but use their answers anonymously. As I approached most interviewees directly on the sites, they had less time to think about the consequences of their participation in my research. By asking them to participate anonymously, it increased their willingness to do so. However, approaching people directly might have had other impacts worth addressing here. Being asked by a stranger to have an interview on the spot might have intimidated people, and they might have felt pressured to participate in my research. I tried to prevent this by emphasizing that their participation is entirely voluntary and that they could withdraw from it at any point during the interview. Furthermore, at the beginning of the interview, I informed the respondents about the procedure and aim of my research and how their data would be used. I presented them with an information sheet and consent form (see appendix 8.2.) that we went through together so they could ask clarifying questions and I could make sure that they understood everything well. Finally, I offered to send the interview transcript so they could look at it or give them my email address so they could contact me with questions that might arise after the interview.

For the interviews with the organization, I made sure to inform the respondents before the interview about the procedure and aim of my research and how their data would be used. I also emphasized that their participation is entirely voluntary and that they could withdraw from it at any point during the interview. I decided to anonymize all the interviews with the organizations as one of the interviewees preferred this. The interview content was not sensitive data, and by anonymizing the content, I made sure that their own name and the name of the organization were not affiliated with the answers given. For the document analysis, I only included publicly available policy documents, which I made sure to cite correctly.

An important aspect is data management to ensure the research's transparency, reproducibility, and verifiability. Data management is conducted according to the '*Guidelines for preparing and carrying out an MSc thesis*' from the Forest and Nature Conservation Policy Group (FNP) at Wageningen University & Research (WUR). During the thesis process, I stored the data collected for this Master thesis on my personal computer and in OneDrive to prevent

data loss. After completion of the thesis, the data will be stored by the FNP chairgroup. Therefore, the project proposal and the raw and processed data files will be delivered to the FNP supervisor. The data collected for this thesis entails the interview recordings, transcripts, and notes, the coded interview data, the Excel sheet with data collected from the data analysis, and the notes from the observations.

4. Results

In the following section, I use the specific research questions (see section x) to structure the results of my research. In the first section, I present the findings from the document analysis where I investigated how my case study relates to the concept of urban wilderness in German policy documents. The second section deals with urban residents' interaction with urban wilderness, while the third section is about urban residents' experience of these interactions. Finally, in the fourth section, I address my findings on how interacting with urban wilderness influences CWN.

1.1. Application of urban wilderness

The following part focuses on answering the first specific research question. It focuses on how the application of the concept of urban wilderness in German policy documents relates to the case study of this research. I also decided to investigate similar concepts to urban wilderness as the document analysis revealed that the concept of urban wilderness is applied in only a few documents. Consequently, I also included the concepts of wilderness and industrial nature. It is interesting to reflect on how the concept of wilderness that is not specific to any type of environment relates to wilderness in the urban context. Industrial nature is a specific type of urban nature that frequently occurs in the Ruhr area and, in some cases, in the form of wild urban nature (Keil et al., 2021).

First, I look at wilderness as a broader concept that might entail the more specific concept of urban wilderness. Wilderness areas, as defined by the European Union (EU), are larger than 1,000 ha, for which only one area in NRW classifies as a wilderness area (LANUV, 2017a). Hence, in the analyzed documents, the concept of wilderness is mainly discussed as wilderness development areas, also called process sanctuaries. This type of nature designates state forests larger than 5 ha that have the potential to develop into wilderness areas and that are not used for timber production. Furthermore, several criteria must be fulfilled for an area to be considered a wilderness development area. For instance, the area should contain trees older than over 120 years, be classified as a special habitat type, and provide possibilities for nature education (LANUV, 2017b).

It is not specified that the areas need to lie outside urban areas. Hence, urban sites could potentially classify as wilderness development areas. However, the case study probably does not classify as such because it does not fulfill several criteria. For example, as the project was only initiated 30 years ago, trees on the site cannot be older than 120 years. Another factor is that the nature of the site is highly anthropogenically influenced and does not correspond to any of the habitat types on the criteria list. In fact, when looking at a map of the wilderness development sites, they are mainly located on the periphery of the Ruhr area (LANUV, 2017b). The wilderness development areas do not seem to be legally protected yet, as one of the documents from 2021 emphasizes the need to do so (Keil et al., 2021).

The analysis of the application of the urban wilderness concept in policy documents showed that this concept is not used in official planning documents with legal character. However, I found it mentioned in two documents issued or funded by official administrative organizations. One of the documents is the "Positions on Biodiversity Strategy Ruhr" (Positionen zu einer Regionalen Biodiversitätsstrategie Ruhrgebiet) which is funded by the Ministry for Environment, Agriculture, Nature (MULNV). Urban wilderness can be expected

to be included in future planning documents as this document is currently used to develop a regional strategy for green infrastructure in the Ruhr area (Keil et al., 2021). The second document, "Nature in NRW – wilderness areas" (Natur in NRW – Wildnisgebiete: Prozesschutz dient Artenvielfalt), is an edition of the magazine *Nature in NRW* issued by the North Rhine-Westphalia State Office for Nature, Environment and Consumer Protection (LANUV). Being an informative magazine, it assembles policy papers based on insights from conferences, workshops, and discussions with relevant policy actors in the UGS management field in NRW.

Studying the document "Positions on Biodiversity Strategy Ruhr" more in detail, I found that it does not define urban wilderness. However, it emphasizes the need to define wilderness in the urban environment for the current process of drawing up the regional biodiversity strategy for the Ruhr area (Keil et al., 2021). This demonstrates that the potential differences between urban and non-urban wilderness are recognized, and its application as a concept in future planning documents can be expected. A definition for wilderness is provided that can be applied to the urban and non-urban context as the surrounding conditions are not further specified. It is defined as "areas of free [ecological] succession or completely calmed areas with unrestricted development" (Keil et al., 2021, p. 23), leaving some room for interpretation as terms such as succession, calmed, or development are not clarified. This definition also applies to my case study as vegetation on both site Alma and site Rheinelbe is allowed to follow natural succession (Weiss et al., 2005).

Urban wilderness is discussed in the forms in which it currently occurs in the Ruhr in the document "Positions on Biodiversity Strategy Ruhr". Industrial and residential brownfields, urban forests without timber production, overgrown parklands and quarries or sand, gravel, and clay pits with natural ecological succession are the types of urban wilderness listed (Keil et al., 2021). Relating it to my research, my case study falls under the category of urban forests without timber production, indicating that the case study is a common type of urban wilderness in the Ruhr.

The second document, "Nature in NRW – wilderness areas" defines wilderness without explicitly differentiating between the urban and non-urban context. It refers to the conference on wilderness and large natural habitats in Prague in 2009, where two different forms of wild nature were differentiated: wilderness and wild areas. Wilderness applies to large areas where humans have little influence on ecological processes. Wild areas are defined as smaller and frequently fragmented areas where ecological conditions have been altered (LANUV, 2014). Both forms of wild nature could potentially occur in the urban environment. However, wild areas are more likely to be found in cities than wilderness as urban nature is often smaller and fragmented. The case study does not fall within the definition of wilderness as past human use of the area has influenced the ecological processes strongly. However, the definition of wild areas is rather vague, as it does not specify the size, degree of fragmentation, or alteration of ecological conditions. Hence, it makes it difficult to determine whether the case study corresponds to the concept of wild areas.

Reflecting on the social dimension of wild nature, the document "Nature in NRW – wilderness areas" highlights that wilderness in cities is an example of nature being perceived as wild despite being influenced by humans (LANUV, 2014). Hence, the importance of the perception of the wild aspect of an area is recognized for it to be described as wilderness. The document includes a discussion on urban industrial brownfields, which can be regarded as one type of

wild urban nature (Keil et al., 2021). While labeling it as artificial because humans have created it, it is also described as wild and close to nature (LANUV, 2014).

The analysis of the third concept of industrial nature in the policy documents revealed that it is a frequently mentioned type of nature. “Positions on Biodiversity Strategy Ruhr” describes industrial nature as “biotic communities that have emerged spontaneously on areas of the former coal and steel industry, on abandoned railroad tracks, railroad stations and industrial sites” (Keil et al., 2021, p. 41). The most common attribute of the different types of industrial nature is the anthropogenic influence. Around 8.12 % of the biotope network in the Ruhr are classified as industrial nature. Examples are ecologically significant brownfields, tailings piles, and excavation areas (LANUV, 2017a). One document indicated that industrial nature will be included as a key project within urban forest management concepts in the regional plan for the Ruhr area, which is currently under development (Wald & Holz NRW, 2012). Hence, the concept of industrial nature will likely receive more attention in future planning documents for the Ruhr area.

Having emerged on sites of former coal and steel production and being highly anthropogenically influenced, my case study classifies as a type of industrial nature. Furthermore, it is part of the project “Industrial forests” mentioned in several documents and explicitly labeled as industrial nature (LANUV, 2017b). It is emphasized that this project is a new form of city forest due to its integration of ecological and social aspects. For instance, while nature is allowed to develop freely without human intervention, the project is also used for environmental education (Wald & Holz NRW, 2012). The document “Forestry report for the Regional Plan Ruhr” (Forstlicher Fachbeitrag zum Regionalplan Ruhr) even suggests that the “results from this project can be exemplary for comparable regions in Europe” (Wald & Holz NRW, 2012, p. 83). Most importantly, two documents label the nature in the project sites as wilderness (Keil et al., 2021; Wald & Holz NRW, 2012), supporting the labeling of my case study as urban wilderness.

Table 1: *Depiction of the most relevant documents that contain information about the concepts of wilderness, urban wilderness, and industrial nature*

Name of the document	Organization (publisher or funder)	Urban wilderness	Wilderness	Industrial nature
Positionen zu einer Regionalen Biodiversitätsstrategie Ruhrgebiet	MULNV, RVR	x	x	x
Natur in NRW – Wildnisgebiete: Prozesschutz dient Artenvielfalt	LANUV	x	x	x
Daten zur Natur in Nordrhein-Westfalen 2016 LANUV-Fachbericht 83	LANUV		x	x
Landwirtschaftlicher Fachbeitrag zum Regionalplan „Metropolregion Ruhr“	RVR			x
Fachbeitrag des Naturschutzes und der Landschaftspflege für die Planungsregion des Regionalverbandes Ruhr (RVR)	RVR		x	x
Mentioned in number of documents (out of 31)		2	8	14

1.2. Interaction of urban residents with urban wilderness

In the following section, I present the results for the second research question that focused on the type of interactions of urban residents with urban wilderness. First, I describe the findings from the activity observations that only apply to site Rheinelbe. Then, I describe the results from the interviews with the organizations and urban residents that apply to site Alma and Rheinelbe.

1.2.1. Activities on site Rheinelbe

In the following Figure 3, I provide the results from the observational study, which I only conducted on site Rheinelbe. I used the categories provided in the document “Recreation and tourism concept Ruhr” (Freizeit-/Tourismuskonzept Metropole Ruhr) for the discussions of the recreational use of former coal mines. The document also provides a third category, ‘cultural use’, which was mentioned in the interviews with the urban residents. However, as I did not observe activities that fall in this category during the observations, it is not included in Figure 3. An interesting point mentioned in the document is that the use of former coal

mines depends on the site's characteristics. Important aspects are the architecture, the spatial impact of landmarks and cultural objects on the site, use for events, infrastructure available, and the integration into the surroundings (RVR, 2018a).

The most frequently observed activities are walking and riding a bicycle. Both activities occurred in variations, such as people using different types of bikes, walking in small groups, or wearing headphones. Activities observed less frequently were running, people eating lunch, and sitting on a bench. The most commonly observed activity, however, was also dependent on the location where I carried out the observation. At the location with the paved road, the most frequent activity was riding a bicycle, while at the location with the gravel road, the most frequent activity was walking the dog. Furthermore, some activities are only possible at specific locations. For instance, people can only sit if benches are available. Finally, there is a bias toward counting more people riding the bicycle as they move at a greater speed and pass by more quickly.

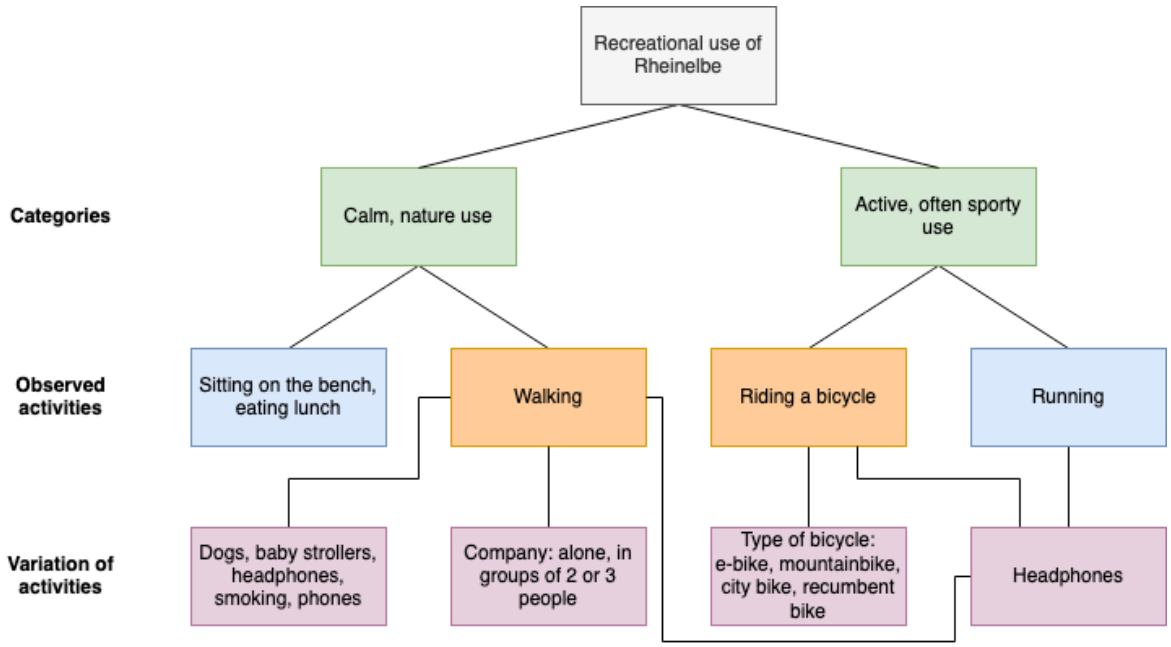

Figure 3: *The recreational use of Rheinelbe is grouped into two categories (adapted from Keil et al. (2021)), with the most frequent activities depicted in orange, namely walking and riding a bicycle. Activities in blue were observed less frequently. Variations of the activity are shown in the last row.*

1.2.2. Interactions with site Alma and Rheinelbe

The following interactions are specific to the two urban wilderness sites, Alma and Rheinelbe, as I conducted the interviews with urban residents there. Again, I used the three categories that described the recreational use of former coal mines from the document “Recreation and tourism concept Ruhr” to structure the results. I grouped the interactions into the three categories ‘calm, nature use’, ‘active, often sporty use’, and ‘cultural use’. I also added a fourth category, ‘social use’, as this was frequently mentioned and cannot be fully assigned to any of the other three categories. Overall, the interactions described in the categories in the document “Recreation and tourism concept Ruhr” are broader than the interactions mentioned by the interviewees. This is probably due to the interviewing process where respondents are invited to reflect deeply on their interaction with the site. Nevertheless, the

list is perhaps not exhaustive as the interviewees might not have remembered to mention all possible activities on urban wilderness sites.

