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A l e k s a n d r a K u k l i n s k a

P u b l i c a t i o n : 2 0 2 3

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Chalmers School of Architecture

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Direction of Building Design for Sustainability

(UN)NATURAL HABITAT

Redesigning spaces for support of biodiversity
and bring a human & nature coexistence

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THESIS MOTIVATION

From the beginning of my studies I was associated with architecture as a field of human development and achievement of new tools and technologies. I was always thinking about it as a human-centered discipline that shapes the habitat that we are living in. However, ongoing climate changes and my increasing awareness about sustainability made me understand how egocentric we have been. Our development and in general the lifestyle, disturbed the life of other living organisms on our planet. We are behaving like the only-owners of all the land, building more and making our cities grow bigger.

Architects and city planners have now an important role to show that “shared-habitat” is possible and biodiversity in our cities can flourish. In order to face climate changes we need to promote sustainable architecture that takes the natural environment and biodiversity as one of the main design guidelines and is not only greenwashing “additional value”.

I had the feeling that during my architectural education I’ve learnt a lot about the design of the building that has decreased demand of energy consumption or even produce it’s own energy, but the same time biodiversity in built environment have never been as much important.

With my thesis I am taking this topic to show my respect for the natural environment and to inspire others for taking initiatives that will support wildlife to live with us in the future.

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ABSTRACT

Sustainability becomes an inseparable element of the built environment. We observe that the most popularized sustainable solutions are focusing mostly on aspects of building materials or energy efficient systems. However, even building in a new environmentally-friendly way, still interferes in natural habitat and leads to its slower or faster degradation. There is a gap of building examples that would consider biodiversity support in the early stage of the project. At the same time, it is already well-known that nature has a big positive impact on our mental health and well-being. How beneficial would it be then, for both of the sides (human - nature) if architects started to design spaces with inclusion of wildlife in the built environment?

The purpose of the work is to draw attention to the problem of exclusion of biodiversity in the field of architecture and habitat degradation caused by ongoing urbanisation. In order to achieve a coexistence between human and nature, newly designed projects, as well as already existing spaces should aim to integrate nature in the built environment. The aim of this thesis is however to highlight the importance of transformation and redesign of already existing outdoor spaces.

The research part was based on literature and study of references to ground a base of present knowledge. In the next stage, the context of the site was analysed in order to get a bigger picture and understand wider correlations between chosen site and other biodiversity valuable areas. Later, the process of rethinking and redesigning were made in relation to stated findings and was summarised with sketch concepts for ideas of adjustments. The final proposal is a presentation of a few selected concepts, shown with drawings and perspectives.

This paper does not provide a biological knowledge about biodiversity but is taking an architectural perspective as a main direction. Thesis illustrates how big possibilities can be found in already existing spaces and how crucial the transformation approach can be for the prevention of biodiversity loss. The results show that the broader local context and cross-disciplinary approach is needed for achieving a new healthy shared habitat.

key words:

biodiversity support, shared habitat, human-nature

We are living our own human life often
forgetting about the beauty of other species.

- Aleksandra Kuklinska

INTRODUCTION

BACKGROUND

As Magurran (2010) said, in simple words, biodiversity is defined as the variety of life on our planet. It's starting with the very small invisible microbes going through all of the other living organisms of flora and fauna. Its extinction throughout history was a natural process that has been connected to evolution of organisms and changes in the world's ecosystems. This constant disappearance of populations and species, that were not prepared anymore to survive in new conditions, allowed for better-adapted generations to thrive and continue to develop. In this way changing environments were gaining new groups of organisms and they ensured a balance in ecosystems. (Turvey & Crees, 2019)

However human evolution and development disrupted this harmony. Biodiversity loss caused by humans is now "one of the most well-recognised and catastrophic human disruptions to global systems and the natural environment" (Turvey & Crees, 2019, p. R986). We are consuming more and more, and our cities are growing bigger. While building homes for ourselves and expanding our territories we are destroying the natural habitat of wildlife.

We can not forget that we are an integral part of the environment and our future relies on proper function of ecosystem services, where biodiversity is its inseparable part. Provision of food, water or materials, climate regulation and support of all natural services will be directly touched and disrupted with the wildlife degradation. The extinction of one species is always affecting another one in the food chain and this also applies to human beings.

Besides the material profits, ecosystems give a cultural value for human beings and positively influence our health and well-being (Hirons et al., 2016). Such a complexity of correlations is showing how much nature should be important for us. However if it is like that, why is there a lack of architecture examples that would promote the idea of shared habitat ? To face these days climate changes and ensure a better future architects need to promote the inclusion of wildlife in the built environment and bring nature into human habitat.

With the main focus on biodiversity, this thesis is addressing mainly Goal - 14. Life below water, and 15. Life on land with a close connection to Goal 3. - good health and well-being. However it is important to highlight that wildlife preservation is connected and influential to all of the 17 SDGs. The conservation of biodiversity is one of the most effective levers

to achieve sustainability, according to recent studies on the dialogues seen between the SDGs goal 14 and 15 stand out as multipliers of cross-goal benefits (Obrecht et al., 2021)

RESEARCH QUESTION

How to re-design an outdoor space to support biodiversity and bring a coexistence of human and wildlife in a built environment?

sub-questions:

What designed outdoor elements can bring the support for biodiversity?

How can outdoor elements supporting biodiversity contribute to the healing environment of healthcare facilities?

PURPOSE

The purpose of this thesis is to draw attention to the problem of exclusion of biodiversity's habitat in the built environment. By the idea of redesigning, the thesis has an intention to inspire other architects or urban planners and show the possibilities hidden in already existing spaces. With the connection to the primary care center project, the thesis intends to highlight benefits for our health and well-being because of creating a shared habitat between people and wildlife.

AIM

The thesis aims to investigate how architecture and urban design can provide qualities of natural habitat in a built environment, in order to create good conditions for wildlife. In the context of choosed site, thesis is focusing on rethinking and redesigning spaces and elements to provide places for biodiversity. Thesis design proposal aims to illustrate benefits in redesigned spaces, for both wildlife and people.

METHODS

Thesis process was based on research for design (phase A) and by design (phase B). The first phase "A" used literature and reference projects to create a base of knowledge. This gave an overview of what are the trends and existing solutions for supporting biodiversity by design. Inseparable part of the research was the study of different environments and preferences of choosed wildlife's groups. The focus was put on the species that are already associated with the human environment or are present there occasionally. Another important part was to understand and state what are the benefits of the inclusion of biodiversity in architecture and what is the conflict. Site visits, photo documentation and analysis were necessary to collect all of the information about the design context, to recognize problems and possibilities.

Phase "B" was the moment of redefining collected knowledge in the context of the site that the thesis put focus on. Here, the different ideas were tested with sketches and mind-maps. Thesis was then finalized with the proposed final design presented graphically with drawings and perspectives.

DELIMITATIONS

Biodiversity in its own words is a very wide term that includes the variety of all living organisms and their habitats. Its range can very much vary through local ecosystems. Because of that thesis is narrowed down to a particular site in Sweden, choosed in relation to the author's previously done project - primary care center. This gave an opportunity to focus on rethinking newly proposed design, and redesign already existing elements and spaces in the surrounding.

Thesis includes a list of important species connected to the area of study but instead of conservation, it has an intention to promote preventative character. This is why the focus is put on mostly common biodiversity species that are already present in human habitat, linked to the site's context.

Due to the time frame of the project the site documentation is done in only one season of the year. In order to present a complete picture, the design proposal should be presented in a variety of all four seasons. Because of the limited time the design illustrates only the spring/summer period.

In order to create 'biologically' perfect design, for such projects architects would need to collaborate with local biologists. However this paper is looking from an architectural perspective in order to achieve speculative freedom, provoke a discussion and inspire other architects and urban planners for taking initiatives.

R E S E A R H

BIODIVERSITY IN BUILT ENVIRONMENT



Author's observation

If we were to ask someone where we can find biodiversity, the most common answers would be probably forest, meadow, park - the places that are mostly associated with nature. We can assume that the built environment is well-recognized as a human habitat. However our cities are giving home to many different species. The ones that adapted and benefit from human facilities are called synanthropic species, like for example squirrel or hare. Species such as owls or bats have been associated with buildings over many centuries. This is very much connected to traditional building style, that offered gaps, holes or other kind of crevices that wildlife used as nesting places.

With ongoing urbanisation we are observing that natural habitats are being destroyed and fragmented. Decreasing the amount of natural spaces is making biodiversity unable to regenerate and thrive. For a long time, the countryside was rich in a variety of ecosystems and were giving great opportunities for wildlife to live near people. However our lifestyles and growing consumption developed a new, efficient way of food production - monocultures, which drastically decreased the areas of naturally growing wild meadows (Figure 1.). Agriculture now has been recognized as one of the primary drivers of biodiversity loss (Benton, Bieg, Harwatt, Pudasaini & Wellesley, 2021).

Although urbanization causes a big threat to biodiversity habitat, recent studies show that cities are playing a more important role in biodiversity conservation than it was previously assumed. Some of the species populations are growing faster and have larger populations in the city environment than its outside (Spotswood, Beller, Grossinger, Grenier, Heller & Aronson, 2021). We can imagine then, that with a proper design of urban spaces we can invite many more different groups of wildlife. Even small biodiversity supporting interventions can, in any city, provide a new ecosystem for local flora and fauna (Secretariat of the Convention on Biological Diversity, 2012). With the increasing variety of types of environments, the more species will be able to flourish.

