



Research plan
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The Nature-Inclusive Redesign

The possibilities of nature-inclusive redesign
in Dutch urban monumental buildings



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Preface

I am writing this research plan for my graduation research in the Heritage & Architecture graduation studio as a completion of my master's in architecture, urbanism and building sciences at Delft University of Technology.

The research plan is intended as a plan of approach for my graduation research and those interested in the research, such as designers and owners of Dutch urban monumental buildings.

The individual research is about the nature-inclusive redesign of monumental buildings. This subject stems from my interest in working with greenery, such as designing, establishing, and maintaining gardens. I also enjoy watching and caring for animals. Additionally, I am fascinated by monumental buildings, these tell a story and possess many cultural, social, architectural, technical, and environmental values. I see it as a challenge to make such buildings part of society and to let visitors experience these values. Finally, I am committed to the problem of biodiversity and see the opportunity as a future designer to contribute to its solution with this research.

Robin Simons

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1 The studio

1.1 Heritage & Architecture studio

The Heritage & Architecture studio considers sustainable development as a goal for the time ahead. It wants to improve the connection between reuse and building development, and at the same time preserve the heritage value of the built environment. It perceives the preservation and use of vacant built heritage as a good alternative to fulfil the high market demand for functional space. Making built heritage sustainable and functional are important factors for its preservation. (Heritage & Architecture, 2021)

1.2 Research context

This year, the graduation studio concentrates on revitalising the buildings owned by the Dutch police. The fusion of the police into a national unit has created an enormous real estate challenge. 30% of the police buildings must be redeveloped. The studio challenges to reflect on this assignment by doing research and making a design. The emphasis is on eight police buildings with heritage values that need to be redeveloped. The collective research of the Spatial Building Typology (S.B.T.) research line, which is part of the graduation studio, looks at spatial aspects of these buildings and how this impacts the design. This is done on various scales. For example, on the urban scale the research analyses where the greenery, water and public spaces are located. The building envelope scale examines the way the facades and roofs are designed. In the Individual research, one or more spatial aspect(s) are analysed in-depth and is investigated how this can be improved. The subject of the Individual research is introduced in the next chapter. In addition to the research, a design is made for one of the eight buildings. The police station Koudenhorn in Haarlem is used for this (Figure 1). With this, the results of the research are tested and validated. (Heritage & Architecture, 2021)



Figure 1: SBT group. (2021, September 28). The current situation of the courtyard of the monumental building Koudenhorn in the city of Haarlem

2 The research

2.1 Introduction of and motivation for the topic

The Netherlands and many other countries in the world are facing major problems that threaten people and nature. Due to climate change, global temperatures are rising, and extreme weather conditions appear more frequent (Ipcc, 2020). Researchers Tadeo Rahola, Peter van Oppen, and Karel Mulder (2009) discuss the increase of long-lasting heat waves that cause major problems, especially in cities. Such as, thermal discomfort, heat stress, increased energy consumption and affected wildlife. On the other hand, heavy rain is becoming more frequent, causing considerable material and economic damage (Deltares, 2016). In addition, large quantities of carbon dioxide and particles are emitted, which in turn contribute to climate change and deteriorating air quality (Fenger, 1999). Furthermore, the biodiversity is under great pressure. It forms the basis of our food chain, maintains the quality of the soil, and filters the air (Wageningen University & Research, n.d.). Landscape coordinator Koen Helling (2020) concludes in his research that several fauna species depend on the buildings and vegetation in the city. The buildings and their outdoor spaces serve as nesting sites, give accommodation, and can also provide food. Helling, therefore recommends that buildings should be built as nature-inclusive as possible (Helling, 2020).