The interviewees did not engage equally frequently with the activities from the four categories. With 59 % of the interviewees' activities belonging to the category of 'calm, nature use', the interviewees engaged most frequently in these types of interactions. This was followed by the category 'social use' with 21 % and the category 'active, often sporty use' with 15 % of interviewees' activities. The interviewees engaged least with activities from the category 'cultural use', with only 5 % of their activities belonging to this category. This makes sense when considering that there are few facilities on the two sites that invite the visitors to engage in cultural activities.

The people also gave indications regarding the duration and frequency of their visits which did not seem to depend on the type of activity—most people spent between half an hour and three hours on the site. The weather was a factor that influenced the duration of the visit. Many interviewees mentioned that they would spend more time on the site when it was warmer and the sun was shining. On the other hand, the frequency of the visits varied more strongly than the duration. Nine people mentioned going daily, mainly because they had to walk the dog, and five said going at least once per week. The rest of the people would go more irregularly so whenever they had the time or felt the desire to visit the site.

There were also some interesting aspects raised during the interviews with the organizations. Accessibility so the distance between the site and home, was mentioned by one interviewee [O4] as an aspect that determined whether urban residents would use the sites for daily recreation or only during the weekend. This was indeed confirmed during the interviews with the urban residents. Most interviewees lived close to the sites and consequently visited them frequently. The interviewees who lived further away would visit the sites more irregularly. Another aspect emphasized by one interviewee [O3] was the importance of the urban wilderness sites for environmental education of children. Several schools and kindergartens would frequently visit these sites to provide children the opportunity to engage with wild nature. This was also commented on during some interviews with the urban residents that observed groups of children visiting the site with their teachers. However, as my target group excluded children and there were no teachers engaged in environmental education among my sample, this topic was not discussed further during the interviews with urban residents.

Calm, nature use

The first category, 'calm, nature use,' describes activities that are physically demanding on a lower level than 'active, often sporty use'. Going for a walk was the most frequent interaction, with walking the dog being a variation of this activity. This was confirmed by the interviewees from the organizations that going for walks was among the most frequent activities of urban residents interacting with urban wilderness sites. It also makes sense when reflecting on my sampling approach, where I mainly approached people walking as they were moving at a slower speed. Furthermore, the sites were particularly attractive for dog owners as keeping the dog on the leash is not mandatory. Smoking marihuana is another activity that was preferably done on the urban wilderness site rather than in other UGS. Both interviewees [I4; I7] that engaged in this activity explained feeling less observed as there were usually fewer people on the urban wilderness site. Other activities were site-specific because it was

impossible to carry them out on the other site. For instance, going on a forest walk with a forester can only be done on site Rheinelbe because there is no forester on site Alma.

Table 2: *The following table lists the different types of activities mentioned by urban residents during the interviews and grouped in the category 'calm, nature use'. It also entails the number of interviewees engaged in these activities and on which site.*

Type of activity	Number of interviewees	Mentioned on site
Going for a walk	9	Alma, Rheinelbe
Walking the dog	8	Alma, Rheinelbe
Exploring the surroundings	5	Alma, Rheinelbe
Listening to birds	4	Alma, Rheinelbe
Observing nature	4	Alma, Rheinelbe
Observing wildlife	3	Alma, Rheinelbe
Listening to music/podcast	3	Alma, Rheinelbe
Smoking marihuana	2	Alma, Rheinelbe
Doing picnics	2	Alma, Rheinelbe
Sitting	2	Alma, Rheinelbe
Watching the sunset	1	Alma
Lying down	1	Alma
Forest walk with forester	1	Rheinelbe

Regarding the third most frequent activity, 'exploring the surroundings', it depicts activities where the person actively discovers new things on the site as described during the interviews. This seemed to be encouraged by the type of nature on the site ,as one interviewee [I18] explained:

> "I'm taking a closer look here because this is a very special forest. There is nothing else like this here in Gelsenkirchen. On other sites you just walk around, but you don't look too closely. Here there's always something new to discover."

The type of nature also invited the interviewees to observe it and its wildlife more closely. One reason for activities such as 'Listening to birds' and 'Observing nature' being mentioned so frequently is that I conducted the interviews in spring. It is a time when the plants grow leaves and birds sing. It can be expected that the urban residents would engage less frequently with these activities in other seasons. However, one interviewee [I17] explicitly mentioned that she liked observing nature in winter as then the deformations on the trunk of a tree were more visible. She also connected this interest in observing nature with the lack of human intervention in nature:

> "It is pure nature. Nothing is cleared away here, the trees remain lying, which fall over. Plenty of room for animals, for birds. I've just looked, there was a very rare bird I did not know. I will check it when I'm home."

Finally, listening to music or a podcast is an activity that is not connected to the characteristics of the site itself. On the contrary, it somewhat limits interacting attentively with nature. One interviewee [I4] mentioned that listening to something made him focus more on the music than the surroundings.

Active, often sporty use

The category ‘active, often sporty use’ describes physically demanding activities. The most frequent activity in this category was riding a bicycle, followed by running. This was contrary to the perception of the interviewees from the organizations that named running and riding bikes among the most frequent activities on urban wilderness sites. One reason for this discrepancy in my findings is that I approached people directly on the site. Therefore, it was more challenging to talk to people engaging in a sportier activity where they would move at a higher speed. Finally, the two activities of mountain biking and climbing slopes were specific to site Rheinelbe as its topography was hillier than on site Alma.

Table 3: *The following table lists the different types of activities mentioned by urban residents during the interviews and grouped in the category ‘active, often sporty use'. It also entails the number of interviewees engaged in these activities and on which site.*

Type of activity	Number of interviewees	Mentioned on site
Riding a bicycle	6	Alma, Rheinelbe
Running	2	Alma, Rheinelbe
Gymnastics	1	Alma
Mountain biking	1	Rheinelbe
Climbing slopes	1	Rheinelbe

Social use

The category, ‘social use’, depicts activities where the interviewees would spend time with other people. The most frequently mentioned social activity is meeting friends or family on the site, followed by encounters with other dog owners or other visitors of the site. Some of these activities were carried out more frequently due to the characteristics of the sites. For instance, it was particularly likely to encounter other dog owners because the site attracted many dog owners. Finally, “sightseeing” with visiting friends and family could also be due to the site's interesting characteristics and nature. However, mentioned only by one person, it might also be due to the characteristics of this particular person.

Table 4: *The following table lists the different types of activities mentioned by urban residents during the interviews and grouped in the category ‘social use'. It also entails the number of interviewees engaged in these activities and on which site.*

Type of activity	Number of interviewees	Mentioned on site
Meeting friends/family	8	Alma, Rheinelbe
Encounters with other dog owners	4	Alma, Rheinelbe
Encounters with other visitors	3	Alma, Rheinelbe
“Sightseeing” with visiting friends/family	1	Rheinelbe

Cultural use

The category ‘cultural use’ describes activities connected to cultural events or infrastructure. Few activities belong to this category as both sites provide few opportunities to engage in cultural activities such as events. However, on both sites, there are landmarks that function as an attraction to the visitors. On site Rheinelbe, is the Himmelsleiter, an artificial hill with

an art installation on top. For one interviewee [I13], climbing the Himmelsleiter was the main reason for visiting site Rheinelbe daily. On site Alma, there is the Zechengebäude Alma, an abandoned building from the former coal production. The interviewee [I6] that mentioned visiting this building was looking for drawings of an artist inside the building. Several interviewees also said that children and adolescents would climb onto the roof of the building, with one interviewee remembering that she did so as a child. One interviewee [I8] voiced her concerns about the state of the building and the potential danger of entering it as there is no responsible person for maintaining it.

Table 5: *The following table lists the different types of activities mentioned by urban residents during the interviews and grouped in the category 'cultural use'. It also entails the number of interviewees engaged in these activities and on which site.*

Type of activity	Number of interviewees	Mentioned on site
Visiting the Himmelsleiter	3	Rheinelbe
Visiting Zechengebäude Alma	1	Alma

The overall difference with other urban green spaces

In the interviews, there were several aspects mentioned by the urban residents on how their interaction with the urban wilderness site differed from other UGS. Most frequently, interviewees emphasized that they associated other UGS, especially parks, with a playful character in a social setting. Typical interactions would be playing football or barbecuing, and as one interviewee [I5] explained, it was mainly about having fun. However, in the opinion of some interviewees, it prevented them from engaging in calmer activities where they would be more attentive to their surroundings. Nature in other UGS was perceived as more homogenous; hence, they felt more of a need to do something actively. As one interviewee [I2] phrased it:

> "In the park you have everything, there are people. You have to keep yourself busy. It is not enough for me to do nothing, play nothing in a park. You have to eat an ice cream, for example, eat fries."

Another reason to visit other UGS were the facilities on these sites. For example, many parks would provide facilities for sitting such as benches. One interviewee [I7] highlighted this contrast between site Alma and other UGS. Nevertheless, this also depends on the characteristics of the urban wilderness site, as there is a bench in one location on Rheinelbe. For the dog owners in my sample, the motivation to visit the urban wilderness site instead other UGS was that it was mandatory to keep the dog on the leash in other UGS. Finally, one of the interviewees [O2] from the organization mentioned that urban residents would use UW sites for purposes that were not allowed in other UGS or which would fall within the grey area of the law. For instance, people would go camping or mountain biking, including building own trails. One interviewee [I3] did engage in mountain biking, but camping was not mentioned as an activity during the interviews with urban residents.

1.3. Experience of interaction with urban wilderness

The interviewees mentioned many different aspects of how they experienced their interaction with the urban wilderness sites. They experienced it mainly positive with some

negative aspects discussed as well. In the following section, I describe how urban wilderness influenced the interviewees' feelings, the experienced contrast between urban wilderness and the surrounding city, and their perception of the industrial aspects. Then I elaborate on the negative experiences on the site and the difference between the experience on the urban wilderness site and other UGS.

1.3.1. Positive experiences on the site

For many interviewees, being in nature on the urban wilderness site generated positive feelings. They appreciated many aspects related to spring, such as listening to birds and seeing flowers and fresh leaves emerge. Experiencing "good" weather was another critical aspect that made the interviewees feel positive. Several interviewees also said that just being on the site was enough to make them feel happy. One interviewee [I5] contributed this positive impact on his state of mind to his familiarity with the site as he knew the place very well. The site also influenced interviewees' dealing with thoughts. While some interviewees particularly enjoyed letting go of thoughts and being in the moment, others said it was an ideal place to brainstorm and let thoughts wander freely.

One of the most frequently mentioned aspects interviewees appreciated about the urban wilderness site was its peaceful and calm energy. Most importantly, it enabled the interviewees to relax and focus on themselves, which was an aspect that motivated them to revisit the site. It was also particularly beneficial for regulating other feelings such as sadness or stress from a working day. As one interviewee [I12] put it:

> "I notice that I just come back to myself. Sometimes, when I'm stressed or sad, I go through here and then I come home and I'm fine again."

Several interviewees also commented on their appreciation of the wildness of the nature on the site labeling it as unspoiled, natural, mysterious and beautiful. For instance, one interviewee [I12] mentioned that interacting with nature that is allowed to grow freely conveys a feeling of freedom to her. Another interviewee [I17] commented very positively on the aspect of dead trees not being cleared away as it would give space to animals, hence, recognizing the interconnectedness in nature. People who highly appreciated the sites' wildness only wished for the site to be larger and better connected to other urban green spaces.

One aspect frequently mentioned in the interviews was their relationship with the site. Many interviewees said that they experienced the place as home, with several aspects having been pivotal for developing this feeling. Some interviewees had grown up in the vicinity of the site and had spent much time on the site when growing up. For instance, one interviewee [I7] mentioned that he made first experiences there, such as smoking his first joint. Another interviewee [11] had used the site for adventure explorations with friends as a child. Another aspect was visiting the site frequently. For one interviewee [I2], this even led to a feeling of owning nature and being part of it. He appreciated this feeling, especially when he felt like the rest of his life did not go very well. Another interviewee [I5] mentioned that the urban wilderness site was his personal space that he would not share with friends but visit alone.

The personal relationship with the site could also be connected to the industrial past of the Ruhr area. One interviewee [I6] mentioned being proud of the Ruhr having green spaces despite its reputation of being black. For another interviewee [I3], the site was strongly connected to his family's past. When visiting the site, he reflected more deeply on the contrasting relationship between himself and his father with the site. He had a positive relationship with the site as he used it for recreation. On the other hand, his father had a more difficult relationship with the site as it had been a place where he would have to work very hard in the coal industry. According to the interviewee, this also created conflicting feelings when being on the site:

> "Emotionally it is the working world of my parents, my grandparents. […] My father was injured several times at this coal mine to the point that he had to go to the hospital, that he lost 2 fingertips. […] I'm in a place that wasn't necessarily such a nice place for him. Where he had to work, I am now a guest."