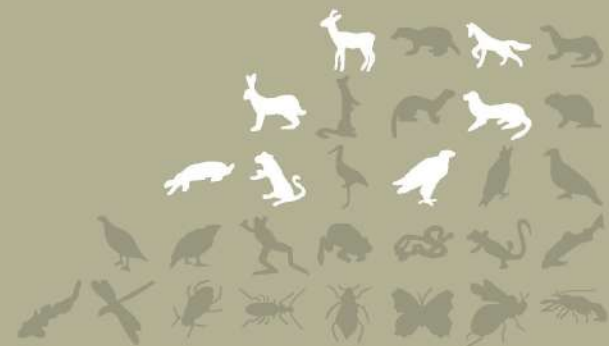
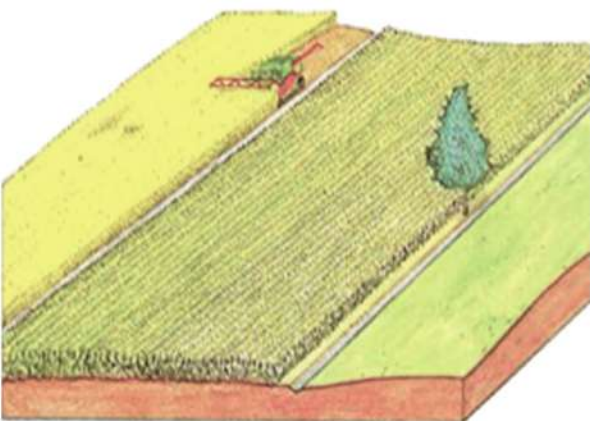
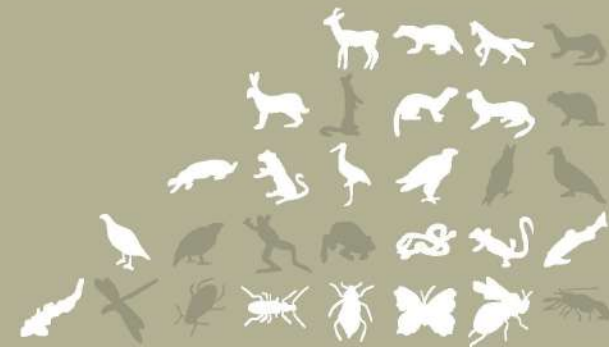
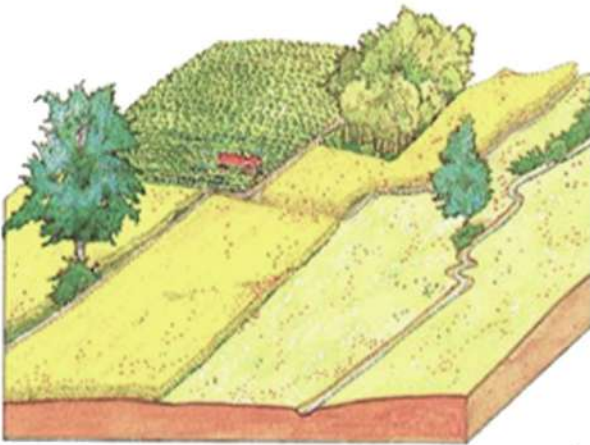
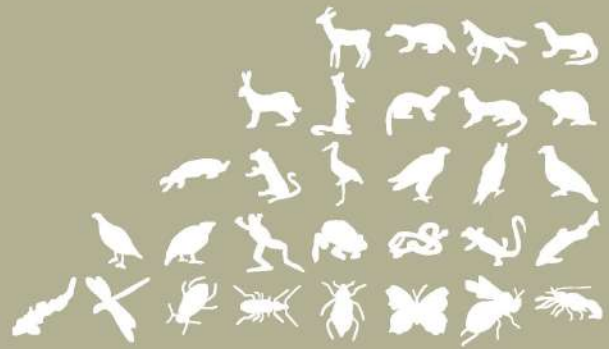
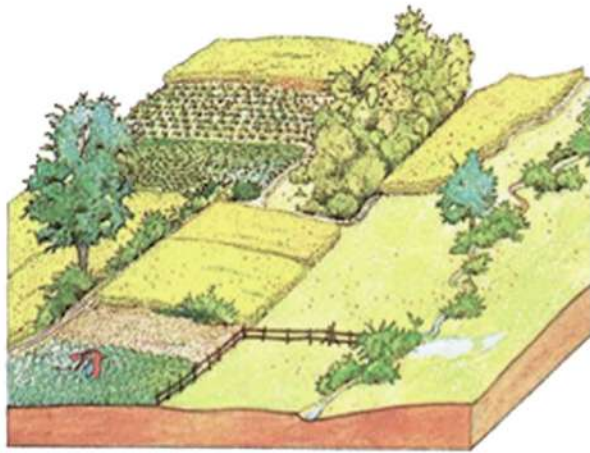


Figure 1. Agriculture influence biodiversity range

HEALING NATURE

The scale of biodiversity relates to the health of each ecosystem, and healthy cities are dependent on well-functioning ecosystems. The complexity of those structures link biological diversity to human prosperity and the outdoor environment plays a crucial role not only in the context of biodiversity.

Nature is as important for wildlife's existence as to human's health. The proper design of the outdoor space can have a therapeutic meaning and positively influence us and our well-being (Marcus & Sachs, 2013). Both active or passive contact with nature experienced during stay in hospital have been documented as having a strong evidence in reducing pain or stress though patients (Marcus & Sachs, 2013). As our domesticated pets often play therapeutic roles in our lives. We can assume that the in-direct contact with wildlife species through observation can have the same healing effect. This assumption is directly connected to the term biophilia, explaining our appreciation of nature, "love of life and all that is alive" (Fromm, 1973, p. 406).

Outdoor spaces surround us every day and while including nature in the built environment, we have the opportunity to receive healing enjoyment and pleasure every time we are going out of the building or just looking through the window. "Buildings and landscapes that people do not associate with positive experience of nature will almost always be discarded overtime, because they are not perceived as aesthetically appealing or connected to people's emotional and intellectual well-being" (Kellert, 2005, p.124).



CONFLICT

Looking from another perspective, despite the healing aspect that nature has on people, there is an ongoing conflict between wildlife and humans in the built environment. One of the big factors is the sterility of the buildings or gardens and human's "unwritten" ownership of spaces. There are many different animal or pest repellents in the form of specially designed devices, substances or elements that keep a particular species away from certain areas, objects, other animals, plants or people. We can divide them into different groups like organic, chemical, physical or ultrasonic. Repellents are working differently than pesticides, which are simply killing the irritating critter. The aim of those products is to encourage the animals to find another location (Hill, 2023).

What we can observe today, that birds are one of the most common species to be repelled from public spaces. They can fly wherever they want and at the same time leave their excrement everywhere. The absurd example of repelling this group of animals happened in an exclusive part of Bristol in Great Britain. Residents installed anti-bird spikes in two of the trees in the private front garden because the birds that were sitting on those trees were making droppings that were hitting expensive cars standing under (Ward, 2017). If we are now able to make trees inhabitable for birds, what will be next ?

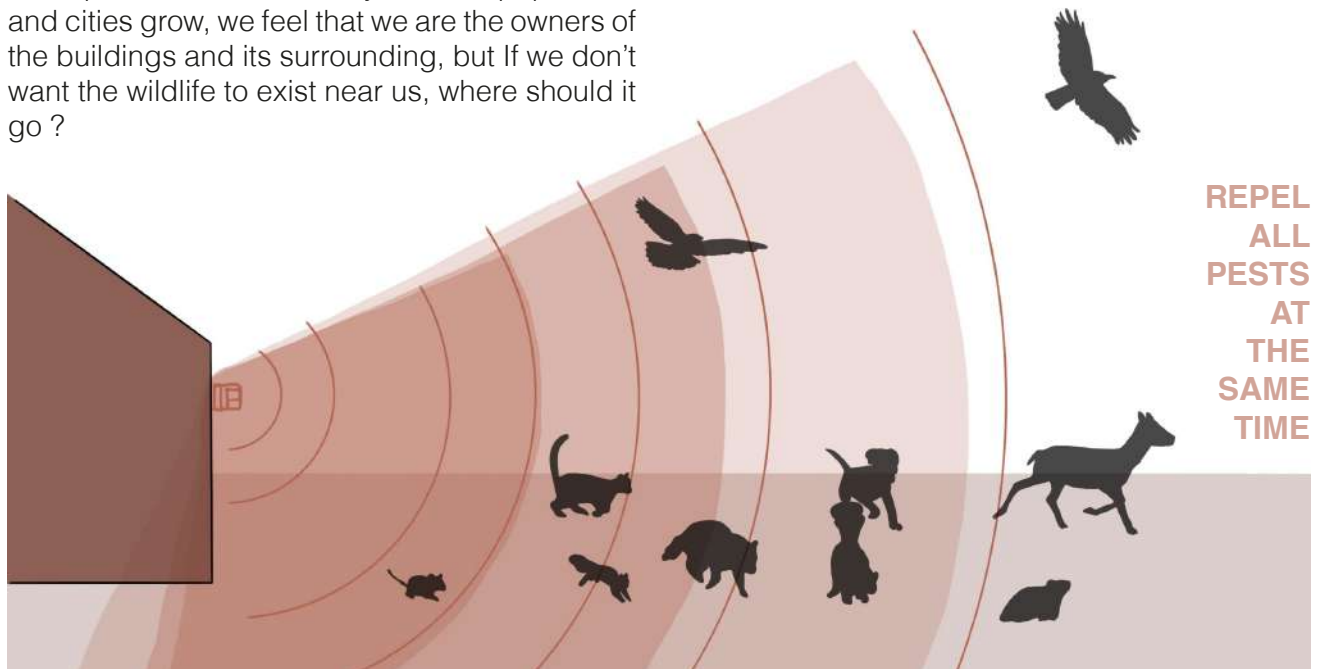
Another thing is that the perfectly designed repeller should be targeted to specific animals or pests. However we can find in the market products that are more general and provide a possibility to chase away more than one species simultaneously. As our population and cities grow, we feel that we are the owners of the buildings and its surrounding, but If we don't want the wildlife to exist near us, where should it go ?



Figure 2. Sitting on trees birds were making droppings, that were hitting cars parked nearby.



Figure 3. Installed anti-bird spikes.



PREVENTION

The world started to understand how important for our future is a protection of biodiversity and the first time in history, in June 1992 at Convention of Biological Diversity, 196 countries signed up a document, building a global plan in order to protect the environment and achieve sustainability (UN, 1992).

However, studies showed that conservation of threatened and endangered species poses a difficult challenge - "assumption - that once the recovery goals for a species are met it will no longer require continuing management - is false" (Scott et al., 2010, p.91). The management of these species will require ongoing and sustained investments which is and "... will be logistically, economically, and politically overwhelming." (Scott et al., 2010, p.91)

These days, biodiversity can not be preserved with only old, traditional strategies. In-situ conservation like national parks, wildlife sanctuaries or other forms of protection of ecosystems will no longer be enough for wildlife to regenerate. To the movements of preservation and conservation we need to add a step before - prevention.

"Biodiversity does not have to be rare to be valuable..." (Secretariat of the Convention on Biological Diversity, 2012, p. 24). The most common species are important indicators of status of the ecosystem. We are in the place where while continuing preserving existing ecosystems, with ongoing investments we need to provide new forms of urban wildlife environments.

There are already existing ready products on the market or DIY solutions for private gardens and balconies that in a very small scale provide very valuable wildlife spaces. Green roofs/facades, rain gardens or designed-in facade nesting spots are not a new invention. Those products and designs are a key element in prevention of biodiversity loss and provision of a new habitat in our built environment. (see references on page 23 & 25)

This is taking the preventative approach and that is why the main focus is put on common species that are already present or are occasionally visiting cities and towns. What is important to highlight, illustration presented on page 19. is not a finished list of species that the thesis is addressing. The collage shows a general overview and gives a starting point for speculation of groups of animals and plants.





GARDEN RELATED PRODUCTS

In the recent study Hanson (2021) emphasises that private yards located in urbanised areas have a big potential to be a place of nature experiences and relaxation, beneficial for well-being of its owners, and at the same time an oasis for wildlife. However for this to be true, it is very important how such places are planned, managed and recognized to be valuable for both sides, human and biodiversity.

There are many different ready to buy products offering shelters and nesting spaces to be placed in the garden or on the buildings (Figure 4., 5. and 7.). On the other hand, some websites and blogs are encouraging and showing easy DIY (do-it-yourself) solutions (Figure 8.). However, sometimes making a biodiversity-friendly garden does not mean buying any special products. Re-using an old pot or bowl to provide water for birds or small mammals can much more increase the amount of species visiting our gardens (Figure 9.). Creating special holes in fences (Figure 6.) will shape a “highway” for small mammals like hedgehogs to pass by and is helping fight habitat fragmentation. It also needs to be highlighted that while letting the garden be a little bit “dirty” we are making the most natural small ecosystems (Figure 10., 11.).