Nature-inclusive building contributes to solving the earlier described problems. Nature-inclusive buildings cool down the environment, thereby reducing heat stress. Designing with vegetation enables infiltration of the soil and water retention, thereby preventing water nuisance. It filters carbon dioxide and fine dust from the air, improving air quality and fighting climate change. In addition, biodiversity is greatly enhanced. (Berardi, GhaffarianHoseini & GhaffarianHoseini, 2014)

Nature-inclusive building brings many other benefits, such as for the city and the users of a nature-inclusive building (Wageningen University & Research, 2018; Jensen, Hvoslef-Eide & Oarga, 2014; Kabisch, Korn, Stadler & Bonn, 2018). The fact that nature-inclusive building contributes to solve major problems and has many benefits, creates a great research subject. Also, it is fascinating to integrate nature into the built environment to improve both the lives of people and nature. An example is shown in Figure 2.



Figure 2: BOOM Landscape. (n.d.). Nature-inclusive design in a new to be built tower in Brinckhorst

2.2 Problem statement

There is a wide range of nature-inclusive options that can be applied to make a building more nature-inclusive (Arcadis, 2018; Gemeente Amsterdam, 2018). The application of nature-inclusive aspects in the design of new buildings are easy to implement, and relatively inexpensive through minor adjustments, because of the blank canvas (Helling, 2020). However, the aspects are more difficult to integrate into existing buildings. Especially in monumental buildings, where multiple constraints have to be considered. Monumental buildings possess great values that must not be substantially affected. The adaptations must be structurally and spatially possible. In addition, there is an existing plot and building shape (form, height, and orientation). It also depends on the presence of certain building elements and the facade materialisation.

The pressure on biodiversity remains high where a large part of the same biodiversity depends on cities and vice versa (FLO Legal, 2021). The above shows that implementing nature-inclusive options in new buildings is easy. On contrary, it is currently unclear if and how existing buildings, in particular monumental buildings, could be redesigned to be more nature-inclusive. The reason behind the choice of the target group and the scope is explained in the theoretical framework.

2.3 Goal of research

The purpose of this study is to gain insight into the possibilities for nature-inclusive design in monumental buildings by consulting literature and doing observations. Furthermore, to get a better perspective on what must be considered when applying this to a Dutch urban monumental building. To create a toolbox for designers and building owners of these buildings and to test it on three S.B.T. case studies with the same selection criteria.

The goal is to use the toolbox to help designers and building owners of Dutch urban monumental buildings to make their buildings more nature-inclusive through a redesign. The implementation of nature-inclusive design will help nature and increase biodiversity.

2.4 Research and design questions

2.4.1 Collective research

The collective Spatial Building Typology study focuses on the following main question:

How and why do the spatial aspects of police real estate influence the redesign options? (Heritage & Architecture, 2021)

2.4.2 Individual research

The results of the research will be applied and tested in the design. For this reason, both a central research question and a central design question have been formulated. The central research question is:

How can Dutch monumental buildings in an urban context be redesigned to be more nature-inclusive?

The sub-questions involved are:

1. What are the benefits of a nature-inclusive building for its users?
2. For which fauna species that occur in the Dutch urban environment should there be more nature-inclusive buildings?
3. What are the possibilities to make a nature-inclusive design and are they applicable to a Dutch monumental building?

4. Which nature-inclusive options could be applied to a redesign of a Dutch urban monumental building to make it more nature-inclusive, and what could be learned from this?

2.4.3 Individual design

The central design question is:

How can the monumental building Koudenhorn in the urban context of Haarlem be redesigned to be more nature-inclusive, while retaining its heritage value?

2.5 Theoretical framework

To give a sense of the framework, the most relevant terms will be defined first. The study focuses on nature-inclusive building. This means creating more space for flora and fauna in new buildings, renovations, or restructurings (IVN Natuureducatie, n.d.). This may involve adding vegetation, water, and accommodations for fauna, but it may also include aspects to reduce nuisance, like avoiding annoying light emissions. It concerns built objects, such as infrastructural objects, buildings, and art objects, but also the surrounding environment (IVN Natuureducatie, n.d.). Thus, the built environment is integrated with nature and people live in harmony with it. A synonym that is used for this is nature-inclusive design.