The interviewees also mentioned other aspects where the site's industrial past influenced their experience. Many interviewees saw it as something positive, appreciating the mixture between wild nature and remnant infrastructure of industrial production. One example of a particularly attractive element is an artificial hill called Himmelsleiter built on site Rheinelbe with an art installation. One person [I13] even mentioned it as one of the main reasons to visit the site daily, with walking up the stairs being an integral part when walking his dog. However, not everyone appreciated the industrial elements. Some interviewees perceived the industrial remnants to be out of place in nature, ugly or dangerous if not appropriately secured, with the example of children climbing onto Zechengebäude Alma. For other interviewees, the site's industrial past was connected to their own growing up in the area. For instance, observing the detrimental effects of industrial activities in the area on human health made them realize how essential nature is.

The site's value for the interviewees was not only connected to what it provided but also to the absence of aspects that would be present elsewhere. One of the aspects that the interviewees appreciated most when being on an urban wilderness site was that fewer people were there. This effect seemed specific for urban wilderness sites as it was mentioned more often as a contrast to parks. Urban wilderness sites were visited by fewer people, giving a feeling of openness and the possibility to enjoy the quietness of the area. As described by one interviewee [I12]:

> "In fact, there are sometimes even more people than here making everything more crowded. It makes it feel more oppressive. Here it's just so much more open, you can breathe more easily."

Another interviewee [I15] reflected that the calm energy of the site could also be due to the forest filtering noise from cars and other sources. This allowed people to enjoy a break from their life in the city.

1.3.2. Negative aspects of urban wilderness sites

There were also some aspects that people disliked about the wilderness sites. One nuisance that two interviewees [I4; I6] experienced was an allergic reaction to pollens in spring.

However, they also experienced this when visiting other types of nature, and it did not refrain them from visiting the site. Most aspects that the interviewees experienced as unfavorable were related to human factors. Something mentioned by almost every interviewee was the irritation of seeing trash left behind by other people, which occurred very frequently. On site Alma this even had negative consequences where one area with vulnerable flora had to be fenced off. Especially dog owners emphasized the adverse effects of the trash for their personal experience on the site. One interviewee [I17] was concerned about her dog eating trash, and another one [I8] mentioned that she had to be cautious of poisonous baits being laid out for dogs.

Relating to the interviewee's idea of what nature is supposed to look like, their perception of the wild nature of the sites could also be negative. One interviewee [I8] commented on the dominance of birch trees and that she would appreciate different species of trees being planted. Another interviewee [I16] criticized the dead trees not being taken away on site Rheinelbe as he perceived it as detrimental to nature. He described it as:

> "The woods there are all broken but that does not belong in the forest. The ones that are broken should be cleared away as soon as possible and replanted."

Another person [I8] had even stronger opinions about site Alma, not considering it as real nature but labeling it as shabby. In general, she strongly disliked site Alma, only frequenting it because she had to walk her dog in the vicinity of her home. She described the overall atmosphere of the site as antisocial, with people selling or taking drugs. According to her, this made other women afraid to visit the site alone. She also complained about the forester only taking care of specific parts of the nature while neglecting the needs of people visiting the site. This contrasted strongly with the views of other interviewees visiting site Alma who did not mention being bothered by these aspects.

1.3.3. Difference with other UGS

The difference between the interviewees' experience on the urban wilderness sites and other UGS was related to their appreciation or rejection of the wild character of the site. Some interviewees could not comment on how they experienced other UGS as they found them a little appealing and hence, would hardly visit them. Others who visited other UGS perceived them as artificial, even as sterile, and would not consider them real nature. However, not everyone made this distinction, and several interviewees said that they felt both urban wilderness sites and other UGS were real nature. One difference mentioned more often was the perceived more substantial influence of the surrounding city in other UGS. According to several interviewees, other UGS would attract more people, especially children and groups of people. This resulted in more noise which hindered some interviewees from relaxing. As one interviewee [I15] put it:

> "A park still feels like the city. You constantly have the view of buildings. [...] The dog doesn't enjoy it and I don't enjoy it. You constantly have some kind of stimuli in your eye."

Consequently, interviewees would find it more challenging to relax and focus on themselves, which many appreciated doing on urban wilderness sites.

While the perception of urban wilderness and other UGS differed, many interviewees said they did not experience different feelings. One person [I16] noted that it was not about feeling differently but having different possibilities on urban wilderness sites. He preferred the urban wilderness site because the diverse nature would allow him to engage in a wider variety of activities. Some interviewees also commented on the heterogeneity of nature in urban wilderness sites to invite them to be more curious and mindful as they perceived other UGS as more boring and less beautiful. Some aspects were the same in both areas, such as enjoying spring and experiencing trash being left behind as disturbing. Hence, among my interviewees, urban wilderness sites were appreciated equally or preferred over other UGS.

1.4. Effects of interaction with urban wilderness on CWN

In the following section, I present the results on the influence of urban wilderness on CWN. To do so, I first describe the interviewees' current level of CWN, its origin and changes in CWN over their lifetime. Then, I elaborate on how urban wilderness had influenced the interviewees' relationship with nature.

1.4.1. Connectedness with nature

The interviewees showed very high levels of CWN, as 17 out of 18 said they felt strongly connected with nature. CWN was measured by asking the interviewees about the three aspects of the NR-scale: their perspectives on nature, their experiences in it, and how nature relates to their identity. Hence, in the following section, I will describe the interviewees' CWN by elaborating on these three aspects. However, first I will reflect on the interviewees' understanding of the concept of CWN.

The interviewees appeared to have a good individual understanding of the concept of CWN. However, there were indications that they interpreted it differently depending on how they experienced their CWN. Many interviewees described an emotional affinity toward nature and recognizing the human responsibility for caring for it. For one interviewee [I11], it translated into recognizing that humans are animals and that feeling connected with nature meant expressing natural instincts and curiosity. She described it as:

> "I believe that humans are somehow also animals. I think we should feel our way into this more often and express our natural instincts more. […] It depends on how you define nature. Actually, everything is nature."

This quote shows her understanding of the inherent belonging of humans to the natural world. Another interviewee [I12] interpreted CWN as a need to interact with nature to live happily and healthily.

The interviewees' perspective on nature was frequently related to their concerns about the state of nature and humanity's role in it. An often mentioned aspect was that humans should be respectful toward nature, which included taking care of it by living environmentally friendly. As one interviewee [I4] noted:

> "We can't blame nature as it takes its own course. All I can really say is that we have to take care that nothing happens to nature."

Another interviewee [I5] advocated for a new way of thinking about how humans engage with nature and the consequences of our actions. According to him, there should be enough motivation for treating nature well as it ensures human survival on planet earth. Among the dog owners I interviewed, a repeatedly raised concern was the human treatment of animals. One interviewee [10] emphasized that pets in particular should be treated well because of their dependence on humans.

The interviewees expressed their level of CWN in various ways. Some interviewees would take up personal actions such as buying more sustainable products, not leaving behind trash, or having solar panels on the roof. One interviewee [I3] stated that with his actions, he wanted to contribute to a peaceful coexistence between humans and nature despite knowing that one person alone would not solve the environmental crisis. His motivation was to conserve nature for his children and grandchildren and destroy as little as possible during his lifetime. For others, going into nature was essential for expressing and feeling their CWN. For instance, several interviewees mentioned that they felt a strong attraction to interact with nature. Others said that they would only feel connected when being in nature.

Regarding the interviewees' experiences in nature, I noticed that many interviewees especially appreciated the stimulation of their senses in nature and the attentiveness to experience its different elements. For instance, an important aspect was to experience the physical factors of nature, such as the seasons, wind and weather, sunsets, and smelling the forest after rain. This heightened awareness of the surroundings helped one interviewee [I11] to perceive the beauty and diversity of nature:

> "But also, versatile. I find nature simply beautiful [...] And if you are mindful, then you also notice what differences there are."

This notion of being mindful and attentive also came up in another interview. The person [I17] mentioned that she would sometimes just sit in nature and listen attentively to birds singing. Another interviewee [I2] would go into nature as a place to seek solitariness while emphasizing that he would not feel lonely. Overall, many interviewees were seeking nature for its calming energy to relax, recharge, and let go of thoughts.

Finally, when asked about how nature related to themselves, interviewees answered that they generally experienced nature as a part of their identity. They emphasized it by expressing their love for it and feeling at home when being in nature. Several interviewees also reflected on the role of nature for humanity overall. While one person [I9] labeled it as mother earth, another person [I1] phrased it as: "We came into being in nature, we belong to it.". Another frequently contemplated aspect was the interviewees' relationship with cities. Interestingly, several interviewees expressed their belonging to nature by identifying as nature people and preferring nature over cities despite living in the urban environment. Other interviewees equally liked the urban and natural environment but felt a bond with nature. Finally, one interviewee [I4] felt connected to nature but did not consider it an essential part of his identity. Hence, not all interviewees expressed their feeling of CWN in nature being an important part of their identity.

Origin of CWN

All but one interviewee feeling connected to nature placed the origin of this connectedness in their childhood. Many of the interviewees grew up in the countryside and only later moved to the city. In their childhood, they would constantly be outside and play in nature. For some people, this was connected to a feeling of freedom as they could explore nature with friends without being supervised by their parents. One interviewee [I12] also commented on the absence of people:

> "We partially felt like the whole forest was ours because there was hardly a person there."

However, this was not only the case for the interviewees who were originally from the countryside. The interviewees growing up in cities also had memorable nature experiences in their childhood. A vital contribution was vacations spent in nature outside cities where the family would go regularly. Several interviewees said that these vacation places felt like home. Another critical factor was spending their free time in nature, which could also be in UGS within the city. For instance, one interviewee [I3] would even spend his vacations there as his parents did not have money to go on holidays. This specific person also felt like his CWN partially originated from experiencing the environmental pollution in the Ruhr caused by industrial coal and steel production. Causing residents' health problems, including his father, made the importance of conserving nature evident to him.

However, not all people could pinpoint their CWN to specific experiences. For instance, one person [I7] would describe it as a feeling that had always been there. He speculated that it might originate from his genes or religion. Finally, family values can also be influential, as several interviewees mentioned that maintaining a relationship with nature was essential to their families.

Change in CWN

Many interviewees did not experience CWN as a static personal trait but as changing over their lifetime. A common reason for feeling more disconnected from nature was when people would move away from the countryside to a city. As the distance to nature was larger, it was more difficult to access nature; hence, for several interviewees, nature felt further away from their reality of life. One person [I12] also mentioned shifting priorities when she moved to the city where she would spend more time with friends. She only started seeking out nature again when she became pregnant.

Overall, I observed that many interviewees experienced an increase in CWN over their lifetime. Several interviewees would attribute this to them becoming more aware and developing reason. For instance, one interviewee [I15] commented on him only becoming aware that his actions had consequences when he got older. Another interviewee [I7] noted that as a child, he used to disrespect nature but, over time started to develop an understanding of the importance of nature. For some interviewees, however, CWN did not change much over their lifetime, but their use of natural spaces did. While as a child, it was mainly a place of curiosity and exploration, as an adult, it became a place for relaxation. Finally, several dog owners attributed their increase in CWN to getting a dog, forcing them to spend more time in nature.

1.4.2. Contribution of urban wilderness site to CWN

When asked about how their interaction with the urban wilderness space had contributed to their CWN, most interviewees said that it had only slightly influenced their CWN formation. However, while the effect on building up CWN was limited, it did affect their relationship with nature. Providing a place to connect with nature, it contributes to an increase in CWN or at least fulfills the need to feel connected with nature. One of the interviewees [I] formulated it as:

> "Before that I thought to myself, I can't live here for long, I have to leave. And now it works after all because I've finally discovered a bit of nature. And that definitely makes it more worth living."

With this quote, the interviewee expresses her need to connect with nature in the proximity of her home. For the interviewees that grew up in the vicinity of the urban wilderness site, it had been an important contact with nature during childhood. According to these interviewees, it was their childhood interactions with nature that contributed to their development of CWN.

This was not only the case for childhood interactions with urban wilderness but also during adulthood. One person [I5] indicated that his interaction with the urban wilderness site had been pivotal for forming his CWN as an adult. He was the only person that did not feel connected as a child but developed it when he got older, partially due to his daily interactions with the urban wilderness site. Another interviewee [I15] realized the importance of his relationship to nature only when he moved to the city. In the countryside, where he grew up, nature was abundant, making its value less obvious. Living in a city, the lack of nature made him seek it out intentionally. He phrased it as follows:

> "That wouldn't have been so clear to me before because you don't know what you have until you no longer have it. I appreciate it [nature] more now. [...] It's not so much the area itself, but that it's not this area around it."

This quote relates to the experienced contrast between the site and the surrounding urban environment, which made the value of the nature on the site more evident. He was very thankful for the urban wilderness site, where in contrast to other UGS, he could connect to the nature on the site.

Several aspects of the interviewees' interaction with the urban wilderness site contributed to forming connections with nature on the site. One of the aspects was the interviewees' feelings when being on the site. For instance, feeling happy or being able to relax from their daily lives and letting go of stress. One interviewee [I15] mentioned that he felt especially connected in moments when he would be mindful of his surroundings, such as attentively listening to birds. However, the site's properties could also influence the interviewees' CWN. One interviewee [I10] mentioned that she felt especially connected to nature when walking on the smaller informal paths instead of the broad gravel paths. She contributed this to them being more interesting as they did not go straight and that, for example, she would have to climb over a fallen tree. For some interviewees, their connection came from their preference for wild nature, which enabled them to bond strongly with urban wilderness. Finally, the positive contribution toward CWN could also come from artificial elements. For instance, one

person mentioned that he was attracted to Rheinelbe by the Himmelsleiter, which contributed to him forming a connection to the nature on the site.