Figure 4. Frog house.



Figure 5. Hedgehog house.



Figure 6. Hedgehog - friendly fence.



Figure 7. Bat nesting box.



Figure 8. Bug hotel.



Figure 9. Water pot.



Figure 10. Pile of leaves.



Figure 11. Log pile.

BUILDING RELATED ELEMENTS

While our human habitat is located inside the building, its outside skin, facade and roof, can be a transition to shared-habitat with wildlife. The facade of the building can offer nesting spots for birds or bats but also a shelter for pollinators. Captured in figures 12., 13. and 14. are the examples of specially designed bricks/modules that give such possibilities. Figure 19. is showing the design of biophilic facade of the COOKFOX and Buro Happold team that designed ceramic modules for birds, bees and plants. Green roofs in urban environments, (Figure 17.) can not only improve the rainwater retention and protect the building from overheating, but also contribute to enhancing birds and pollinators rate in the city. In the direct connection to the building, same as green roofs, rain gardens (Figure 15.) are another form of rainwater harvesting, but what is interesting from the biodiversity perspective, they create unique ecosystems for plants, insects and invertebrates.

However, in most of the cases these kinds of elements should be taken into consideration already in the building design phase, because of the profitability and affordability of the project. In that point we can conclude how important is an architect's role in illustrating the benefits to the investors and decision makers, and in general promotion of the design that supports biodiversity.



Figure 12. Bird nesting brick.



Figure 16. Bird roof box.



Figure 13. Bat nesting facade box.



Figure 17. Green roof.



Figure 14. Solitary bee brick.



Figure 18. Green facade.



Figure 15. Rain garden.



Figure 19. Bird, bee & plant friendly facade.



new trees can link existing separated habitats



vary the shape, size and avoid straight lines



do not artificially light up greenery



hedges as commuting flight paths for birds and bats



BEING MORE LIKE NATURE

To invite the wildlife into our environment we need to understand what qualities provide the perfect habitat for a wide range of biodiversity. Dedák Dalma and Zsoldos Márton illustrated how the various design of the same garden can have a significantly different quality of wildlife (Figure 20.). With popularised “modern” style of the gardens, we made the privet yards very clean with poor diversity of plants and perfectly cutted lawn. In order to help wildlife to flourish in the cities we need to leave this bizarre sterility and think more like nature. The geometry and symmetry in the way how we plant is an artificial human way of thinking about outdoor spaces. What is more, studies showed that informal and natural gardens are perceived to be more therapeutic and restorative than formal one (Twedt et al., 2016).

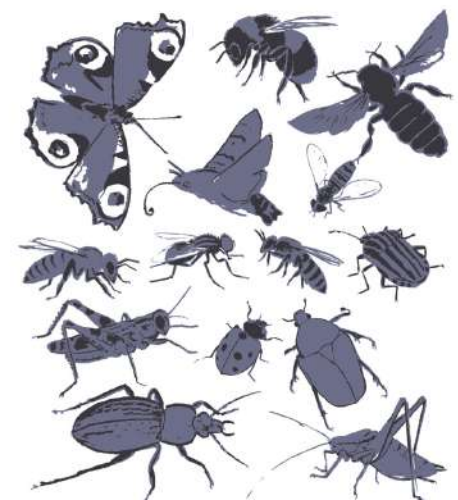
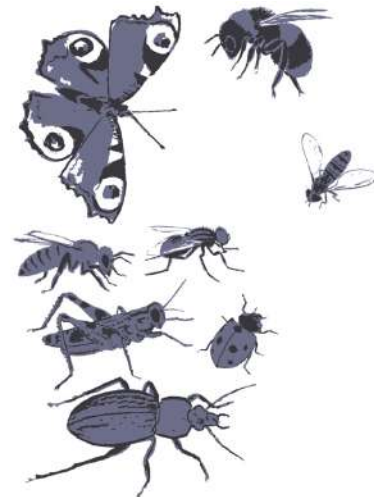


Figure 20. Garden design contributes to a vary group of insects.

WATER SOURCE

GUIDELINES

To create a biodiversity supportive environment it is important to take a holistic approach and combine different scale elements and designs. Thesis summarizes the research with selected guidelines that may have the biggest and important influence while redesigning the outdoor spaces.

FOOD PROVISION

One of the most powerful attractors for wildlife is a source of water. Ponds create an incredible habitat for biodiversity, however even while installing a simple bird bath we can be very supportive not only for birds.

ENSURING LINKS

Fruit and nut trees can be a nutritious food source for a wide range of animals.

NESTING SUPPORT

The spaces that we are creating, often create barriers and cause fragmentation of the environment. However planted trees, bushes as well as created holes in fences can be a link and provide a flow of biodiversity.

WILDLIFE FRIENDLY DESIGN

Old, mature trees as well as buildings with holes and cavities are used as nesting spaces. This is why with new investments it is especially important to include nesting spaces in new facades.

ALLOW FOR WILDNESS

Wider glass facades can be very dangerous for birds as they can't see it as an object but only a reflection. Considering external facade structure or bird deterrent window film in the biggest window openings would create a visual noise and prevent birds from hitting the glass.

OTHER PERSPECTIVE

It is not about leaving outdoor spaces neglected and dirty, but applying this principle to some parts of the lawn and creating in this way wildlife corners.

While designing a building, doing its renovation or transformation human needs are always playing the main role. With changing the perspective designers can shift from thinking about the places that we live to places that we share with other species and in this way create a new shared habitat.

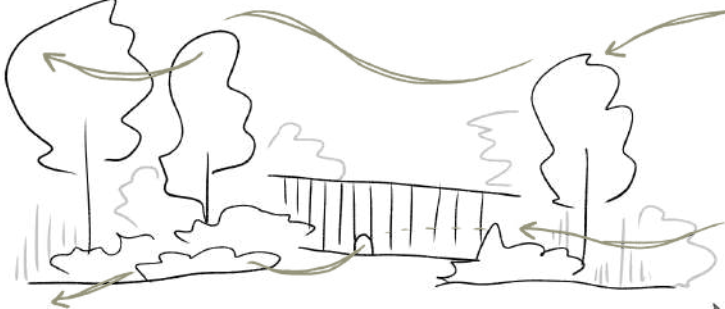
water source



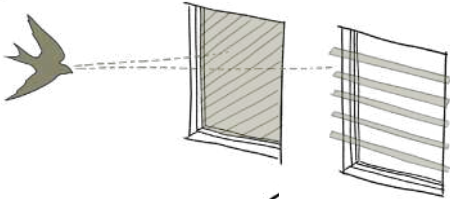
food provision



ensuring links



wildlife friendly design



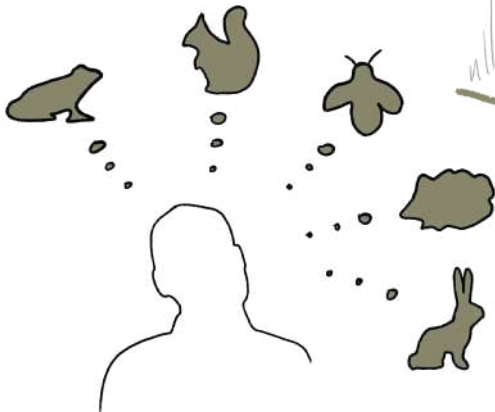
nesting support



allow for wildness



other perspective



DESIGN CONTEXT



SELECTION OF SITE

These days we can observe that mostly, only the big investments have a bigger interest in supporting nature in their design not only because of the aesthetic reason but in order to achieve sustainability. Most of them are new innovative projects, located usually in big cities, where the natural habitat is getting to be more destroyed. However the design for support of biodiversity is the same important both in the bigger scale project and in a local movement (Secretariat of the Convention on Biological Diversity, 2012) and transformation of already existing spaces can be crucial to provide connections between fragmented habitats.

What is more, because of the big positive impact on human's health and well-being that nature is playing, healthcare facilities can play a strategic role in promoting this kind of approach. In relation to these outlines, I decided to do a study case of the group project that I did in a previous semester about a new primary care center in a Swedish town called Vadstena.



Figure 21. Vadstena map



Figure 22. Site for new healthcare facility.

VADSTENA

Vadstena is a municipality located in southeast Sweden in Östergötland County, next to the second largest lake in the country - Vättern. These days there are around 7.400 inhabitants, and despite that small population, for historical reasons, Vadstena is still described as a city. What is interesting, is that Vadstena has had a long tradition for hospital care and it is part of the city's heritage and identity. It started already in the beginning of the 15th century with care for elderly, sick and poor. In the 1940-1950, a modern hospital area was constructed to the east of the former hospital area. These days, only one building of the hospital's area is used as a primary care center. In the current healthcare facility there are around 7.500 listed patients and the building is starting to be too small and out of modern standards for healthcare. Because of that reason, the municipality is planning a new investment in the place of a previous hospital complex.



ARK 263 GROUP PROJECT

During autumn semester 2022, I had the pleasure to take part in an ARK263 Healthcare studio at Chalmers, which was working on a proposal for a new primary care center in Vadstena.

Together with my team - Florence van Laethem and Karl-Johan Gydell, we proposed a new healthcare facility that was designed with a special attention for the future-proof of the building. The major focus was put into design of a volume that respects cultural heritage of the place, and its standardised floor plans that allow it to easily adjust functions inside.

With my thesis I am taking this design as an area of investigation and critical reflection of the project that I was involved in. Thesis aim is to propose a redesign of the presented healthcare project and existing surroundings to discover new possibilities for inclusion of biodiversity in outdoor spaces.

Project available online:
<http://hdl.handle.net/20.500.12380/306031>



Figure 23. Group project design - Chalmers ARK263, 2022.



Photo 1. Park



Photo 2. Lake



Photo 3. Wetlands



Photo 4. Lake



Photo 5. Pond



Photo 6. Allotment gardens



Figure 24.



SITE'S NATURAL CONTEXT

Vadstena is located next to the Vättern lake and it's surrounded in the other sites by farmlands. The area of my study is situated in the north part of the city. In that direction there are beach meadows which are giving a home for a variety of birds and other animals (Photo 4.). Nearby the water there are special plots dedicated for gardening (Photo 6.). The area is open to the public but the slots are rented by inhabitants. In addition to the lake, there are two artificially created water ponds. One of them has a direct connection to the lake (Photo 5.). The larger clusters of trees, which function as public parks, are located in the area of the former monastery and healthcare facilities (Photo 1.).



Figure 25. Ongoing new investment.

DEVELOPMENT OF THE AREA

Through around 60 years the town expanded and some of the existing structures were replaced with new buildings. Some of the green spaces were left untouched and what is important to say here, that older ecosystems are always richer in the context of biodiversity than for example newly planted trees. Another visible change is the farmland system. Already mentioned earlier (page 14./15.) monocultures, on a big level, are decreasing the variety of environments and areas of wild meadows.