Another frequently used term is biodiversity. Biodiversity is a term used to describe the enormous variety of life on earth. It can be divided in three levels. The first level concerns the diversity of ecosystems. An ecosystem is the whole of organisms living in a certain habitat. The second level is about the variation within species of an ecosystem, such as the different kinds of mammals, birds, and insects. The third level is about the diversity of genes within a specific species. An example of this is the difference in eye or hair colour in humans and animals. All this together is called biodiversity. (Compendium voor de Leefomgeving, 2017)

This research is about how Dutch monumental buildings in an urban context can be redesigned to make them more nature-inclusive. This is done for a Dutch urban context, because of location dependency. For example, the climate affects the choice of vegetation types, but also the kind of animal species that forage in the Dutch cities and for whom the design will be made. Besides, in cities the problems are more intense, because of increasing building density, used materials and lack of green-water structures (Deltares, 2016; Fenger, 1999). Monumental buildings are selected because using them and making them sustainable contributes to their preservation. This is supported by the Heritage & Architecture studio of the Technical University of Delft (Heritage & Architecture, 2021). In addition, heritage is an important factor in making a city culturally bustling, financially successful, socially inclusive, and sustainable (UNESCO World Heritage Centre, 2019). This research focuses on nature-inclusive aspects regarding both the exterior façades, and the immediate surroundings of a building. Vegetation, water, and fauna possibilities for birds, mammals and insects are investigated. The specific animal species will follow from the study in sub-question two.

The various benefits of flora and fauna have been studied previously. For example, research by professors Petter Jenssen, Trine Hvoslef-Eide and Andreea Oarga (2014) shows that vegetation makes a building and thus a city more attractive, and therefore increases the well-being of citizens and tourists. The research of researchers Nadja Kabisch, Horst Korn, Jutta Stadler and Aletta Bonn (2018) also shows that vegetation has a positive effect on health, social interaction, creativity, and productivity. Wageningen University & Research (2018) describe the benefits for animals. The researchers limited themselves to a single or few advantages of flora and fauna. The different studies

combined could be used to identify the benefits of a nature-inclusive building for its human and animal users. Many studies have been carried out on the various animal species, including their lifestyles and distribution (De Zoogdierenvereniging, n.d.; Vogelbescherming, n.d.). In addition, the Ministerie van Landbouw, Natuur en Voedselkwaliteit (n.d.) has drawn up lists of suppressed species. However, these lists fluctuate over time. The results of these studies can be used to determine for which animal species nature-inclusive options are designed. Reports and websites could be used to provide a comprehensive overview of the possibilities of nature-inclusive building and their applicability in monumental buildings like Arcadis (2018) and Gemeente Amsterdam (2018). Observations in various case studies form an extension to this. The basic principles for dealing with monuments is described by Federatie Welstand (2008) and form an important guideline for redevelopment.

3 The research process

3.1 Methodology and methods

3.1.1 Collective research

To answer the main question of the collective research, several steps will be taken. First, **case studies** will be analysed. The spatial aspects of eight Dutch police buildings will be studied on four different scale levels in text and image. This will be done according to the Haussmann method (Jallon, Napolitano & Boutté, 2017). Next, through **observational research**, the results of the different locations will be compared to discover generalisations. Afterwards, the different individual studies will be described, and the distinctive redesign options resulting from the same study will be added. In the following step, again through **observational research**, the redesign options will be grouped to define types. Finally, a conclusion will be drawn about the spatial building typology of the Dutch police real estate. (Heritage & Architecture, 2021)

3.1.2 Individual research

The first question will examine the benefits of nature-inclusive building for its users. This concerns both humans and animals. This will be done by means of **literature research** in books, academic papers, reports, web articles and websites. Afterwards, a residential building by landscape architects Buro Harro located at the Groenmarkt in Amsterdam, still to be realised, will serve as a case study.

For the second question, a **literature search** will reveal for which fauna species the design will be made and on what this choice will be based.