Something touched upon more frequently was the interviewees' contrasting connection with nature in other UGS. Many interviewees found it easier to connect with nature in urban wilderness sites; some even said they did not feel connected to other UGS at all. One reason was that the surrounding city strongly influenced other UGS, preventing them from experiencing nature more deeply. The surroundings also influenced one person's [I12] connection to subparts of nature, as she mentioned that she would feel less connected to a tree in a park than on the urban wilderness site. Another interviewee [I18] said she felt connected to the old trees in the park close to her home but had a stronger overall connection to the urban wilderness site. She mainly attributed it to the interesting character of the forest, as its diversity would invite her to explore her curiosity. Others did not connect differently to other UGS than to urban wilderness, considering both as real nature and equally important. One person [I8] even said that her daily visits to the urban wilderness site only contributed to her CWN by creating a longing for real nature.

When asked what they would need to form a stronger connection with nature in the urban wilderness site, most interviewees did not have any desire for change. One interviewee [I18] even explicitly said that nothing should be changed as the forest changed by itself, which is what attracted her so much. However, one frequently mentioned aspect was that trash should be removed or more bins should be provided for throwing away trash. One interviewee [I15] expressed the wish for the area to be larger as he had explored it very well in the four years he had lived in the vicinity. Finally, one interviewee [I16] would wish for more infrastructure for children to play more frequently in the forest. He reasoned that children would not want to go for walks; hence, they would need incentives to engage with nature in the urban wilderness site.

Opinions of the interviewees from the organizations

In the interviews with the organizations, I also asked how interacting with urban wilderness influences urban residents' CWN. Most interviewees agreed that it positively impacted children's relationship with nature. For many children, it is the only time they interact with nature as their parents don't go into nature with them. However, according to the interviewees, the influence on the adult's relationship with nature is more complicated. Two interviewees [O2;O4] think that it has the potential to influence adults' CWN positively but that it is not easy to determine the exact impact. One issue is that it is more challenging to reach adults as it is possible to address children through school because it is mandatory. One interviewee [O5] emphasizes that it is more difficult to influence people when they get older because their CWN is already formed by their life experiences. This was confirmed by the interviews with urban residents, where the interviewees emphasized the importance of their childhood experiences with nature.

The interviewees from the organizations also discussed the role of aesthetics in urban residents' relationship with urban wilderness. According to several interviewees, providing information explaining why nature is not managed is crucial. This is because nature in the form of urban wilderness looks more disordered and hence can be perceived as neglected and ugly. Therefore, one interviewee [O3] proposes managing the area a bit to adapt it to

people's aesthetic preferences. Furthermore, he speculates that European people are afraid of the forest. Hence, a well-managed park is emotionally easier to accept. Interestingly, these aspects did not come up during the interviews with the urban residents, which might be due to the sample of interviewees that felt strongly connected to nature. Furthermore, one interviewee [O1] emphasized that the Ruhr area is a special case. He noted that industrial brownfields are part of the identity of the Ruhr area and hence, are accepted and perceived as beautiful.

5. Discussion

The goal of this study was to answer the main research question, "*How does exposure to urban wilderness influence the CWN of urban residents?"*. Having been guided in my research by four specific research questions, this chapter will focus on answering and discussing the main research question. In the discussion, I summarize the findings from my research, put them into the context of broader literature, reflect on the societal relevance and my research methods and end with implications for future studies.

1.1. Summary of the results

Determining whether the case study classified as urban wilderness was challenging as the concept is little applied in policy documents for the Ruhr area. However, there are several indications that the nature of the investigated sites can be considered wilderness. On the one hand, it falls within the broader definitions of wilderness in the documents, such as wild areas. On the other hand, the case study is a type of industrial nature listed among the sites potentially developing into urban wilderness. Finally, the case study is part of the project "Industrial forests," described as wilderness in two documents.

Interacting with urban wilderness influenced the interviewees' CWN mainly positively. Overall, the interviewed urban wilderness visitors felt strongly connected with nature. Their high level of CWN enabled the interviewees to establish a connection with nature when visiting the urban wilderness site. This momentary connection with nature then contributed to sustaining or even increasing the more stable sense of CWN. This experience proved especially valuable in the urban environment, where their sense of CWN was less present and experienceable in daily life. It also contributed to building up the CWN of the interviewees growing up in the vicinity of the urban wilderness site. For most interviewees, however, their interaction with urban wilderness was not experienced as the origin of their CWN. Most of them attributed their high CWN to their childhood experiences in non-urban areas. One exception was one interviewee who did not develop a feeling of CWN as a child. Building up CWN during adulthood, he experienced his daily interaction with urban wilderness to have contributed substantially to this.

There were various aspects that, according to the interviewees, contributed to a positive experience of wilderness on the site and fostered their CWN. Contrary to my expectations, the type of activity had little influence on the experience itself but would act as a motivation to visit the site. For instance, it was more attractive for dog owners to visit urban wilderness than other UGS, as keeping dogs on a leash was not mandatory. A prevailing experience was the restorative effect due to the contrast of the site to the urban environment. Many interviewees appreciated strongly that the urban wilderness site provided less sensory stimuli such as fewer people, less noise, and seeing fewer buildings. Experiencing it as a break from their daily lives in the city enabled them to relax and recharge. Being less distracted by other stimuli, they could focus more strongly on nature in urban wilderness and build a connection with nature. This was also a reason for the interviewees to prefer the urban wilderness site over other UGS. They found it harder to connect to nature on other UGS as they experienced the urban environment to have a more substantial influence. The interviewees attributed it to the higher amount of people present, better visibility of buildings, and higher level of noise such as from cars.

Another frequently mentioned positive experience on the urban wilderness site was experiencing positive feelings. Being on the site made the interviewees happy, which made them attribute feeling more positively to spending time in nature. As a result, this created a connection with nature. Finally, many interviewees enjoyed experiencing the sensory aspects of nature. Given the time of the year, many interviewees mentioned temporal changes related to spring, such as the emerging vegetation and hearing birds singing. This experience created curiosity and amazement, which invited them to engage with nature more closely and connect with it.

1.2. Research implications

In the following section, I relate my findings to the context of broader literature. First, I discuss the influence of interacting with urban wilderness on CWN and connect it to the importance of contact with nature during childhood and adulthood. Next, I discuss the motivations to engage with urban wilderness frequently. Finally, I discuss the specific pathways of how interacting with urban wilderness can positively influence CWN.

Influence of interaction with urban wilderness on CWN/Origin of CWN

My research showed that urban wilderness positively affected the interviewees' CWN as they could build up a momentary connection with nature when being on the urban wilderness site. By maintaining and strengthening the person's current level of CWN, this momentary sense of CWN translates into a more stable trait of CWN. An essential factor for positively influencing CWN seems to be the frequency of visiting nature. Studies have found that visiting nature daily is positively correlated with the level of CWN (Colléony et al., 2017; Sato, Aoshima, & Chang, 2021), and interventions that encourage people to spend more time in nature increase CWN (Richardson, Cormack, McRobert, & Underhill, 2016; Thompson et al., 2019). In my study, most interviewees visited the urban wilderness sites very frequently, between daily and several times per week. CWN can change over a lifetime (Colléony et al., 2017), hence, continuously fostering CWN might be relevant for ensuring a high level of CWN throughout life.

In my study, the positive influence of engaging with urban wilderness built upon an already existing strong bond to nature formed during childhood. For 17 of the 19 interviewees, childhood interaction with nature was pivotal for developing a sense of CWN. This is confirmed by other research that emphasizes the lasting influence of childhood contact with nature on the adult relationship with the natural world (Colléony et al., 2017; Sato et al., 2021; Soga et al., 2016). Many interviewees did not grow up in the vicinity of the urban wilderness site and mentioned that they developed CWN by spending time in nature outside urban areas. However, developing CWN as a child can also be caused or supported by contact with urban wilderness. Some of the interviewees grew up close to the urban wilderness site, and according to them, their interaction with the site had a significant role in developing their CWN as children. Some studies emphasize that the focus should lie on fostering childhood interaction with nature, as it appears to have a stronger influence on the lifelong level of CWN than spending time in nature as an adult (Colléony et al., 2017; Sato et al., 2021). I visualized the relationship between interacting with nature during childhood and adulthood and its effects on CWN in Figure 4.

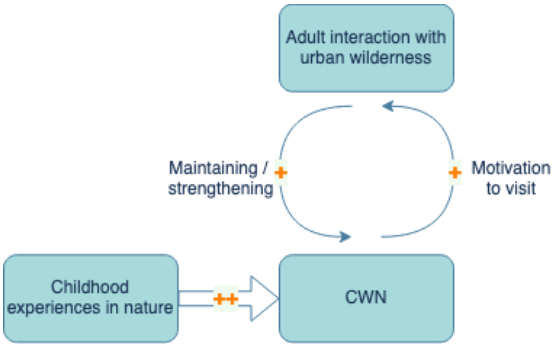

Figure 4: *Influence of childhood and adulthood contact with nature on CWN.*

Nevertheless, Cleary et al. (2020) advocate for fostering interactions with nature during all life stages as humans can form relationships with nature throughout life (Cleary et al., 2018). Rosa et al. (2018) found only an indirect effect of childhood contact with nature on adult CWN. Most importantly, childhood contact with nature motivates people to continue interacting with nature as an adult, which strengthens their CWN (Rosa et al., 2018). This is in line with the findings of my study, as I found that people who spent much time in nature in their childhood felt a strong desire to continue visiting nature as adults. However, connecting with nature as an adult does not necessarily require an already existing bond with nature during childhood. One of the interviewees did not develop a relationship with nature as a child but only when growing older. According to the interviewee, his interaction with urban wilderness was essential for developing this sense of CWN during adulthood. His motivation to interact with the urban wilderness site was to improve his health by spending time outside and doing sports. This contrasted with his job, where he mainly worked on the computer. Hence, for people lacking this strong childhood relationship with nature, it might be important to provide incentives to interact with nature frequently.

Motivation to engage with urban wilderness

When zooming in more closely on the relationship between interacting with urban wilderness and CWN, I found several aspects to be important, as depicted in Figure 5. Next to the pathways of how interacting with urban wilderness influences CWN, my research also provided insight into the motivation to visit urban wilderness sites. Even though this was not the focus of my research, I decided to include it in Figure 5, as it determines people's willingness to visit nature frequently and, therefore, indirectly predicts CWN. In my study, I found that four aspects of the site have an influence on the likelihood of people visiting it regularly. The aspects are topography, grey infrastructure, buffering influences from the urban environment, and proximity to their residency. The site topography depicts factors such as hills, the size of the site, or the diversity of natural elements. Grey infrastructure represents human elements such as art installations or mountain bike paths. The buffering of influences from the urban environment describes influences from the surrounding city being lower on the urban wilderness site. For instance, the interviewees mentioned that they experienced lower noise levels such as from cars, fewer people on the site, and the buildings from the surrounding city were less visible. Finally, the proximity to residency refers to the distance between the urban wilderness site and the interviewees' homes.

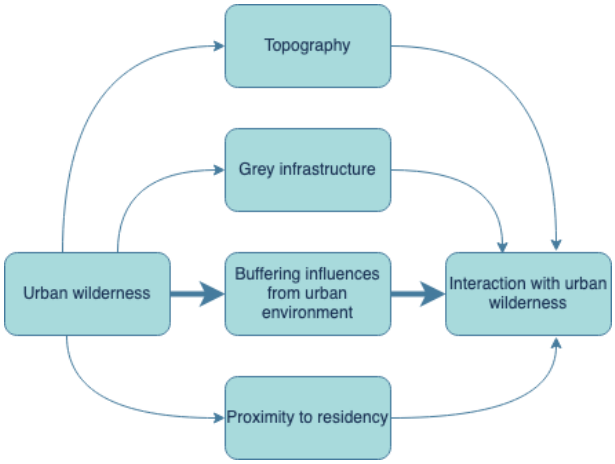

Figure 5: *The different motivations for urban residents to interact with urban wilderness are displayed. Important characteristics of the site topography, grey infrastructure, the buffering of external influences from the urban environment, and proximity to residency. The arrow to and from 'buffering influences from urban environment' is bold as I found this factor to be most important for the motivation of urban residents to visit the site.*

For the goal of this research, it is essential to reflect on my hypothesis that the wild forms of urban nature influence CWN more strongly than other types of UGS. The most important motivation for urban residents to visit urban wilderness was the buffering of external influences from the urban environment. This might be explained by the fact that it appears to be essential to get fully immersed in the natural environment for an interaction with nature to positively impact CWN (Wyles et al., 2019). In fact, nature in cities is often experienced less intense with sensations being more subdued due to the high load of external stimuli from the city (Duvernoy & Gambino, 2021). Experiencing nature in cities, especially the natural cycle of the seasons is often less intense compared to nature outside the city (Duvernoy & Gambino, 2021). Consequently, people associate nature more strongly with non-urban areas (Duvernoy & Gambino, 2021).

However, when being on the urban wilderness site, the interviewees mentioned that it did not feel like still being in the city. The influence of the surrounding urban environment was less perceptible on the urban wilderness sites. Hence, it was easier to get fully immersed in nature and experience nature more intensely. According to the interviewees, urban wilderness fulfilled this function better than other UGS. When being in other UGS, there were many external stimuli such as large groups of people, seeing buildings, or hearing cars. Consequently, the interviewees found it more challenging to focus on nature and their experiences in nature. This was also mentioned as a key motivation to visit urban wilderness instead of other UGS as it resembled contact with nature outside urban areas.

Topography and grey infrastructure were important for some interviewees depending on their activity on the site, such as climbing the slopes or visiting landmark Himmelstreppe. Proximity to residency is less specific for urban wilderness but essential for the probability of urban residents visiting any type of UGS. This complies with literature that determined orientation toward nature to be more important for urban residents to visit a park than the availability and proximity of UGS (Colléony et al., 2017). Nevertheless proximity to residency is likely to have an influence as well, as Schipperijn et al. (2010) found a significant correlation between the use of UGS and distance (Schipperijn et al., 2010).