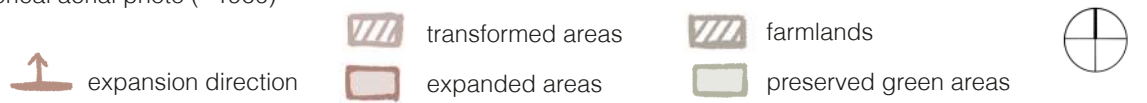
Except for that, there is an area of new investment going on in the town - February 2023 (Figure 25.). Marked in Figure 28. the building plot is significantly "digging into" potential biodiversity corridors and is an example of how urbanisation is covering the natural environments, piece by piece and leading to overconsumption of natural environments.



Figure 26. Current map situation (2022)



Figure 27. Historical aerial photo (~1960)



CONNECTIONS

The way how and where we build in many cases leads to fragmentation of natural habitats, and this is one of the reasons for biodiversity loss. Many species are using trees or low greenery as a safe corridor to move and this highlights the importance of green spaces in between the buildings to function as a connector. However, with the way of thinking of architecture as a shared habitat among human and wildlife, architects and urban planners have a chance to create new, unique ecosystems that would benefit both of the sides and would support already existing natural environments.

Presented diagram is looking for existing connections between different environments and gives a speculation ground for new potentially important directions that could be determinant in redesign. However, redesign can not be limited to just one building, but instead, trying to look for wider context that would create stronger correlations and in the result would be better for biodiversity to flourish. Because of that, the previously selected site was extended to fill the existing gap.

WILDLIFE ZONES

In order to understand the site's wild neighbours, it would be necessary to carry out documentation and observation, in the longer period of time and preferably in comparison to different seasons. However due to the timeframe of the project, the presented diagram shows only the assumption of movement of selected animals. It is important to state here, that it does not exclude existence of these or other species outside marked zones, but it assumes the most preferable and natural habitats. This resulted in illustrating the area of study as being situated in between two bigger natural environments connected together with the line of the coast. It highlighted the potential of the project site in becoming a strategic connector and extension of biodiversity habitat.



dense greenery
 smaller greenery
 private gardens



hare
 hedgehog
 bat
 bird
 frog

 ⊕



Photo 7.



Photo 8.



Photo 9.



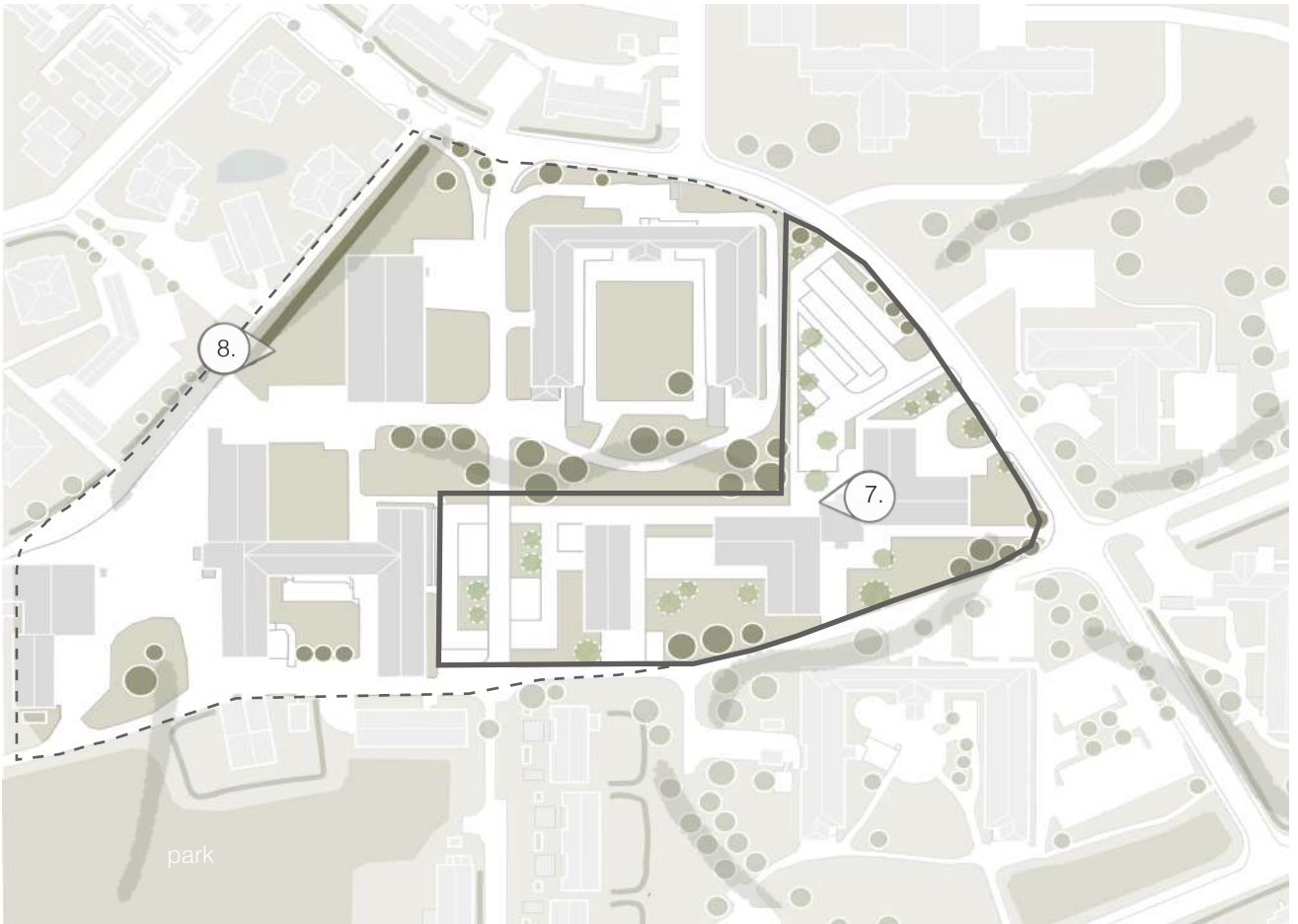
Photo 10.

GREENERY

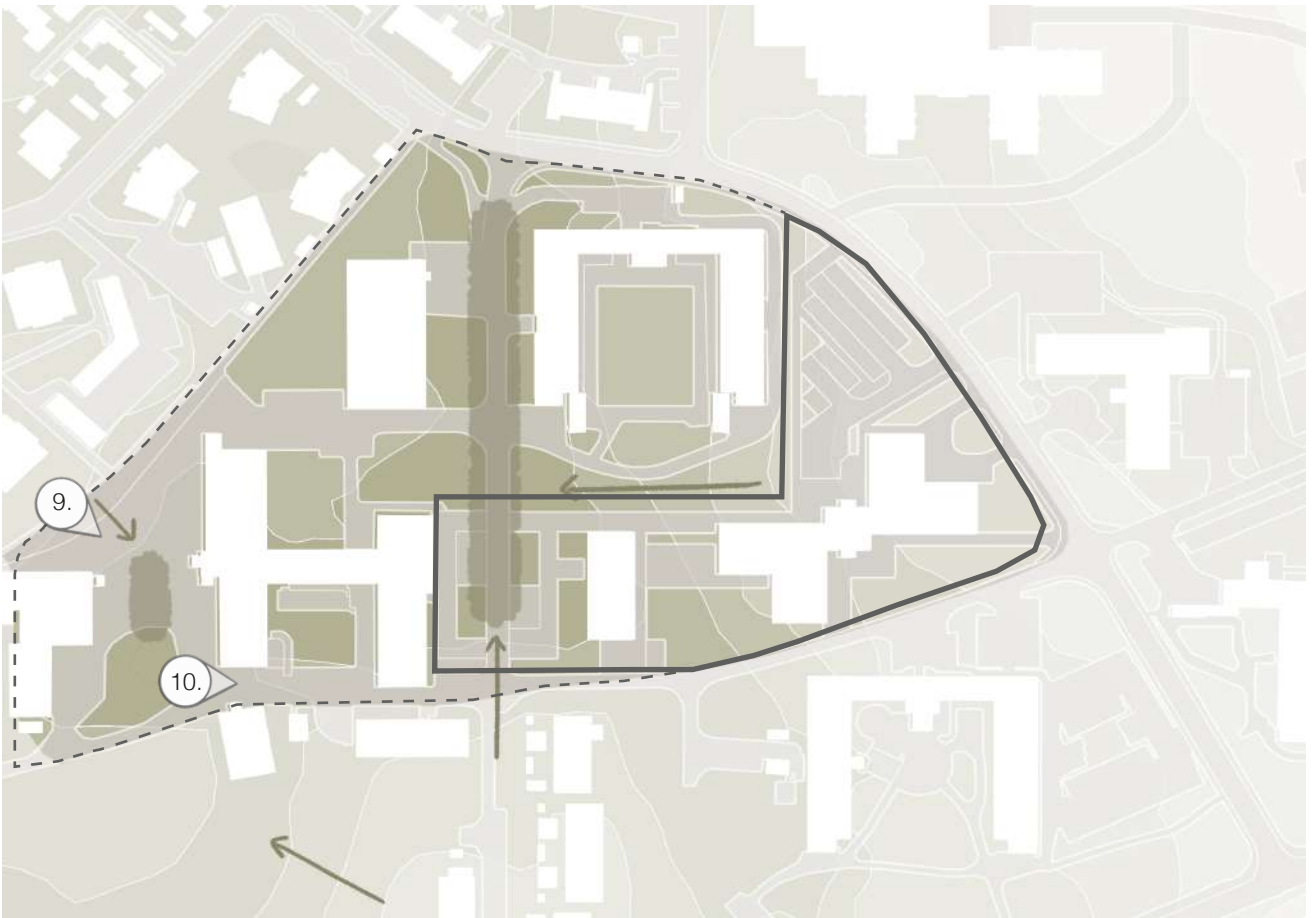
The area is characterized by wide surfaces of grass, which may be seen as good for biodiversity. However, the lawn in this context is a monoculture and does not provide a rich source of food or places to hide. Direct connection to the park, which has the oldest trees in that site, can be one of the possible generators of wildlife flow. In the marked area of focus, existing trees were supplemented with new plantings in the site of a new primary care center. In the north-west direction, a small pond is located in between residential buildings, however it is the only one source of water in this area, excluding the lake. Most of the small green bushes are located next to the streets and are playing the role of a fence, but it can be assumed that they are a possible commuting path for birds or small mammals. Most of the flowers that could be found around and in the site are located in private gardens and balconies, and there is a lack of wildy growing meadows, which are the heaven for pollinators.

HEIGHT DIFFERENCES

The site and its surrounding is quite flat and there are no very big height differences. However we can observe that levels are lowering down towards one side. With a combination of wide "asphalt desserts" we can assume that areas marked in the map areas can have potential water gathering problems in the future. Hardened surfaces increase the risk of flooding, and in the site we can find many of them. What is more, these places can be perceived by the animals as not welcoming and alien for them.



grass
 existing trees
 new plantings
 shrubs
 pond
 potential wildlife pathways



lower higher





Photo 11.



Photo 12.



Photo 13.