Then, by means of **literature and observation research** in books, scientific articles, reports, internet articles and websites, an overview will be made of the possibilities to include nature. First, each possibility will be briefly described and visualised with a hand sketch. This will be followed by an explanation and then a description of what needs to be considered when applying them to a monumental building. Finally, a toolbox will be designed based on the applicability of the different possibilities to a monumental building.

In the last sub-question, a **case study** will be used. The earlier designed toolbox will be applied on a building from the Spatial Building Typology research. The analyses concern building and location studies and a value assessment based on the matrix of Clarke, Kuipers and Stroux (2019). The green-water structure, sun orientation, plot, volume, façade layout, façade construction and materialisation are all aspects that will be addressed. Images and documents will be consulted for this purpose. The analyses will be visualised and make clear which nature-inclusive methods could be applied in a redesign. Lessons can then be learned from the results. The used case study is the Koudenhorn police building in Haarlem. This building is a national heritage site, built in 1768 as a deacon's house (Monumenten.nl, 2020).

Finally, the central research question will be answered by a summary with the toolbox and a recommendation.

3.1.3 Individual design

By visiting the case study location, making emotional mapping drawings, creating models of the building essences, and derived from the individual research question, the design question was formulated. The design question will be answered through a **case study**. A redesign will be made of the monumental building Koudenhorn in Haarlem to make it more nature-inclusive. The design

process consists of specific research into various aspects to make design decisions. The decisions made will be reflected in a repetitive loop on the original principles and regulations.

The design process consists of the concept phase followed by the preliminary design phase that results in an elaborated design. In the concept phase, situation analyses will be started, including a value assessment according to the matrix of Clarke et al. (2019). Based on the findings, the new function(s) with additional requirements will be defined. The personal vision and especially the results of the research will serve as a basis for the design proposal. In this phase, sketching, drawing, modelling, and making schematic illustrations will be performed.

Subsequently, the design will be further developed under the influence of four disciplines. These disciplines are design, technology, values, and nature-inclusiveness. In this phase, sketching, drawing, modelling, making schematic illustrations and calculations will be central. These results will be processed in a preliminary design that becomes an elaborated design through a reflection process.

Finally, the design will validate the results of the research. This will show whether a Dutch monumental building in an urban context could become more nature-inclusive. To this end, the ecological value assessment of the existing situation will be compared to that of the new situation. Also, quantitative, and qualitative data from both situations will be compared. Such as, the surface of greenery and water. The number of trees and housing places for fauna and the quality of the greenery.

3.2 Research and design structure

Figure 3 shows the general structure of the graduation project. It contains the two research tracks. Firstly, the collective Spatial Building Typology research that results in the Spatial Building Typology book. Next, there is the individual nature-inclusive building research that results in a research report. Also, there is the research based design that consists out of two phases. The research and the design are closely connected. In the design, the results of the research are applied, also called research-based design. The results are validated by comparing the existing and new situation. In the end, a reflection report will look back on the process. The research and design structure is specified in Figure 4.