The willingness of individuals to visit nature frequently is an important aspect for strengthening CWN (Soga et al., 2016). In my study, the interviewees showed that they consciously chose to visit these spaces. Hence, the mere presence of the site was enough to facilitate an increased contact with nature. However, this is not the case for all urban residents, as research has shown that the availability of UGS alone is not enough, but it requires an active decision to engage with these spaces (Martin et al., 2020; Rosa et al., 2018; Soga et al., 2016). As my sample already felt strongly connected with nature, it would be interesting to find out how to address urban residents that lack this positive orientation toward nature. I recommend future studies to investigate incentives to visit UGS more frequently for urban residents with lower CWN. This research could then also determine whether this lack of CWN determines the positive orientation toward a specific type of UGS, hence distinguishing between urban wilderness and other types of UGS.

Pathways from interacting with urban wilderness to CWN

Investigating how interacting with urban wilderness can benefit CWN, the interviewees mentioned three factors most frequently influencing their relationship with nature, as shown in Figure 6. These were: affective effects, restorative effects, and sensory experiences. Affective effects describe positive influences on the interviewees' emotions with them experiencing positive feelings such as happiness and joy. Restorative effects represent people's ability to relax and release stress and negative feelings. Sensory experiences describe experiences that were connected to a close interaction with nature, such as observing wildlife, the growth of vegetation, or listening to birds singing. While the first two factors refer to influences on the interviewees' emotional state during or after the visit, the third factor refers to an experience during the actual interaction with urban wilderness. These aspects did not emerge in the interviews when the urban residents described their interaction with other UGS. Hence, they are likely to be specific about the interviewees' interaction with urban wilderness.

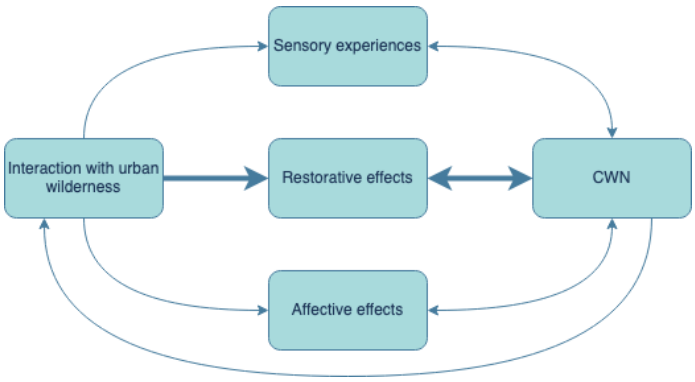

Figure 6: *The relationship between interacting with urban wilderness and CWN is depicted. Three pathways are proposed that mediate this relationship: sensory experiences, restorative effects, and affective effects. The relationship between the variables is also bi-directional. The arrow to and from 'restorative effects' is bold as I found it to be the most important factor in influencing urban residents' CWN.*

When reflecting on the relationship between the interaction with nature and CWN, it is helpful to look at the framework by Lumber et al. (2017) that I already introduced in the theoretical framework section. They found that interacting with nature should activate the senses, emotion, beauty, meaning, and compassion to positively impact CWN (Lumber et al.,

2017). Relating it to my interviews, the three aspects of affective effects, restorative effects, and sensory experiences could correspond to several pathways from the framework by Lumber et al. (2017). While affective effects are related to emotion, sensory experiences could work by activating the senses and beauty. Finally, restorative effects are more difficult to allocate to a specific pathway in the framework. Furthermore, they might stimulate all five pathways more subtly, such as making people compassionate when having sensory experiences or exploring meaning when experiencing the restorative effects.

One characteristic of the urban wilderness site that might contribute to fostering CWN through sensory experiences is habitat diversity and the site's heterogeneous topography. A key experience of the interviewees was to encounter wildlife which the diversity of habitat might foster as this attracts more wildlife than on other UGS. Moreover, as expressed by one interviewee, she found the nature of the urban wilderness site fascinating as it was constantly changing. According to her, there was always something new to discover, which was a reason for her to visit the site frequently, also in contrast to other UGS in proximity to her home.

Mindfulness might be another factor in the extent to which sensory experiences influence CWN. In a meta-study, Schutte and Malouff (2018) found mindfulness to be a pathway to CWN. Being aware of the present moment in a non-judgmental way enables humans to interact with nature more fully which influences CWN positively. This relationship is bi-directional as more connected individuals are also more mindful when being in nature (Schutte & Malouff, 2018). In my interviews, a sense of mindfulness was evident when the interviewees talked about their sensory experiences in urban wilderness. For instance, one interviewee mentioned just standing still and listening attentively to birds singing which required him to be present in the moment.

This is also confirmed in a recent study by Richardson et al. (2022), where the authors found that to achieve a positive effect on CWN, it is important to notice nature actively instead of merely being exposed to it. Feeling more connected to nature can also stimulate the person to be more mindful of nature and consequently notices it more actively. As the interviewees in my research felt highly connected and were mindful about noticing nature, I depict the relationship between sensory experiences and CWN as bi-directional in Figure 6. Finally, Schutte and Malouff (2018) also found that being more mindful can positively influence the extent to which interacting with nature restores the attention capability. However, this was not mentioned by the interviewees in my research.

Exploring the ‘restorative effects’ as a potential pathway to CWN, it might be useful to look at the “Attention Restoration Theory” by Kaplan (1995). This theory states that interacting with nature can restore human attention capacity. The key aspects are a feeling of being away, fascination, experiencing the extent of nature, and feeling compatibility with the environment (Kaplan, 1995). This has been supported by various studies showing the positive impact of interacting with nature on the attentional recovery of humans (Ratcliffe, Gatersleben, & Sowden, 2013; Wyles et al., 2019). CWN has been proposed as the mediating variable for this positive impact on human well-being (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2008). Research has also shown that individuals feel more connected with nature in more restorative environments, with several studies indicating a linkage between the two variables (Wyles et al., 2019). Consequently, the relationship between restorative effects and CWN is depicted as mutual in Figure 6.

The type of ecosystem also has an important effect on the restorative potential of ecosystems. Colléony et al. (2017) found that forests are particularly restorative, especially in comparison with urban areas. Wyles et al. (2019) showed that urban nature with designated status had greater restorative benefits than visiting urban nature without such a status. The official designated status was assigned to nature areas that were associated with higher scientific, ecological, or aesthetic value (Wyles et al., 2019). Relating these findings to my research, the urban wilderness sites that I investigated were forests, and studies had found high levels of biodiversity (Gausmann, 2012; Weiss et al., 2005), reflecting a high ecological value of the areas. This might partially explain why the interviewees felt more restored after visiting the urban wilderness sites. As the interviewees mentioned feeling less restored after visiting other UGS, I assume the restorative potential is higher for the urban wilderness sites I investigated.

The affective effects from interacting with nature and its positive influence on CWN have also been observed in other studies. In a study by Nisbet and Zelenski (2011), the authors found happiness to be a mediating variable between contact with nature and CWN. Comparing it to walking indoors, walking in nature made respondents happier, facilitating a sense of CWN (Nisbet & Zelenski, 2011). They investigated the effect for nearby nature, a walking path along a Canal in the urban environment. While I did not find affective effects from interacting with other UGS in the interviewees, it might not be specific to urban wilderness. However, the authors did not distinguish between different types of urban nature hence, the intensity of the affective effects might be higher for urban wilderness than for other UGS. Happiness and CWN also seem to have a mutual impact on each other. In a meta-study, Capaldi et al. (2014) focused on the effect of CWN on happiness and found that more connected individuals felt happier. Feeling connected to nature makes people experience good feelings when being in nature, such as an emotional affinity toward it (Soga et al., 2016). In my research, it was difficult to determine whether the emotional well-being of the interviewees was fostered by their CWN or solely by their interaction with urban wilderness. Hence, I assume the relationship between affective effects and CWN to be bi-directional, as depicted in Figure 6.

Finally, my study mentioned an individual's need to interact with nature as a driver to seek contact with nature. This is in line with Capaldi et al. (2014), showing that the strength of CWN correlates with the frequency of nature visits. It is also interesting to discuss the findings from the study by Colléony et al. (2017). The authors found that people with a stronger CWN preferred forests while people with lower CWN would visit parks instead. Hence, the forest might also serve as a place to access this feeling of CWN. Relating it to my case study, it might explain the positive impact on CWN to a certain extent. As both urban wilderness sites that I investigated were forests, the interviewees' high level of CWN might have served as a motivation to visit these spaces. Consequently, in Figure 6, I display CWN also to influence the interaction with urban wilderness. Nevertheless, it might be interesting to investigate other types or succession stages of urban wilderness as this might result in different findings.

Interestingly, contrary to my expectations as outlined in the theoretical framework section, the type of activity did not influence the experience on the site. This might be due to the type of activities carried out by the interviewees. The most frequent activity among the interviewees was walking with or without a dog. This corresponds to a Wyles et al.'s (2019) study, where walking was associated with the highest increase in CWN. Other activities mentioned by the interviewees, such as noticing nature, watching wildlife, or listening to birds,

were also positively correlated with the level of CWN (Richardson, Hamlin, Butler, Thomas, & Hunt, 2022). However, other activities mentioned by the interviewees, such as exercise or visiting an attraction, were listed as having less influence on CWN (Wyles et al., 2019). This might be explained by the low number of interviewees carrying out these activities. As only a few interviewees mentioned activities such as exercising or visiting an attraction, they might not have noticed that it influences their CWN differently.

Combining the findings from Figures 5 and 6, following Figure 7 gives an overview of the overall relationship between urban wilderness and CWN.

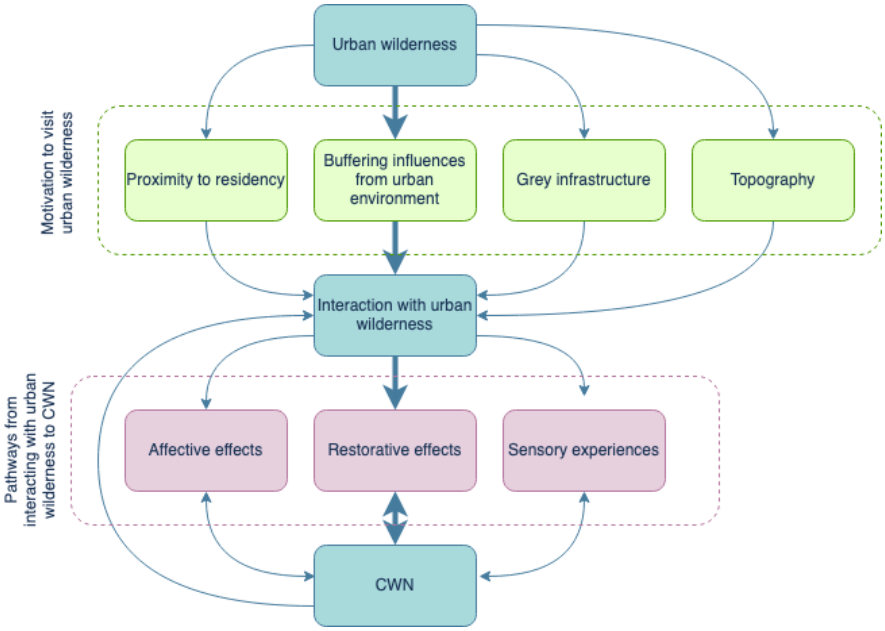

Figure 7: *Relationship between urban wilderness and CWN is displayed. Four different factors influence the motivation to interact with urban wilderness. Three aspects influence the extent to which interacting with urban wilderness influences CWN.*

1.3. Societal and policy relevance

With high urbanization rates in many places of the world (Kowarik, 2011), it is essential to understand how people relate to and interact with nature in urbanized regions. Studies have shown the seriousness of the extinction of experiences, where humans cease to interact with the natural world (Soga et al., 2016). This can lead to people failing to recognize the human dependence on the natural world and a lack of care for the fate of the environment (Soga et al., 2016). In this study, I provided insight into how a specific type of urban green space can contribute to strengthening the CWN of people living in the city. This is particularly insightful as urban wilderness is an emerging concept for which few studies have investigated its social value. I found that interacting with urban wilderness contributes to urban residents' well-being and the development of environmental awareness. My findings also suggest that the type of UGS plays an essential role in fostering urban residents' propensity for developing a connection with nature. In my research, interacting with urban wilderness affected CWN more profoundly than other types of UGS. However, this should be confirmed by future studies focusing on comparing different types of UGS on CWN.

On a policy level, I recommend policy actors to focus on providing a diversity of urban green spaces in future management regimes, including urban wilderness. Several scholars have emphasized the importance of all types of natural elements in the city to potentially reconnect humans with nature (Cleary et al., 2020; Restall, Conrad, & Cop, 2021; Soga et al., 2016). Most importantly, different natural elements provide diverse opportunities for urban residents to regularly engage with nature (Restall et al., 2021). Human interventions in urban wilderness should be limited to guaranteeing safety for visitors, such as creating paths, monitoring tree safety, and preventing falling branches on the paths. Interventions should also minimize adverse effects from people visiting the site, such as removing litter. In general, there is a need for expanding and strengthening the network of UGS, which also concerns urban wilderness areas. In many modern cities, a lack of space creates pressure to use UGS for other purposes, such as economic activities (Fischer et al., 2018). To counteract this, the protection of existing urban wilderness areas should be strengthened, and new areas should be established. Measures to alleviate visitor pressure from parts where biodiversity is particularly sensitive can be introduced, but residents should generally be provided access to urban wilderness areas.

Another recommendation is to introduce incentives to visit wild UGS for people that feel less strongly connected to nature. My research has shown that these people are underrepresented among visitors of urban wilderness sites but could benefit enormously from interacting with these spaces. Several studies have investigated how to effectively engage people with nature that lack CWN (Cleary et al., 2018; Leavell et al., 2019; Richardson et al., 2015; Thompson et al., 2019). Hence, implementing such interventions could effectively foster urban residents' interaction with urban and non-urban nature. For example, barefoot walking or using a smartphone app that invites participants to daily notice good things in nature were effective measures to increase CWN (McEwan et al., 2020; Rickard & White, 2021).