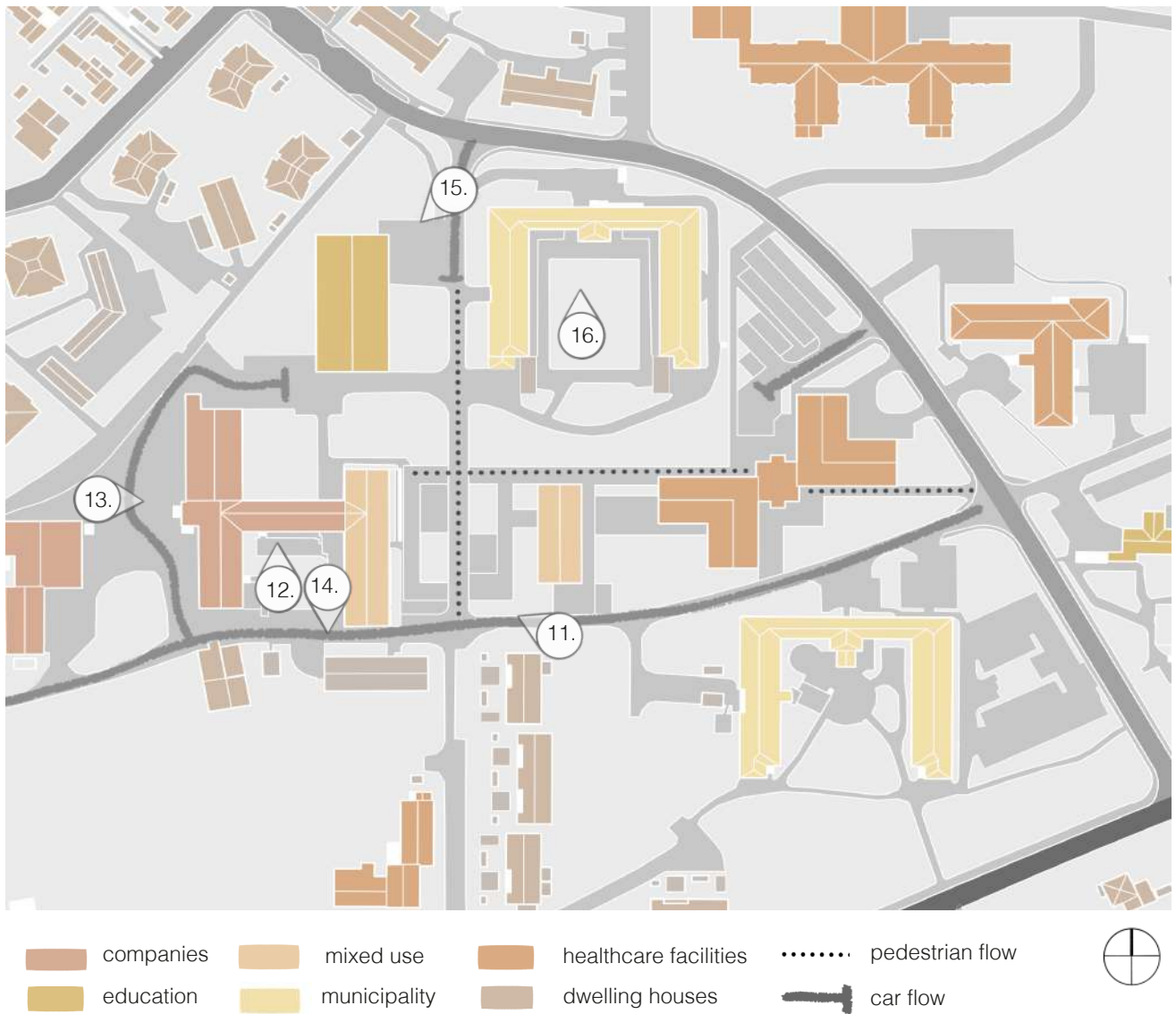
Photo 14.



Photo 15.



Photo 16.



FUNCTIONS

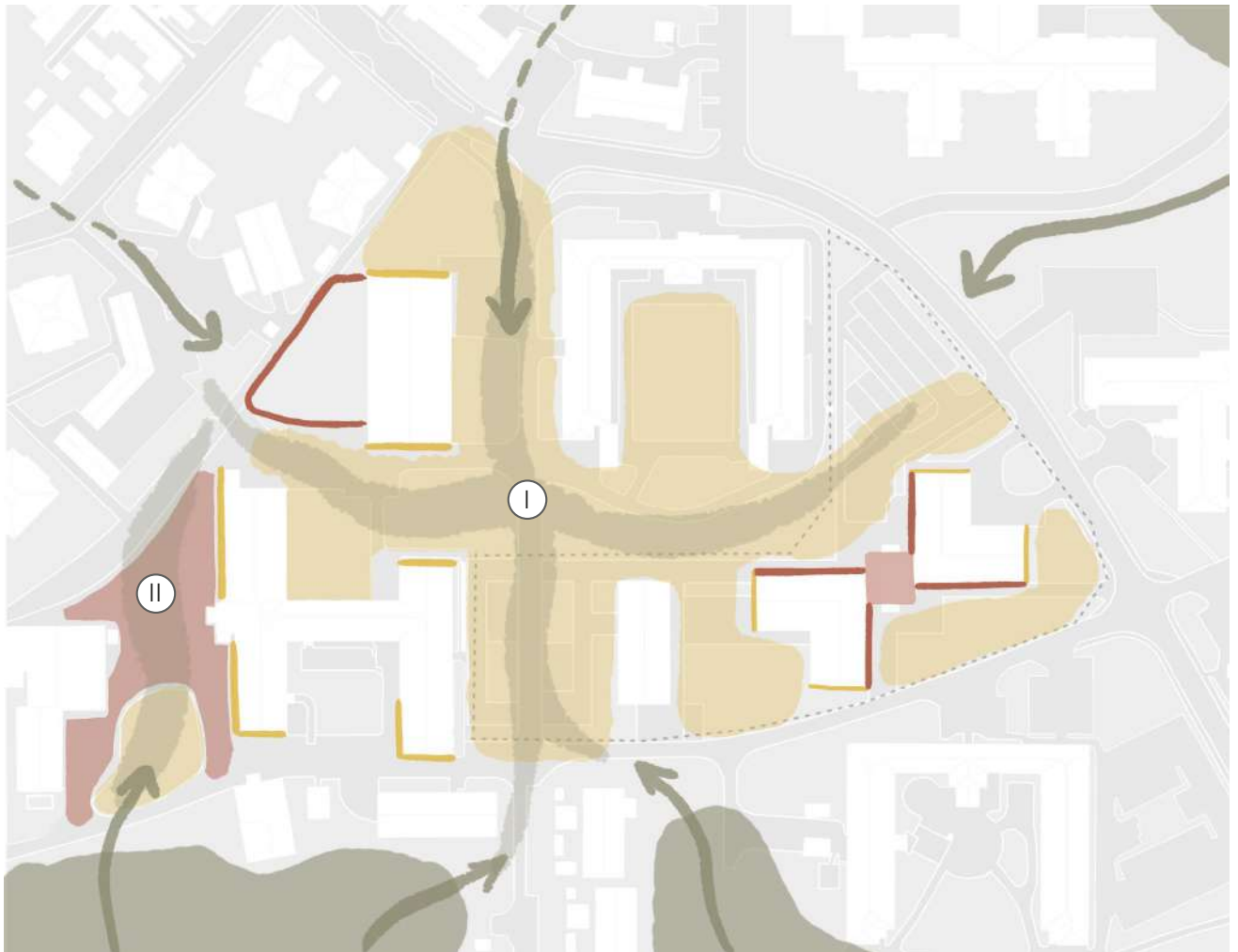
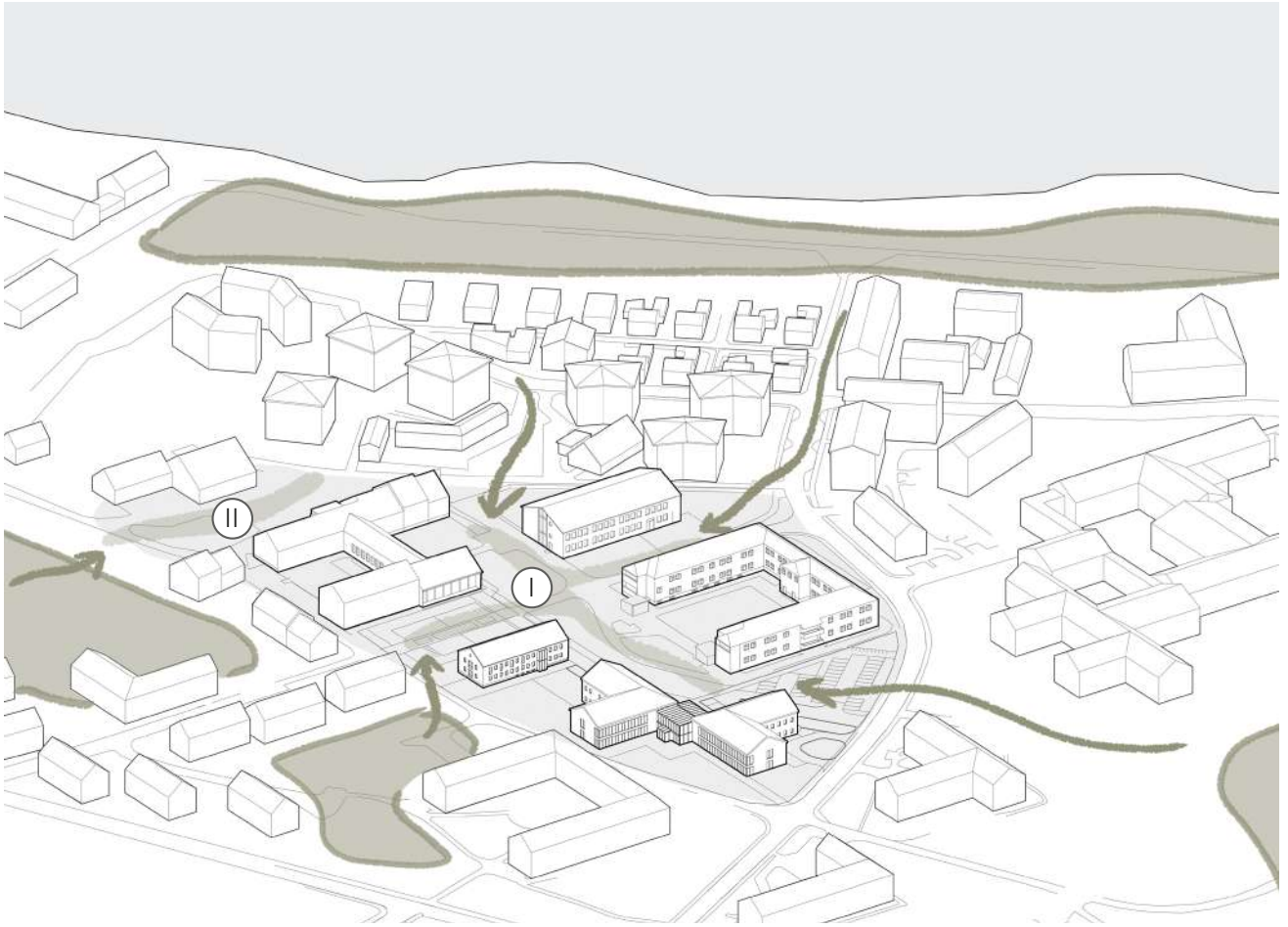
In the area of study, most of the buildings are non-residential. Programs of the new primary care center were splitted into two buildings and supplemented with a cafe and pharmacy in the smaller one. Besides that, in the north there is a school and municipality buildings. In the north-east there is a newly built psychiatric center and the building of an old primary care. In the left side of the site are focused private companies and the area is covered mostly with paved surface of mixed use character. Some of the buildings are located quite far from each other which in some way gave the impression of a weak relationship between them (observed during site visit). However this weakness gives an opportunity for the greenery to work as a supplement and connector between those structures.