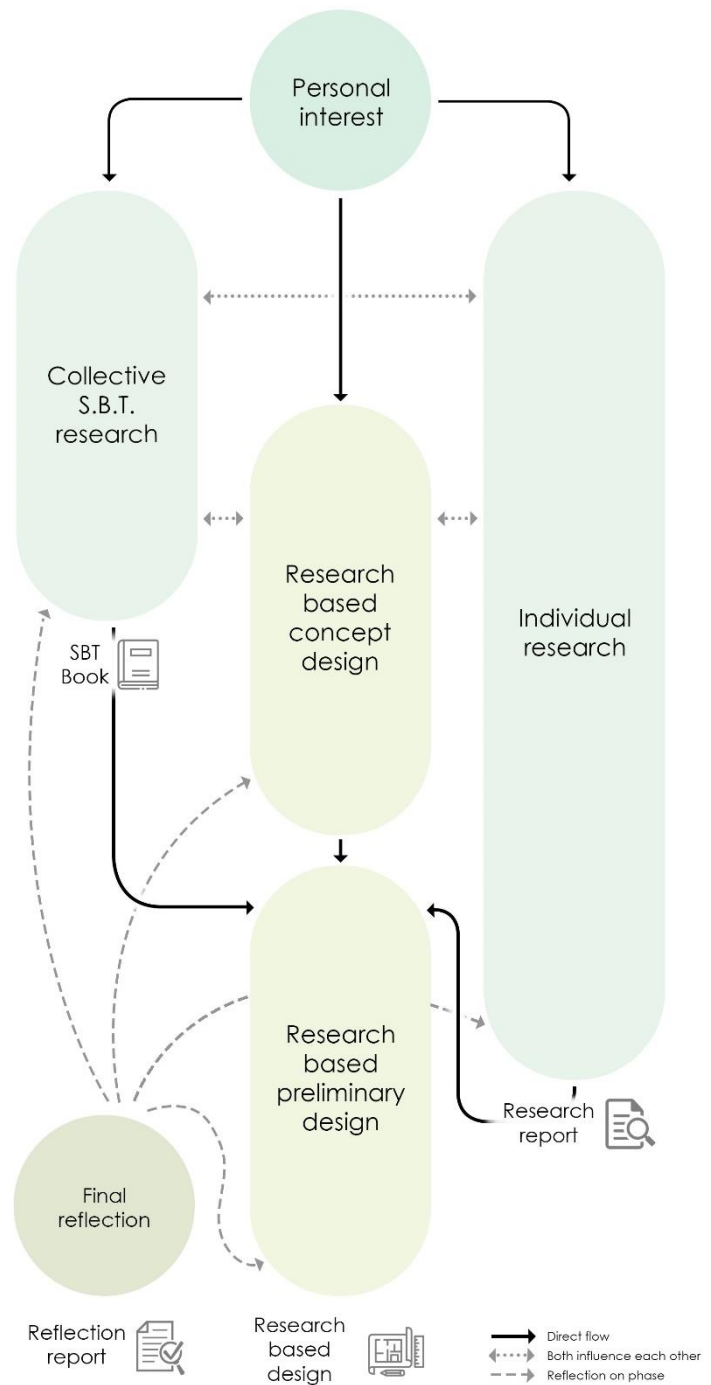


Figure 3: Simons, R. S. (2021, October 27). Simplified structure graduation project