1.4. Limitations and direction for future research

Due to the explorative character of this study, I chose semi-structured interviews as the primary data collection method. It allowed me to reach the necessary interview data depth to answer my research question. The advantage of semi-structured interviews is that it is possible to clarify questions or ask follow-up questions when unexpected aspects are mentioned in the interviews. Furthermore, personal interaction with people makes it possible to accommodate them by creating an accepting and non-judgmental atmosphere where they feel comfortable sharing their opinions freely. However, choosing this method of data collection inevitably comes with certain downsides.

An alternative would have been conducting quantitative research, for instance, a survey. It provides the advantage that the answers are more comparable and can be statistically analyzed. This would have been beneficial for measuring the level of CWN using scales such as Inclusion of Nature in Self (Schultz, 2001), Connectedness to Nature Scale (Mayer & Frantz, 2004), or the Nature Relatedness Scale (Nisbet et al., 2009). However, opportunities for study participants to reflect on their interactions with nature would have been missed. Conducting a survey would be the next logical step to quantifying the influence of interacting with urban wilderness on the CWN of urban residents. Building upon the findings from this research, it

would be interesting to incorporate the three factors that strengthen CWN, namely affective effects, restorative effects, and sensory experiences, in a survey.

Another advantage of surveys is that there is little influence from the person conducting the research, as respondents can answer the questionnaire without assistance. In semi-structured interviews, on the other side, the interviewer itself can influence the answers given. This is also called the interviewer effect. In my research, I assume my characteristics, such as being female, young, and white, to influence the interviewees depending on their personality and cultural background. As I was the only person doing the interviews, I consider this aspect consistent over time. However, other elements were less constant such as my interviewing skills that might have changed over the course of conducting interviews. This is inevitable as becoming more accustomed to the procedure of asking questions is inherent to the method of interviewing. Furthermore, judging by the richness of the data I obtained during fieldwork, I estimate the interviewer effect not to have been a restricting factor for my research.

Another aspect to consider when reflecting on the methods is the sample of interviewees. Contrary to surveys, doing interviews only allows for selecting a small sample due to time constraints. This can make the sample less representative of the target group. I tried to avoid this by selecting respondents from a broad range of ages and genders and conducting interviews until observing data saturation. The high level of CWN of the interviewees coincides with the German average, as a German study about nature awareness found that 94 % felt an emotional affinity with nature (BMU & BfN, 2019). Nevertheless, caution should be exercised when generalizing based on the results of this study, as more quantitative research should be conducted to validate the findings.

Regarding the sampling process, my approach of targeting potential participants on the urban wilderness site could have inadvertently influenced the selection of participants. Furthermore, my way of addressing people might have been a factor in some people not wanting to talk to me. When addressing people, I tried to emphasize that I was interested in their personal opinion and did not expect a specific answer. However, as it was their free time, they might have felt bothered to be addressed or made assumptions about my research, so they did not want to participate. Another aspect to consider is that I did not talk to urban residents that engaged in less common activities such as mountain biking or paragliding. It was challenging to speak to these people as only a few residents carried out these activities, and they were also less easily approachable because they would move very quickly. However, as I covered the most frequent activities, such as biking and walking, I do not consider it a major weakness of my research.

Another influencing factor might have been the time of fieldwork. I conducted the interviews in March for a period of 10 days. Consequently, several people mentioned spring when discussing their experiences on the site. I suspect the answers could have been different when conducting fieldwork at another time in the year. However, due to time and financial constraints for doing fieldwork, I decided to limit data collection to this short time frame. I do not suspect a negative impact on the data quality. Still, I might not have covered some aspects that would have been relevant to the interviewees' experience in other seasons. Therefore, I recommend future studies to investigate urban residents’ experience of urban wilderness at different times throughout the year, allowing for a comparison of different seasons.

In my interviews, I relied strongly on people's ability to recall past experiences. This might have been a limiting factor for people to accurately determine the influence of past interactions with nature on their current level of CWN. A potential solution for this would be to conduct a repeated measures study to investigate changes in CWN while interacting with urban wilderness. However, conducting research over a more extended period is outside the limits of a master thesis. Another possibility would have been to do an experimental setup where I would subscribe an intervention to interact with urban wilderness in a particular manner. I decided not to do this as I wanted to investigate how people currently interact with urban wilderness and how this interaction influences CWN. For instance, people could be asked to walk through specific nature areas to evaluate the effect on CWN, like in the study by Hoyle et al. (2019). Future studies should compare the effect of walking through urban wilderness, other UGS, and non-urban nature areas on CWN. This is key for validating my research findings that urban wilderness fosters CWN more effectively than other types of UGS.

Finally, some considerations should be given to the language of the research. I conducted the interviews in German and translated the findings from the interview transcripts and documents into English. Despite my best efforts to translate meticulously, it might have impacted my ability to convey the original meaning of the findings in this report. For instance, there was no appropriate translation for some words, while other terms might have slightly different meanings in English. However, overall, I judge its impact to be relatively minor and that it did not substantially lower the quality of my research.

6. Conclusion

This thesis investigated how interacting with urban wilderness influences urban residents' connectedness with nature. Based on the findings from this research and substantiated by broader literature, I conclude that interacting with urban wilderness positively influences CWN. I determined several pathways of how interacting with urban wilderness fosters CWN. Urban wilderness strengthens CWN by allowing urban residents to restore, experience positive emotions, and enjoy sensations caused by interacting with nature. When interacting with other types of UGS, urban residents experienced a lower effect on their feelings, and sensations from interacting with nature were less intense.

Furthermore, urban wilderness allowed the interviewees to take a break from city life while remaining within the city. This is because there were fewer people on the urban wilderness sites while sound and visuals from the city were buffered, such as hearing cars or seeing buildings. The experienced contrast to the surrounding environment and the positive influence on their feelings and deeply experiencing nature motivates them to visit nature frequently. This is important as it provides the necessary contact with nature to strengthen urban residents' CWN.

The findings from this thesis contribute to an understanding of how connectedness with nature can be strengthened in an urban environment. Next to its ecological value shown in other studies, this research provided first indications for urban wilderness also to provide social benefits. Information about the role of different types of UGS in fostering human well-being and environmental awareness can support policymakers in deciding what kind of UGS management regime to implement. This might contribute to counteracting the "extinction of experiences" with nature which is essential for halting the biodiversity crisis. The protection of nature ultimately depends on human care for the state of the environment.

7. References

Annerstedt Van Den Bosch, M., Mudu, P., Uscila, V., Barrdahl, M., Kulinkina, A., Staatsen, B., … Egorov, A. I. (2016). Development of an urban green space indicator and the public health rationale. *Scandinavian Journal of Public Health*, *44*(2), 159–167. https://doi.org/10.1177/1403494815615444

Barbiero, G., & Berto, R. (2021). Biophilia as Evolutionary Adaptation: An Onto- and Phylogenetic Framework for Biophilic Design. *Frontiers in Psychology*, *12*(July). https://doi.org/10.3389/fpsyg.2021.700709

Beery, T., Jönsson, K. I., & Elmberg, J. (2015). From environmental connectedness to sustainable futures: Topophilia and human afiliation with nature. *Sustainability (Switzerland)*, *7*(7), 8837–8854. https://doi.org/10.3390/su7078837

Bele, A., & Chakradeo, U. (2021). Public perception of biodiversity: A literature review of its role in urban green spaces. *Journal of Landscape Ecology*, *14*(2), 1–28. https://doi.org/10.2478/jlecol-2021-0008

Berto, R., Barbiero, G., Barbiero, P., & Senes, G. (2018). An individual's connection to nature can affect perceived restorativeness of natural environments. some observations about biophilia. *Behavioral Sciences*, *8*(3). https://doi.org/10.3390/bs8030034

Bonthoux, S., Brun, M., Di Pietro, F., Greulich, S., & Bouché-Pillon, S. (2014). How can wastelands promote biodiversity in cities? A review. *Landscape and Urban Planning*, *132*, 79–88. https://doi.org/10.1016/j.landurbplan.2014.08.010

Botzat, A., Fischer, L. K., & Kowarik, I. (2016). Unexploited opportunities in understanding liveable and biodiverse cities. A review on urban biodiversity perception and valuation. *Global Environmental Change*, *39*, 220–233. https://doi.org/10.1016/j.gloenvcha.2016.04.008

Buijs, A. E., Elands, B. H. M., & Langers, F. (2009). No wilderness for immigrants: Cultural differences in images of nature and landscape preferences. *Landscape and Urban Planning*, *91*(3), 113–123. https://doi.org/10.1016/j.landurbplan.2008.12.003

Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: A meta-analysis. *Frontiers in Psychology*, *5*, 1–15. https://doi.org/10.3389/fpsyg.2014.00976

Church, S. P. (2018). From street trees to natural areas: retrofitting cities for human connectedness to nature. *Journal of Environmental Planning and Management*, *61*(5–6), 878–903. https://doi.org/10.1080/09640568.2018.1428182

Cleary, A., Fielding, K. S., Murray, Z., & Roiko, A. (2018). Predictors of nature connection among urban residents: Assessing the role of childhood and adult nature experiences. *Environment and Behavior*, 1–32. https://doi.org/10.1177/0013916518811431

Colléony, A., Prévot, A.-C., Saint Jalme, M., & Clayton, S. (2017). What kind of landscape management can counteract the extinction of experience? *Landscape and Urban Planning*, *159*, 23–31. https://doi.org/10.1016/j.landurbplan.2016.11.010

Cronon, W. (1996). The trouble with wilderness: Or, getting to the wrong nature. *Environmental History*, *1*(1), 7–28.

Danford, R. S., Strohbach, M. W., Warren, P. S., & Ryan, R. L. (2018). Active greening or rewilding the city: How does the intention behind small pockets of urban green affect use? *Urban Forestry and Urban Greening*, *29*(2017), 377–383. https://doi.org/10.1016/j.ufug.2017.11.014

Dirzo, R., Ceballos, G., & Ehrlich, P. R. (2022). Circling the drain: the extinction crisis and the

future of humanity. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *377*(1857). https://doi.org/10.1098/rstb.2021.0378

Ducarme, F., Flipo, F., & Couvet, D. (2020). How the diversity of human concepts of nature affects conservation of biodiversity. *Conservation Biology*, *35*(3), 1019–1028. https://doi.org/10.1111/cobi.13639

Duvernoy, I., & Gambino, M. (2021). Where to find nature? Connecting with nature in urban and non-urban areas in southwestern France. *GeoJournal*, *8*. https://doi.org/10.1007/s10708-021-10392-8

Federal Ministry for the Environment Nature Conservation and Nuclear Safety (BMU), & Federal Agency for Nature Conservation (BfN). (2020). *2019 Nature awareness study: Population survey on nature and biological diversity*. Retrieved from https://www.bmu.de/fileadmin/Daten_BMU/Pools/Broschueren/naturbewusstseinsstudie_2017_en_bf.pdf

Fischer, L. K., Honold, J., Cvejić, R., Delshammar, T., Hilbert, S., Lafortezza, R., … Kowarik, I. (2018). Beyond green: Broad support for biodiversity in multicultural European cities. *Global Environmental Change*, *49*, 35–45. https://doi.org/10.1016/j.gloenvcha.2018.02.001

Fletcher, R. (2017). Connection with nature is an oxymoron: A political ecology of "nature-deficit disorder." *Journal of Environmental Education*, *48*(4), 226–233. https://doi.org/10.1080/00958964.2016.1139534

Franz, M., Güles, O., & Prey, G. (2008). Place-making and "green" reuses of brownfields in the Ruhr. *Tijdschrift Voor Economische En Sociale Geografie*, *99*(3), 316–328. https://doi.org/10.1111/j.1467-9663.2008.00464.x

Gausmann, P. (2012). *Ökologie, Floristik, Phytosoziologie und Altersstruktur von Industriewäldern des Ruhrgebietes*.

Henne, S. K. (2005). "New wilderness" as an element of the peri-urban landscape. In *Wild Urban Woodlands: New Perspectives for Urban Forestry* (pp. 247–262). https://doi.org/10.1007/3-540-26859-6_15

Hobbs, R. J., Arico, S., Aronson, J., Baron, J. S., Bridgewater, P., Cramer, V. A., … Zobel, M. (2006). Novel ecosystems: Theoretical and management aspects of the new ecological world order. *Global Ecology and Biogeography*, *15*(1), 1–7. https://doi.org/10.1111/j.1466-822X.2006.00212.x

Hofmeister, S. (2009). Natures running wild: A social-ecological perspective on wilderness. *Nature and Culture*, *4*(3), 293–315. https://doi.org/10.3167/nc.2009.040305

Hoyle, H., Jorgensen, A., & Hitchmough, J. D. (2019). What determines how we see nature? Perceptions of naturalness in designed urban green spaces. *People and Nature*, *1*(2), 167–180. https://doi.org/10.1002/pan3.19

Ives, C. D., Giusti, M., Fischer, J., Abson, D. J., Klaniecki, K., Dorninger, C., … von Wehrden, H. (2017). Human–nature connection: a multidisciplinary review. *Current Opinion in Environmental Sustainability*, *26–27*, 106–113. https://doi.org/10.1016/j.cosust.2017.05.005

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*(3), 169–182. https://doi.org/10.1016/0272-4944(95)90001-2

Keil, A. (2005). Use and perception of post-industrial urban landscapes in the ruhr. In *Wild Urban Woodlands: New Perspectives for Urban Forestry* (pp. 117–130). https://doi.org/10.1007/3-540-26859-6_7

Keil, P., Hering, D., Schmitt, T., & Zepp, H. (2021). *Positionen zu einer Regionalen Biodiversitätsstrategie Ruhrgebiet - Studie im Rahmen der Offensive Grüne Infrastruktur 2030*. Oberhausen, Essen und Bochum.