DESIGN CONCEPT

THREATS AND POTENTIALS FOR BIODIVERSITY

Showed in previous diagrams (page 37.) the area of study has a potential to become an important extension and connector with existing natural environments. To define what places are necessary to focus in redesign, assumption of potential biodiversity direction was made. That highlighted two most important zones that the thesis put focus on - I & II.

As defined in analysis the site has a lot of hardened surfaces, which in some points are mixed-used by cars and pedestrians, creating in some kind 'non-defined' empty spaces. However, we can say that at the same time, the area is quite green with a big amount of well-kept lawn. On the other hand there is a lack of wild bushes and flowers on the assumption that the grass is easier and cheaper to maintain. We could say that this type of environment is not preferable for wildlife because of the weak variety of food provision around the year (fruits, herbs, seeds). There is a one small pond located nearby the site, and it can be an important link to the project site. Creation of another water source would strengthen the value of the area. During the site visit I defined that there are some places that have a potential to function as shelter for small mammals or birds, but they need to be adjusted and redesigned. In some places we can find fences that create physical barriers for small mammals, which are not able to cross the place or run away, and they also need to be rethought. Project of the primary care center proposed new plantings around the new building and together with already existing trees they will create good opportunities, for example, for birds. However, the proposed wide glazed facades and glass core of the design is a risk for them to collide with the building. Narrow walls could offer designed-in nesting spots for birds, bats and pollinators.

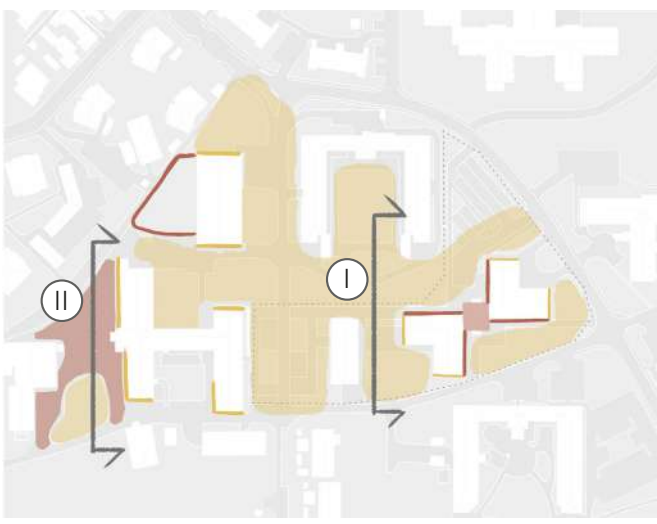
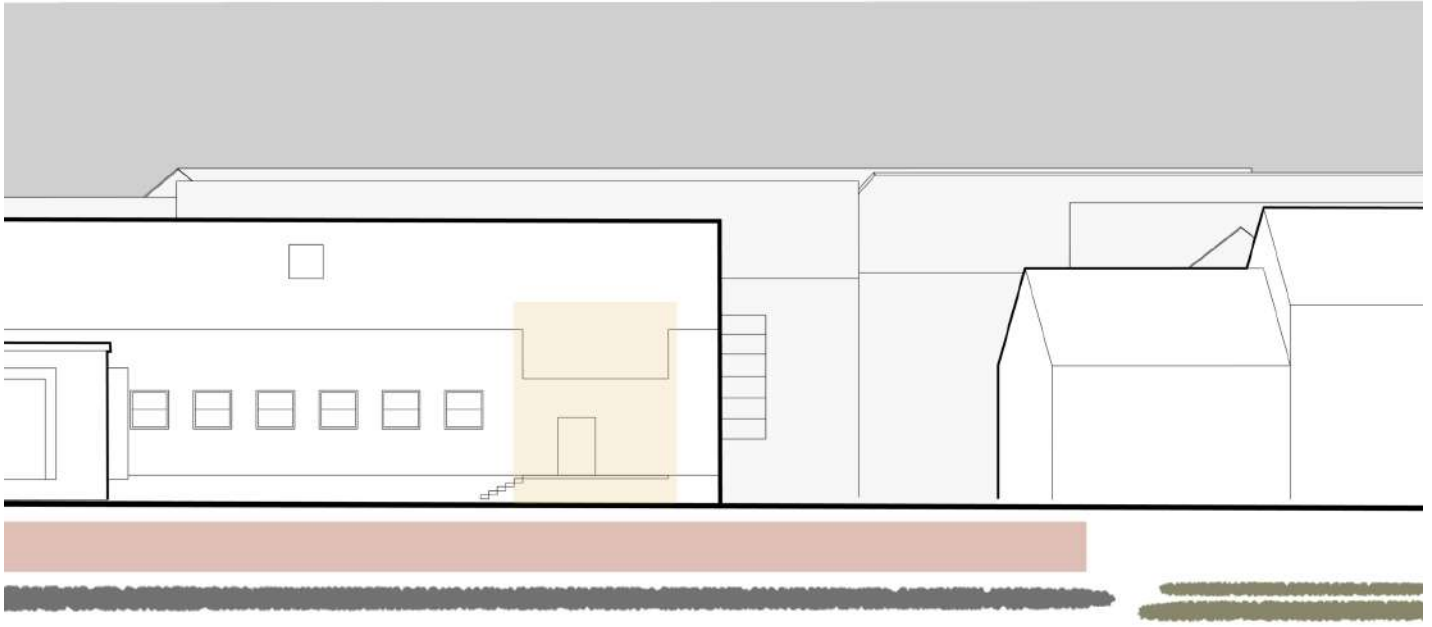
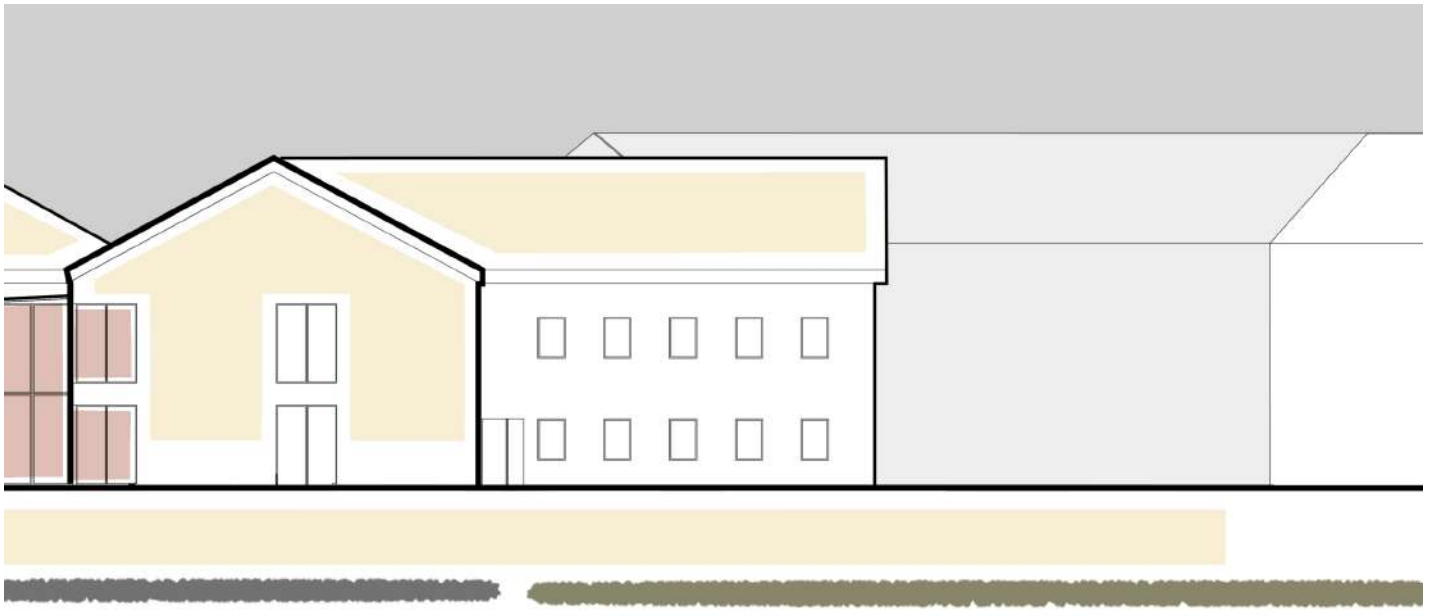