Research and design structure
An integral process

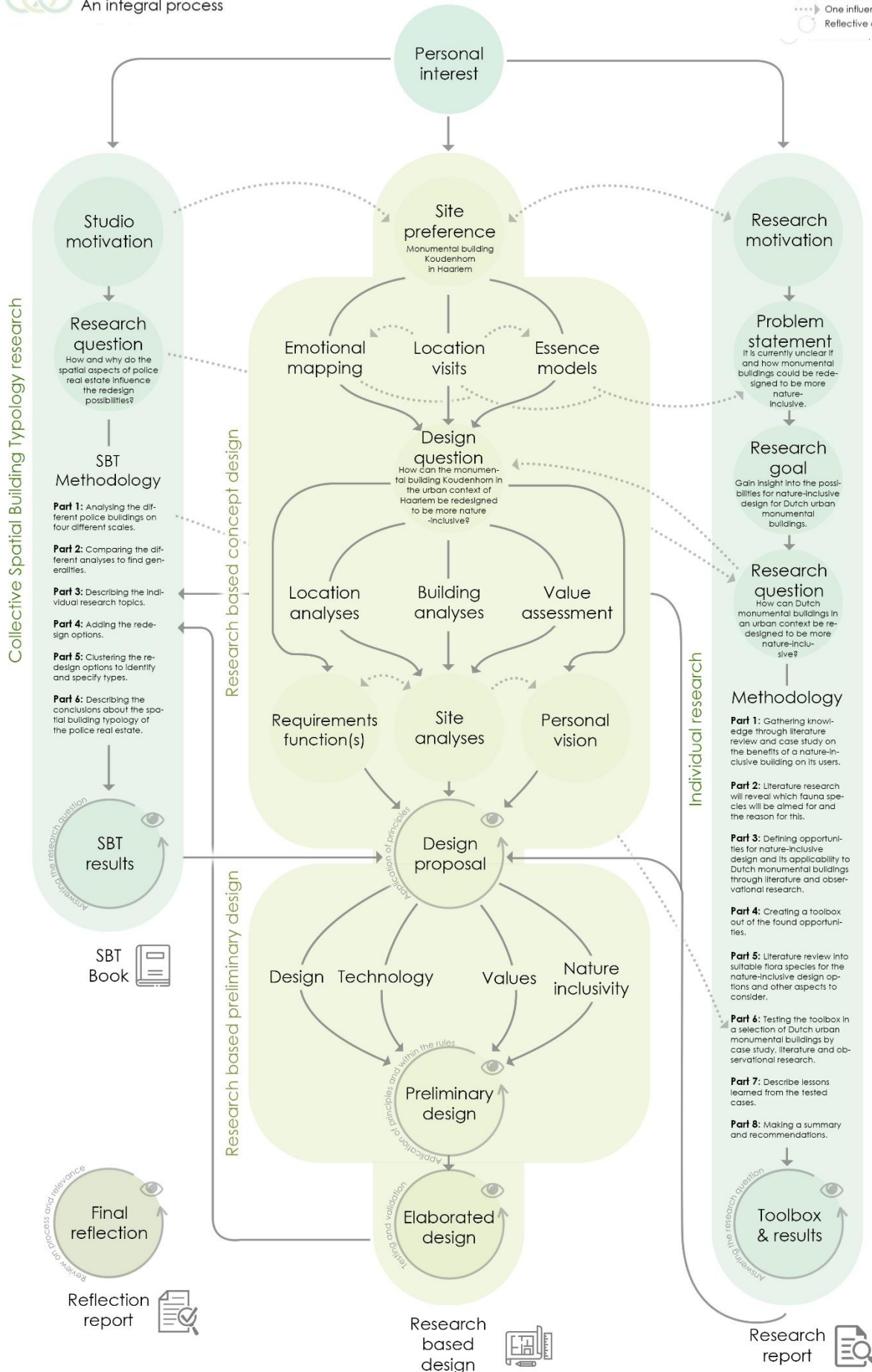
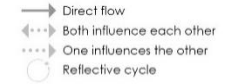


Figure 4: Simons, R. S. (2021, October 21). Structure graduation project

4 Relevance

This study clearly lists a wide variety of nature-inclusive possibilities. In addition, this study analyses the applicability of these possibilities to Dutch monumental buildings in an urban context. The study of this specific group is an extension of the existing literature.

The involved group of Dutch urban monumental buildings is large, because it concerns three different types of built monuments: national, municipal, and provincial. In August 2021, there were 61,809 national monuments in the Netherlands, which are mainly houses and residential complexes (Rijksdienst voor het Cultureel Erfgoed, 2021). The number of municipal monuments was estimated at 55,801 (in 2015) and the amount of provincial monuments was 811 (in 2019) (Rijksdienst voor het Cultureel Erfgoed, 2020). A large proportion of these monuments are in an urban environment. This shows that the research is carried out for a relevant number of buildings.

This research is of practical relevance. The toolbox helps designers and owners of Dutch urban monumental buildings to make their buildings more nature-inclusive. The more far-reaching goal is to be socially relevant. Making these monuments more nature-inclusive will help nature and reduce the pressure on biodiversity. Not to forget, the research also contributes to solving other serious problems, which are already addressed in the introduction. Furthermore, it has a positive effect on the users of the city and the redesigned estates (Wageningen University & Research, 2018; Jenssen et al., 2014; Kabisch et al., 2018).

5 Source list

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6 Figures list

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