Kowarik, I. (2005). Wild urban woodlands: Towards a conceptual framework. In *Wild Urban Woodlands: New Perspectives for Urban Forestry* (pp. 1–32). https://doi.org/10.1007/3-540-26859-6_1

Kowarik, I. (2011). Novel urban ecosystems, biodiversity, and conservation. *Environmental Pollution*, *159*, 1974–1983. https://doi.org/10.1016/j.envpol.2011.02.022

Kowarik, I. (2013). Cities and wilderness: A new perspective. *International Journal of Wilderness*, *19*(3), 1974–1983.

Kowarik, I. (2018). Urban wilderness: Supply, demand, and access. *Urban Forestry and Urban Greening*, *29*, 336–347. https://doi.org/10.1016/j.ufug.2017.05.017

Kruize, H., van der Vliet, N., Staatsen, B., Bell, R., Chiabai, A., Muiños, G., … Stegeman, I. (2019). Urban green space: creating a triple win for environmental sustainability, health, and health equity through behavior change. *International Journal of Environmental Research and Public Health*, *16*, 2–22. https://doi.org/10.3390/ijerph16224403

Landesbetrieb Wald und Holz NRW. (2009). Industriewald Ruhrgebiet: Ein Projekt des Landesbetriebs Wald und Holz NRW.

Landesbetrieb Wald und Holz NRW. (2012). *Forstlicher Fachbeitrag zum Regionalplan Ruhrgebiet*.

Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen (LANUV). (2014). *Natur in NRW Wildnisgebiete: Prozesschutz dient der Artenvielfalt*.

Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen (LANUV). (2017a). *Daten zur Natur in Nordrhein-Westfalen 2016*. Recklingshausen.

Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen (LANUV). (2017b). *Fachbeitrag des Naturschutzes und der Landschaftspflege für die Planungsregion des Regionalverbandes Ruhr (RVR)*. Recklingshausen. Retrieved from www.lanuv.nrw.de

Leavell, M. A., Leiferman, J. A., Gascon, M., Braddick, F., Gonzalez, J. C., & Litt, J. S. (2019). Nature-based social prescribing in urban settings to improve social connectedness and mental well-being: A review. *Current Environmental Health Reports*, *6*, 297–308. https://doi.org/10.1007/s40572-019-00251-7

Liu, S., Zhang, J., Geng, Y., Li, J., Wang, Y., & Zhang, J. (2021). Plausible response of urban encroachment on ecological land to tourism growth and implications for sustainable management, a case study of Zhangjiajie, China. *Ecological Indicators*, *132*. https://doi.org/10.1016/j.ecolind.2021.108253

Lumber, R., Richardson, M., & Sheffield, D. (2017). Beyond knowing nature: Contact, emotion, compassion, meaning, and beauty are pathways to nature connection. *PLoS ONE*, *12*(5), 1–24. https://doi.org/10.1371/journal.pone.0177186

Lumber, R., Richardson, M., & Sheffield, D. (2018). The pathways to nature connectedness: A focus group exploration.

Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*, *68*(January). https://doi.org/10.1016/j.jenvp.2020.101389

Mathey, J., Arndt, T., Banse, J., & Rink, D. (2018). Public perception of spontaneous vegetation on brownfields in urban areas—Results from surveys in Dresden and Leipzig (Germany). *Urban Forestry and Urban Greening*, *29*, 384–392.

https://doi.org/10.1016/j.ufug.2016.10.007
Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, *24*(4), 503–515. https://doi.org/10.1016/j.jenvp.2004.10.001
Mayer, F. S., Frantz, C. M. P., Bruehlman-Senecal, E., & Dolliver, K. (2008). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior*, *41*(5). https://doi.org/10.1177/0013916508319745
McEwan, K., Ferguson, F. J., Richardson, M., & Cameron, R. (2020). The good things in urban nature: A thematic framework for optimising urban planning for nature connectedness. *Landscape and Urban Planning*, *194*. https://doi.org/10.1016/j.landurbplan.2019.103687
Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. *Lancet*, *372*, 1655–1660. https://doi.org/10.1016/S0140-6736(08)61689-X
Myers, Z. (2020). Reimagining an Urban Nature. In *Wildness and Wellbeing* (pp. 41–70). https://doi.org/10.1007/978-981-32-9923-8_2
Nisbet, E. K., & Zelenski, J. M. (2011). Underestimating nearby nature: Affective forecasting errors obscure the happy path to sustainability. *Psychological Science*, *22*(9), 1101–1106. https://doi.org/10.1177/0956797611418527
Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The Nature Relatedness Scale. *Environment and Behavior*, *41*, 715–740. https://doi.org/10.1177/0013916508318748
Ratcliffe, E., Gatersleben, B., & Sowden, P. T. (2013). Bird sounds and their contributions to perceived attention restoration and stress recovery. *Journal of Environmental Psychology*, *36*, 221–228. https://doi.org/10.1016/j.jenvp.2013.08.004
Reddekop, J. (2014). *Thinking across worlds: Indigenous thought, relational ontology, and the politics of nature; Or if only Nietzsche could meet a Yachaj*. *Electronic Thesis and Dissertation Repository*. Retrieved from https://ir.lib.uwo.ca/etd/2082%0Ahttp://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=3410&context=etd&sei-redir=1&referer=http://scholar.google.com/scholar_url?hl=en&q=http://ir.lib.uwo.ca/cgi/viewcontent.cgi%3Farticle%3D3410%26context%3Detd&sa=X&scisig=AAGB
Restall, B., Conrad, E., & Cop, C. (2021). Connectedness to nature: Mapping the role of protected areas. *Journal of Environmental Management*, *293*. https://doi.org/10.1016/j.jenvman.2021.112771
Richardson, M., Cormack, A., McRobert, L., & Underhill, R. (2016). 30 days wild: Development and evaluation of a large-scale nature engagement campaign to improve well-being. *PLoS ONE*, *11*(2), 1–13. https://doi.org/10.1371/journal.pone.0149777
Richardson, M., Hallam, J., & Lumber, R. (2015). One thousand good things in nature: Aspects of nearby nature associated with improved connection to nature. *Environmental Values*, *24*(5), 603–619. https://doi.org/10.3197/096327115X14384223590131
Richardson, M., Hamlin, I., Butler, C. W., Thomas, R., & Hunt, A. (2022). Actively Noticing Nature (Not Just Time in Nature) Helps Promote Nature Connectedness. *Ecopsychology*, *14*(1), 8–16. https://doi.org/10.1089/eco.2021.0023
Rickard, S. C., & White, M. P. (2021). Barefoot walking, nature connectedness and psychological restoration: the importance of stimulating the sense of touch for feeling closer to the natural world. *Landscape Research*, *46*(7), 975–991. https://doi.org/10.1080/01426397.2021.1928034

Rink, D. Wilderness: The nature of urban shrinkage? The debate on urban restructuring and restoration in eastern Germany, 4 Nature and Culture 275–292 (2009). https://doi.org/10.3167/nc.2009.040304

Rink, D., & Emmrich, R. Surrogate nature or wilderness? Social perceptions and notions of nature in an urban context, Wild Urban Woodlands: New Perspectives for Urban Forestry 67–80 (2005). https://doi.org/10.1007/3-540-26859-6_4

Rosa, C. D., Profice, C. C., & Collado, S. (2018). Nature experiences and adults' self-reported pro-environmental behaviors: The role of connectedness to nature and childhood nature experiences. *Frontiers in Psychology*, *9*, 1–10. https://doi.org/10.3389/fpsyg.2018.01055

Rupprecht, C. D. D., Byrne, J. A., Ueda, H., & Lo, A. Y. (2015). "It's real, not fake like a park": Residents' perception and use of informal urban green-space in Brisbane, Australia and Sapporo, Japan. *Landscape and Urban Planning*, *143*, 205–218. https://doi.org/10.1016/j.landurbplan.2015.07.003

Regionalverband Ruhrgebiet (RVR). (2018a). Auf dem Weg zu einem Freizeit- / Tourismuskonzept Metropole Ruhr Zwischenbericht 2018.

Regionalverband Ruhrgebiet (RVR). Auf dem Weg zu einem Handlungsprogramm zur räumlichen Entwicklung der Metropole Ruhr Zwischenbericht 2018 (2018).

Sato, M., Aoshima, I., & Chang, Y. (2021). Connectedness to nature and the conservation of the urban ecosystem: Perspectives from the valuation of urban forests. *Forest Policy and Economics*, *125*(January). https://doi.org/10.1016/j.forpol.2021.102396

Schipperijn, J., Ekholm, O., Stigsdotter, U. K., Toftager, M., Bentsen, P., Kamper-Jørgensen, F., & Randrup, T. B. (2010). Factors influencing the use of green space: Results from a Danish national representative survey. *Landscape and Urban Planning*, *95*(3), 130–137. https://doi.org/10.1016/j.landurbplan.2009.12.010

Schultz, P. W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of Environmental Psychology*, *21*, 327–339. https://doi.org/10.1006/jevp.2001.0227

Schutte, N. S., & Malouff, J. M. (2018). Mindfulness and connectedness to nature: A meta-analytic investigation. *Personality and Individual Differences*, *127*, 10–14. https://doi.org/10.1016/j.paid.2018.01.034

Seto, K. C., Güneralp, B., & Hutyra, L. R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *Proceedings of the National Academy of Sciences of the United States of America*, *109*(40), 16083–16088. https://doi.org/10.1073/pnas.1211658109

Shaw, R. (2002). The international building exhibition (IBA) emscher park, Germany: A model for sustainable restructuring? *European Planning Studies*, *10*(1), 77–97. https://doi.org/10.1080/09654310120099272

Soga, M., Gaston, K. J., Koyanagi, T. F., Kurisu, K., & Hanaki, K. (2016). Urban residents' perceptions of neighbourhood nature: Does the extinction of experience matter? *Biological Conservation*, *203*, 143–150. https://doi.org/10.1016/j.biocon.2016.09.020

Soga, M., Yamaura, Y., Aikoh, T., Shoji, Y., Kubo, T., & Gaston, K. J. (2015). Reducing the extinction of experience: Association between urban form and recreational use of public greenspace. *Landscape and Urban Planning*, *143*, 69–75. https://doi.org/10.1016/j.landurbplan.2015.06.003

Souto, A. (2011). Archiving Berlin's Past and Renewing the Ruhr Valley. *Austausch*, *1*(2), 98–120.

Thompson, C. W., Elizalde, A., Cummins, S., Leyland, A. H., Botha, W., Briggs, A., … Mitchell, R.

(2019). Enhancing health through access to nature: How effective are interventions in woodlands in deprived urban communities? A quasi-experimental study in Scotland, UK. *Sustainability (Switzerland)*, *11*. https://doi.org/10.3390/su10023317

Threlfall, C. G., & Kendal, D. (2018). The distinct ecological and social roles that wild spaces play in urban ecosystems. *Urban Forestry and Urban Greening*, *29*, 348–356. https://doi.org/10.1016/j.ufug.2017.05.012

Toni, S. A., & Duinker, P. N. (2015). A framework for urban-woodland naturalization in Canada. *Environmental Reviews*, *23*(3), 321–336. https://doi.org/10.1139/er-2015-0003

Totaforti, S. (2020). Emerging biophilic urbanism: The value of the human-nature relationship in the urban space. *Sustainability (Switzerland)*, *12*. https://doi.org/10.3390/su12135487

Unterweger, P., Schrode, N., & Betz, O. (2017). Urban Nature: Perception and acceptance of alternative green space management and the change of awareness after provision of environmental information. A chance for biodiversity protection. *Urban Science*, *24*(1). https://doi.org/10.3390/urbansci1030024

van den Berg, A. E., Koole, S. L., & van der Wulp, N. Y. (2003). Environmental preference and restoration: (How) are they related? *Journal of Environmental Psychology*, *23*, 135–146. https://doi.org/10.1016/S0272-4944(02)00111-1

Vierikko, K., Elands, B., Niemelä, J., Andersson, E., Buijs, A., Fischer, L. K., … Konijnendijk van den Bosch, C. (2017). Considering the ways biocultural diversity helps enforce the urban green infrastructure in times of urban transformation. *Current Opinion in Environmental Sustainability*, *22*, 7–12. https://doi.org/10.1016/j.cosust.2017.02.006

Weiss, J., Burghardt, W., Gausmann, P., Haag, R., Haeupler, H., Hamann, M., … Stempelmann, I. (2005). Nature returns to abandoned industrial land: Monitoring succession in urban-industrial woodlands in the German Ruhr. In *Wild Urban Woodlands: New Perspectives for Urban Forestry* (pp. 143–162). https://doi.org/10.1007/3-540-26859-6_9

Wiegandt, C.-C., Osterhage, F., & Haunstein, S. (2015). Polyzentralität in Deutschland – Eine vergleichende Untersuchung für drei Stadtregionen. *Raumforschung Und Raumordnung | Spatial Research and Planning*, *73*(3), 167–183. https://doi.org/10.1007/s13147-015-0342-y

Wrede, V., & Mügge-Bartolović, V. (2012). GeoRoute Ruhr-a network of geotrails in the Ruhr Area National GeoPark, Germany. *Geoheritage*, *4*, 109–114. https://doi.org/10.1007/s12371-012-0057-1

Wyles, K. J., White, M. P., Hattam, C., Pahl, S., King, H., & Austen, M. (2019). Are some natural environments more psychologically beneficial than others ? The importance of type and quality on connectedness to nature and psychological restoration. *Environment and Behavior*, *51*(2), 111–143. https://doi.org/10.1177/0013916517738312

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). sage.