ZONE I



ZONE II

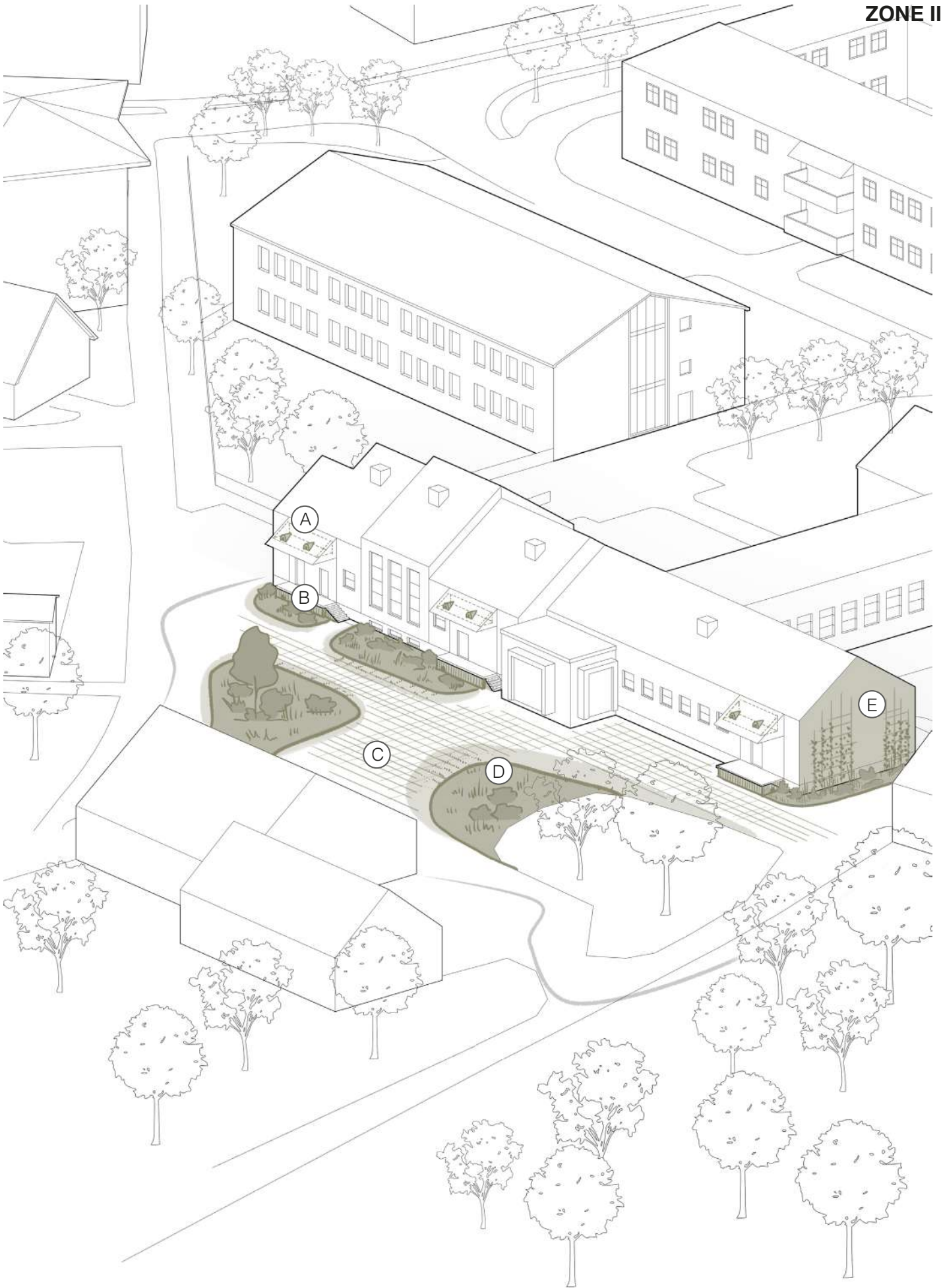




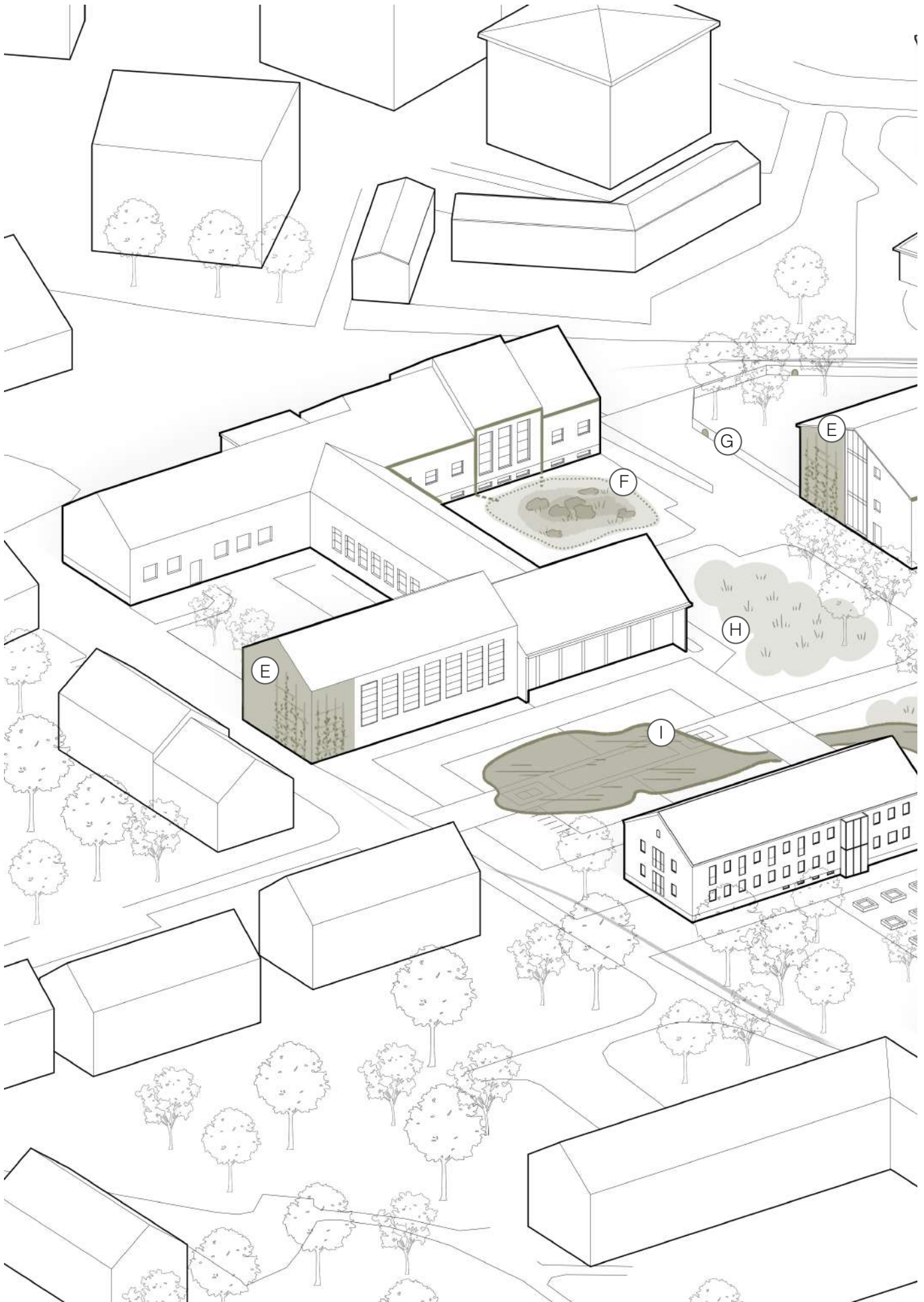
- threats
- potentials

INTERVENTIONS

After defining what elements and areas can be seen as a threat or have a potential to be beneficial from biodiversity perspective, thesis defined concept proposals for each of the zones with assumed wildlife flow. Presented elements aim to bring the connections between the site and surrounding natural environments and support already existing ecosystems.



A | bird nesting roof B | hideout stairs C | permeable pavement D | green island E | green wall



E | green wall F | rain garden G | commute hole H | wild meadow I | pond



J | bat nesting K | green roof L | bird and bee nesting wall M | climbing plant structure