Zepp, H. (2018). Regional green belts in the Ruhr region a planning concept revisited in view of ecosystem services. *Erdkunde*, *72*(1), 1–22. https://doi.org/10.2307/26411577

Zepp, H., Groß, L., & Inostroza, L. (2020). And the winner is? Comparing urban green space provision and accessibility in eight European metropolitan areas using a spatially explicit approach. *Urban Forestry and Urban Greening*, *49*. https://doi.org/10.1016/j.ufug.2020.126603

Zimmermann, K., & Lee, D. (2021). Environmental justice and green infrastructure in the Ruhr. From distributive to institutional conceptions of justice. *Frontiers in Sustainable Cities*, *3*. https://doi.org/10.3389/frsc.2021.670190

Zylstra, M. J., Knight, A. T., Esler, K. J., & Le Grange, L. L. L. (2014). Connectedness as a core conservation concern: An interdisciplinary review of theory and a call for practice. *Springer Science Reviews*, *2*, 119–143. https://doi.org/10.1007/s40362-014-0021-3

8. Appendix

8.1. Interview guide for urban residents

Start question: What comes to mind when you hear the term industrial nature/urban wilderness? How do you relate to [site Alma or Rheinelbe]?

1. How do you interact with [site Alma or Rheinelbe]?
    a. Can you give me examples of your activities in [site Alma or Rheinelbe]?
    b. Can you elaborate more in terms of frequency, social context, duration etc. in the last month?
    c. What are reasons to visit this place?
    d. What aspects do you find particularly pleasant? What aspects do you find particularly unpleasant?
    e. Does your interaction with [site Alma or Rheinelbe] differ from your interactions with other types of urban green spaces?
2. What feelings, thoughts or other experiences do your interactions with [site Alma or Rheinelbe] evoke?
    a. Do your experiences differ depending on your activities?
    b. Have you experienced memorable moments in urban wilderness? Can you recall them?
    c. Do your experiences in urban wilderness differ from your experiences in other types of urban green spaces?
3. How connected do you feel with nature?
    a. NR-Self: How does nature relate to your own identity?
    b. NR-Perspective: From your point of view, how do humans and nature relate to each other? What would be the ideal coexistence?
    c. NR-Experience: How do you experience being in nature in general?
4. How has this connectedness with nature emerged? How has it changed over time?
    a. Were there particular visits to nature that have been important for shaping your connection with nature?
    b. What would you need to feel more connected with nature?
5. Have your interactions with [site Alma or Rheinelbe] influenced your connectedness with nature?
    a. Are there specific aspects of your interaction with [site Alma or Rheinelbe] that have influenced your connectedness with nature? Type of activities or experiences?
    b. How you feel connected to [name of urban wilderness place] when you interact with it?
    c. What would have to be different when interacting with [name of urban wilderness place] to influence your connectedness with nature more strongly?
    d. Do other types of urban green spaces contribute differently to your connectedness with nature than [name of urban wilderness place]? How is it with non-urban nature areas?

Asking for background information

1. Assumed gender

2. Age
3. Profession
4. Migration background
5. Current residency

8.2. Information sheet and consent form

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Information sheet for study participants

Dear Study Participant,

Thank you for your interest in participating in this study. You will find all necessary information about the study on this information sheet which informs you about the purpose of this study, the conditions of study participation, the study procedure, the use of the study results, and data protection.

Background and study objectives:

Urban green spaces are important components of urban areas because they provide diverse benefits to people and nature. They make an important contribution to the conservation of biodiversity, and they provide urban residents with opportunities to interact with nature in their function as recreational areas. Regular contact with nature can support human well-being and pro-environmental behavior. At the same time, not all urban green spaces are the same on all aspects. One aspect on which urban green spaces differ is the extent to which they are maintained by people and degree to which the animal and plant development is influenced by human activities.

Within the framework of a master thesis, this study is carried out with the aim to investigate the relationship between humans and nature in urban environments. The focus lies on investigating whether the interaction with different types of urban green spaces has an influence on our relationship with nature. By participating in this study, you can help to provide valuable insights into how interactions with different types of urban green spaces influence people's connectedness with nature.

Requirements for participation:

- You regularly visit urban green spaces so on average at least once a month.
- You live in a city in the Ruhr area or in the Ruhr metropolitan region.
- Your English is good or very good.
- You are at least 18 years old.

Study procedure:

The study consists of a one-time interview, which will last about 20 - 30 minutes. Questions will be asked about personal interactions with urban green spaces and the effects of these interactions. Study participants will be given access to the interview results to verify accuracy. There are no identifiable risks associated with your participation in this study. If any questions or concerns arise after the study has ended, then study participants may contact Mirjam Schibler, whose contact information can be found on the consent form.

Data Protection:

All results of the study will be stored anonymously, making it impossible to identify individual study participants. If study participants agree, interviews will be recorded to facilitate subsequent transcription and data analysis. Since this is anonymized, it is not possible to draw conclusions about individual persons from the results in the study report. Contact details are only collected in order to subsequently send the transcripts of the interviews to the study participants. The anonymized transcripts of the interviews will be stored by Wageningen University.

Publication:

The results of this study will be published as part of a master's thesis and will be publicly available on the Internet.

Participation withdrawal:

Participation in the study should be voluntary, and participation can be ceased at any time, even without giving reasons. In the case of study withdrawal, research data and personal information collected up to that point will be deleted.

Consent form

This consent form is used to ensure that you have received the necessary information to participate in the study. By participating, you confirm that you know what this master thesis is about and that you are participating voluntarily.

Please check the boxes and circle the *appropriate wording**:

- ☐ I have read the "Information sheet for study participants".
- ☐ I know what this master thesis is about.
- ☐ I know that my statements will be collected anonymously, and that the identification of individual study participants based on information in the study report, including myself, is not possible.
- ☐ I know the conditions under which the recording of the interview and any other information I provide will be stored.
- ☐ I understand that I am not required to answer all questions, and I reserve the right to withdraw from the study at any time and to request that certain information be kept confidential.
- ☐ I understand that I may ask for more information about the study at any time.
- ☐ I *agree/disagree** to participate in this research project and that the information I provide will be used for data analysis and results
- ☐ I *consent/do not consent** to the recording of the interview and to the storage of an anonymous recording for research purposes in accordance with the privacy statements as indicated on the "Information Sheet for Study Participants".

By signing below, I certify that the information provided is correct:

	Study participant	**Study responsible**
Name:		
Signature:		
Date:		

For further questions or concerns about this study, please contact:

Mirjam Schibler
Tel: +31 6 44 34 89 42
Email: mirjam.schibler@wur.nl

8.3. Question list for interviews with organization

1. How would you define urban wilderness?
2. How does it differ from other types of urban green spaces?
3. Where can it be found in the Ruhr?
4. How do urban residents access and use urban wilderness in the Ruhr? Does this vary much between different urban wilderness areas?
5. Can you distinguish different user groups of urban wilderness?
6. Can you recommend ways to reach these different user groups of urban wilderness areas in the Ruhr?
7. From your point of view, do interactions with urban wilderness contribute to a stronger feeling of connectedness with nature by urban residents? Do you expect this effect to be different from other types of urban green spaces?
8. Does your organization consider the potential interactions between people and nature in the planning of urban green spaces? How?
9. Does your organization's work influence the relationship between people and nature in any other way? How?

8.4. Document analysis

Table 6: *Information to be extracted from the documents and the related search strategy*

Wilderness mentioned	Wilderness definition	Urban wilderness (UW) mentioned	Definiton of UW	Types of UW	Locations of UW	Activities of urban residents in UW	Description of UGS	Industrial nature	Industriewald–projekt	Other
Using the search term "Wildnis" (wilderness) or "wild" (wild) to search through the document and determine whether the search results refer to wilderness (e.g. the term wild can also be misleading and refer to wildlife)	Extracting definition of wilderness from search results for wilderness [column I] (if applicable)	Limiting search results for wilderness [column I] to the urban context	Extracting definition of urban wilderness from search results for UW [column K] (if applicable)	Extracting types of UW from search results for UW [column K]	Extracting locations of UW from search results for UW [column K]	Extracting activites of urban residents in UW from search results for UW [column K]	Using the search term "Grünanlage" (green space or area), "Grünzüge" (green corridor) or "Grünfläche" (green space or area) to search through the document and information on how UGS are described	In the context of the Ruhr, urban wilderness can occur in the form of industrial nature. Using the search terms "Industrienatur" (industrial nature), "Halde" (slag heap), "Zeche" (coal mine) and "Brache" (brownfield site) to search through the document, determine whether the search results refer to industrial nature in the form of UW and extract	Within my case study, I focus on the project industrial forests. Using the search terms "Industriewaldprojekt" (project industrial forests), "Rheinelbe" or "Alma" to search through the document, determine whether the search results refer to the project industrial forests and extract the	Other information that I find interesting and relevant but does not fit the selection criteria of the other columns

								the relevant information	relevant information	

Table 7: *Description of the documents being analyzed with the title, authors, year, and which planning level it applies to*

Nummer	Title	Authors	Year	Planungsebene
1	Fachbeitrag des Naturschutzes und der Landschaftspflege für die Planungsregion des Regionalverbandes Ruhr (RVR)	Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen (LANUV)	2017	Landesebene NRW
2	Gebietsentwicklungsplan für den Regierungsbezirk Düsseldorf	Bezirksregierung Düsseldorf	2000 (Aktualisierung 2009)	Metropolregion Ruhr
3	Gebietsentwicklungsplan Regierungsbezirk Münster - Teilabschnitt "Emscher-Lippe"	Bezirksregierung Münster	2004	Metropolregion Ruhr
4	Gebietsentwicklungsplan Regierungsbezirk Arnsberg Teilabschnitt Oberbereich Dortmund - westlicher Teil- (Dortmund/Kreis Unna/Hamm)	Bezierksregierung Arnsberg Bezirksplanungsbehörde	2004	Metropolregion Ruhr
5	Gebietsentwicklungsplan Regierungsbezirk Arnsberg Teilabschnitt Oberbereiche Bochum und Hagen (Bochum, Herne, Hagen, Ennepe-Ruhr-Kreis, Märkischer Kreis)	Bezierksregierung Arnsberg Bezirksplanungsbehörde	2001	Metropolregion Ruhr
6	Landesentwicklungsplan Nordrhein-Westfalen (LEP NRW)	Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen	2020	Landesebene NRW
7	Textteil und Begründungzum Regionalen Flächennutzungsplander	Planungsgemeinschaft Bochum, Essen, Gelsenkirchen, Herne,	2009	Metropolregion Ruhr

	Planungsgemeinschaft Städteregion Ruhr	Mülheim an der Ruhr und Oberhausen (?)		
8	Positionen zu einer Regionalen Biodiversitätsstrategie Ruhrgebiet	Peter Keil, Daniel Hering, Thomas Schmitt, Harald Zepp	2021	Metropolregion Ruhr
9	Mensch. Natur. Raum. Grüne Infrastruktur in der Metropole Ruhr	Regionalverband Ruhr	2021	Metropolregion Ruhr
10	Biodiversitätsstrategie NRW	Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen (MKULNV)	2015	Landesebene NRW
11	Forstlicher Fachbeitrag zum Regionalplan Ruhrgebiet	Landesbetrieb Wald und Holz Nordrhein-Westfalen	2012	Metropolregion Ruhr
12	Fachliche Grundlage „Regionale Grünzüge“ zum Regionalplan Ruhr	Regionalverband Ruhr	2015	Metropolregion Ruhr
13	Natur in NRW - Wildnisgebiete: Prozesschutz dient der Artenvielfalt	Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen (LANUV)	2014	Landesebene NRW
14	Daten zur Natur in Nordrhein-Westfalen 2016 LANUV-Fachbericht 83	Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen (LANUV)	2016	Landesebene NRW
15	Forstlicher Fachbeitrag zum Regionalplan Planungsregion Düsseldorf	Landesbetrieb Wald und Holz Nordrhein-Westfalen	2013	Planungsregion Düsseldorf (Essen, Mülheim an der Ruhr)
16	Handlungsprogramm zur räumlichen	Regionalverband Ruhr	April 2018	Metropolregion Ruhr

	Entwicklung der Metropole Ruhr			
17	Landwirtschaftlicher Fachbeitrag zum Regionalplan „Metropolregion Ruhr“	Landwirtschaftskammer Nordrhein-Westfalen	Juni 2012	Landesebene NRW
18	RuhrImpulse Beiträge zur Regionalentwicklung Band 1: Bevölkerung und Wirtschaft	Regionalverband Ruhr	April 2018	Metropolregion Ruhr
19	RuhrImpulse Beiträge zur Regionalentwicklung Band 2: Flächennutzung	Regionalverband Ruhr	Juni 2019	Metropolregion Ruhr
20	Begründung I Regionalplanerischer Teil Sachlicher Teilplan Regionale Kooperationsstandorte zum Regionalplan Ruhr	Regionalverband Ruhr	Juni 2021	Metropolregion Ruhr
21	Begründung II Erarbeitung des Umweltberichts und Zusammenfassung Sachlicher Teilplan Regionale Kooperationsstandorte zum Regionalplan Ruhr	Regionalverband Ruhr	Mai 2021	Metropolregion Ruhr
22	Begründung III Zusammenfassende Erklärung Sachlicher Teilplan Regionale Kooperationsstandorte zum Regionalplan Ruhr	Regionalverband Ruhr	Mai 2021	Metropolregion Ruhr
23	Anlage 1 Sachlicher Teilplan Regionale Kooperationsstandorte zum Regionalplan Ruhr	Regionalverband Ruhr	Juni 2021	Metropolregion Ruhr

24	Entwurf Freizeit-/Tourismuskonzept Metropole Ruhr Zwischenbericht 2018	Regionalverband Ruhr	2018	Metropolregion Ruhr
25	Klimaresiliente Region weiterdenken	ZUKUR Zukunft Stadt-Region-Ruhr		Metropolregion Ruhr
26	Trägerschaft für den Emscher Landschaftspark Evaluierungsbericht 2019	Regionalverband Ruhr	2019	Metropolregion Ruhr
27	Landschaftsplan Gelsenkirchen	Stadt Gelsenkirchen		Kommunale Ebene Gelsenkirchen
28	Landschaftsplan Essen	Stadt Essen		
29	Landschaftsplan Dortmund	Stadt Dortmund		
30	Landschaftsplan Recklingshausen	Kreis Recklingshausen		
31	Landschaftsplan Herne	Stadt Herne		