DESIGN PROPOSAL

GUIDELINES

WATER SOURCE

FOOD PROVISION

ENSURING LINKS

NESTING SUPPORT

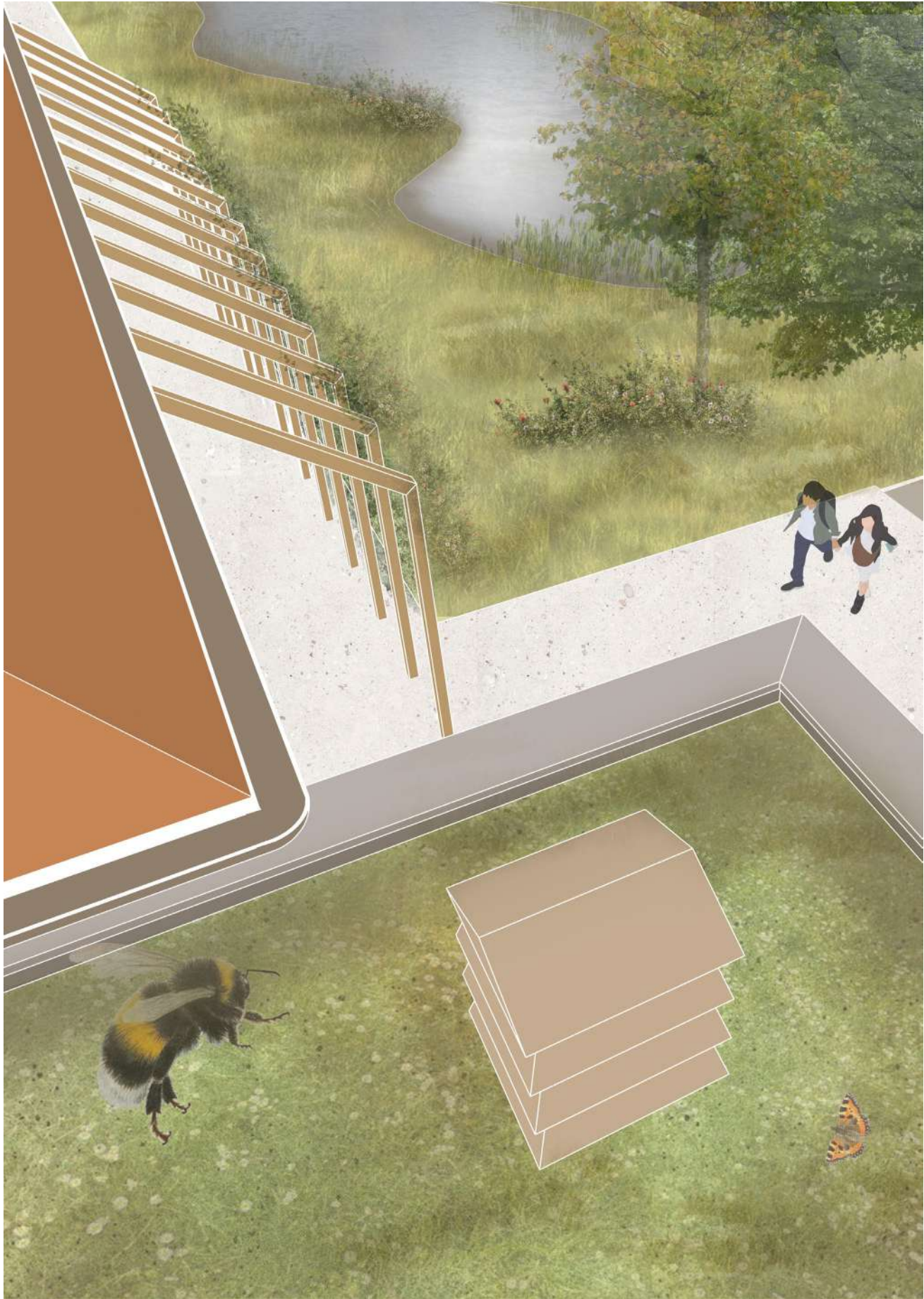
WILDLIFE FRIENDLY DESIGN

ALLOW FOR WILDNESS

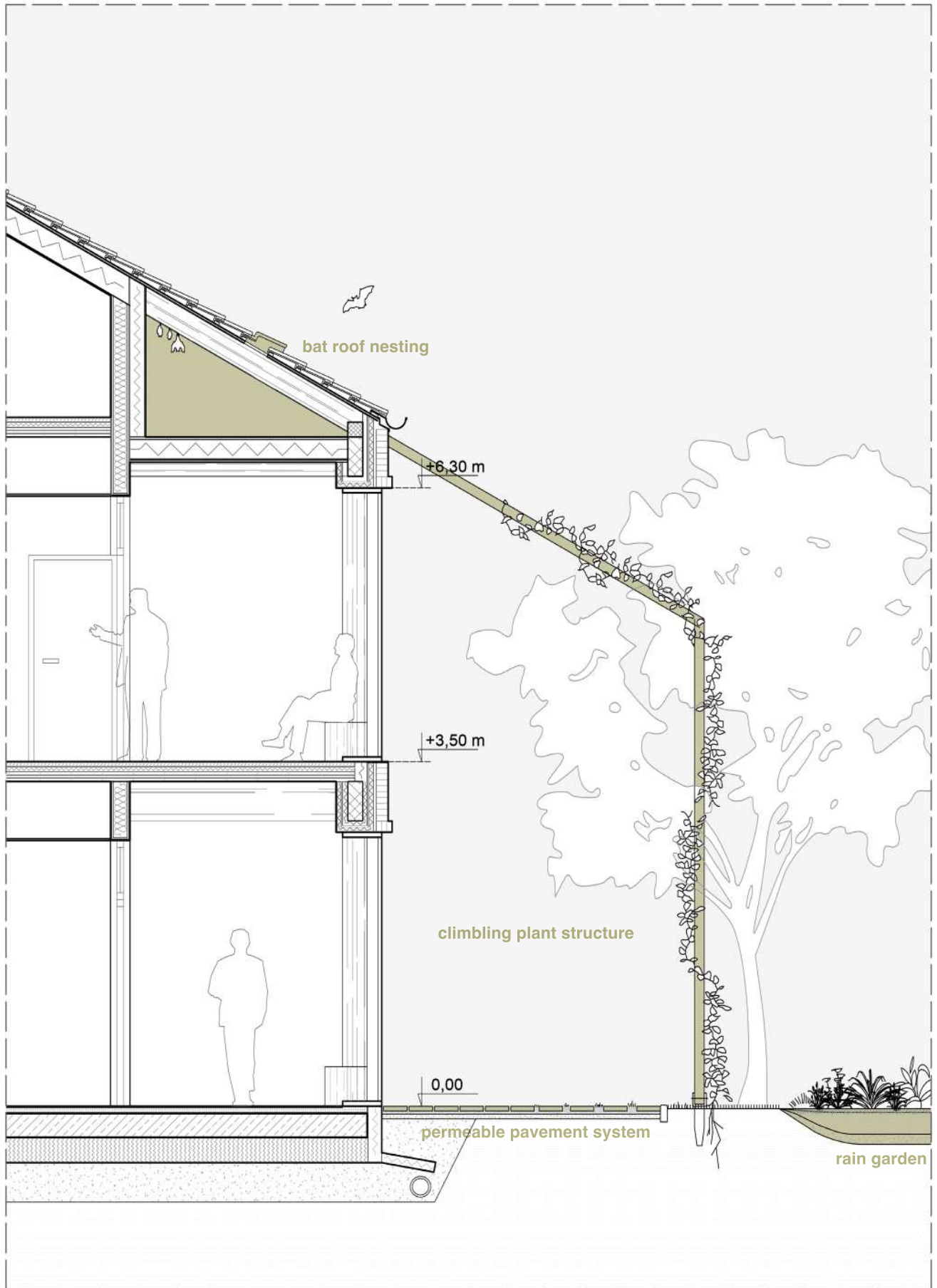
OTHER PERSPECTIVE

This design proposal consists of drawings and perspectives of a few selected concept elements, presenting the outdoor spaces after the redesign. The proposal illustrates the implementation of the earlier stated guidelines (p. 26-27).





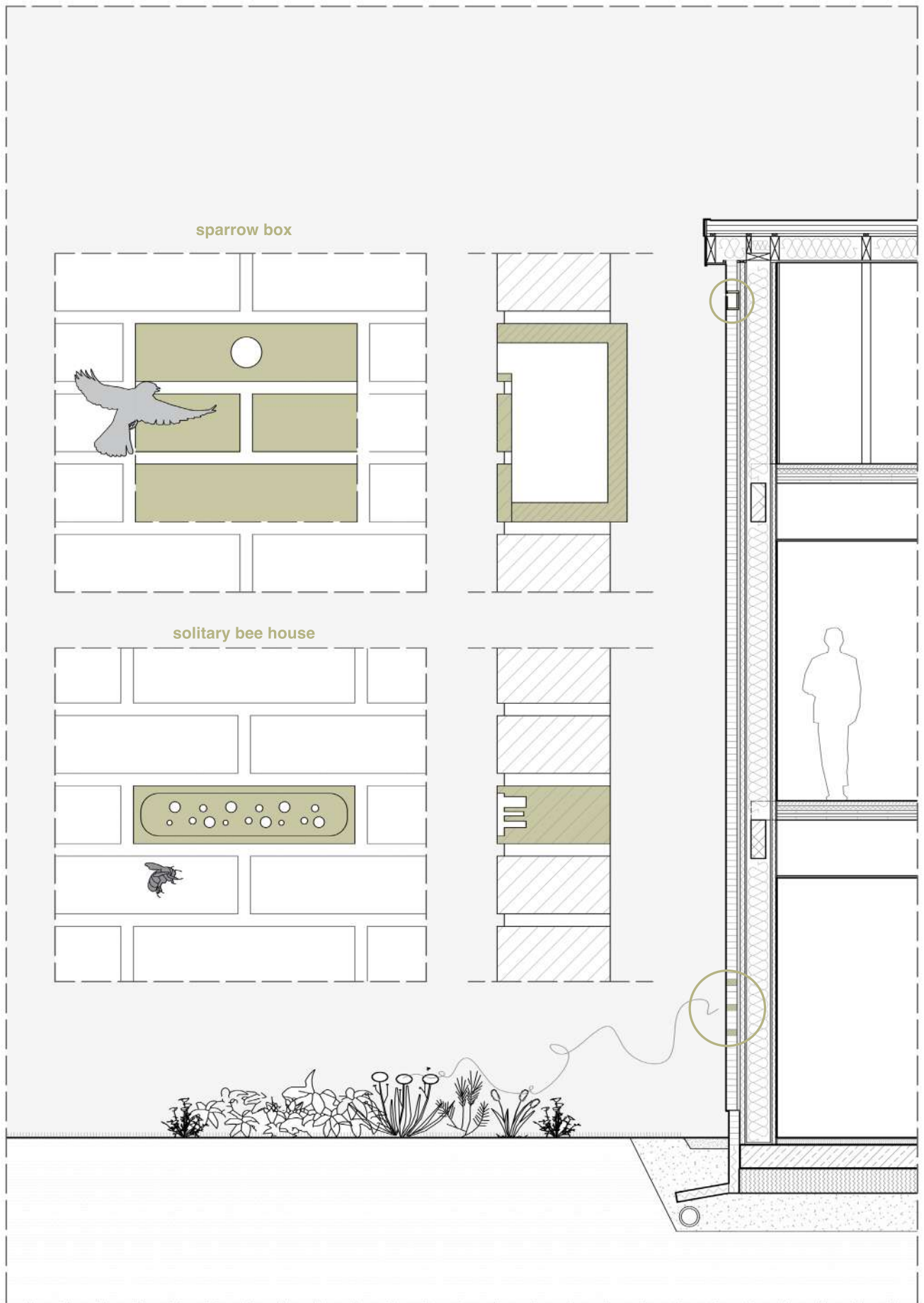
guideline | **FOOD PROVISION**
concept element | **K**



WILDLIFE FRIENDLY DESIGN | guideline
J, F, M | concept elements



guideline | **WATER SOURCE**
concept element | I



NESTING SUPPORT | guideline
L | concept element



guideline | **ENSURING LINKS**
concept elements | **C, D**



OTHER PERSPECTIVE | guideline
A, B | concept elements



guideline | **ALLOW FOR WILDNESS**
concept elements | **H, F**

DISCUSSION

**How to re-design an outdoor space to support
biodiversity and bring a coexistence of human and
wildlife in a built environment?**

DISCUSSION

In order to face the problem of biodiversity loss, a preventative approach is needed to be popularised among building fields. Thesis purpose was to highlight the current exclusion of biodiversity in the built environment and aimed to investigate what new qualities of outdoor spaces could bring “wildlife refugees” back.

Thesis proposal is a combination of different scale designs and it showed that there is a good possibility for the buildings and its surroundings to create a shared habitat among biodiversity and human beings, being links in-between those two. However not all of the existing products or solutions for biodiversity are always suitable for one place. There is a big importance of analysis of a broader context in relation to redesigned site. Local context is one of the key aspects for taking into account in the future projects.

Thesis highlighted that keeping the outdoor spaces in more natural conditions is not only better for wildlife but is much more appealing for human beings and gives a therapeutic sense (Hanson, 2021). With the inclusion of biodiversity in our built environment, we can have a chance to provide a new healing quality to the spaces that we are living in every day. This improved healing aspect of the place is an assumption based on biophilic hypothesis, and in order to be measured, would need to be tested in a real environment.

What is more, to support already existing biodiversity and natural environments, not only new architecture needs to be adjusted. Thesis showed how big possibilities we can find in already existing spaces and how crucial the transformation approach can be for the prevention of biodiversity loss.

It was beyond the scope of this study to measure how much we can increase the biodiversity rate of particular places by redesigning them. The concept and the final design of the project is not a fixed guide, however it illustrates the way of thinking while including biodiversity in the built environment through redesigning.

REFLECTION

On the other hand one can ask where is the point that this coexistence will bring disturbance in human life rather than healing. Having animals and plants so close to humans and buildings may pose challenges and conflicts. Thesis have not put focus on that topic, but rather give a base to start the reflection and assumption what and when can mean too much. Different species can be perceived in opposite ways for example - butterflies vs rats. While one is considered to be beautiful and friendly the other one may be seen as dirty or even dangerous for humans. What is more, some of the species like spiders, that are actually very important and useful in human habitats (eating flies, mosquitos, etc.) are very often objects of phobia. Some structures can be accommodated by wasps and in this way cause anxiety in people to be near these places. The coexistence of humans and wildlife in built environments requires careful consideration.

However the traditional notion of perceiving animals as intruders or nuisances should be replaced in order to support biodiversity and ensure its balance in ecosystems. People need to change their perspective and adjust their lifestyle. Presence of biodiversity should be acknowledged and valued, as it contributes to ecological balance of urban environments. We should strive to understand their needs and find ways to accommodate them in our urban landscapes. That creates new challenges for architects and urban planners and opens a discussion in a relatively new approach.

Thesis is showing the possibilities of provision suitable habitats for wildlife among the built environment by redesigning them and is encouraging for taking supportive actions by architects and urban planners. With taking a thesis approach in further projects, designers can have a valuable impact on establishing wildlife corridors and promote an appreciation for nature between buildings, making biodiversity an inseparable element of every project in the future.

Although the thesis created its own guidelines that were helpful to make decisions in the context of the site, the effectiveness and choice of strategies implemented in one context may vary in different geographical locations or cultural settings. Redesigning spaces for biodiversity should then very much focus on local context. The work was delimited in taking mainly architectural perspective, however the results could be different while doing the project in collaboration of architects, urban planners, wildlife experts, biologists or even government agencies. In further development of this approach wider collaboration is needed to develop comprehensive strategies in regional context. By working together we can more easily share knowledge, resources, and ensure the successful implementation of initiatives for prevention.

In overall, working with the topic of biodiversity had deepened my understanding of the complexities going between ecosystems and our built environment. It also showed me the importance of broader context and diverse perspectives that I will take with in my future projects.

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Figure 2. Sitting on trees birds were making droppings, that were hitting cars parked nearby. (2017, December 19). The Sun. <https://www.thesun.co.uk/news/5174097/bristol-residents-spikes-trees-stop-birds-pooing-on-cars/>

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All the other graphics and photos not mentioned in the list of figures are made by author.

APPENDIX

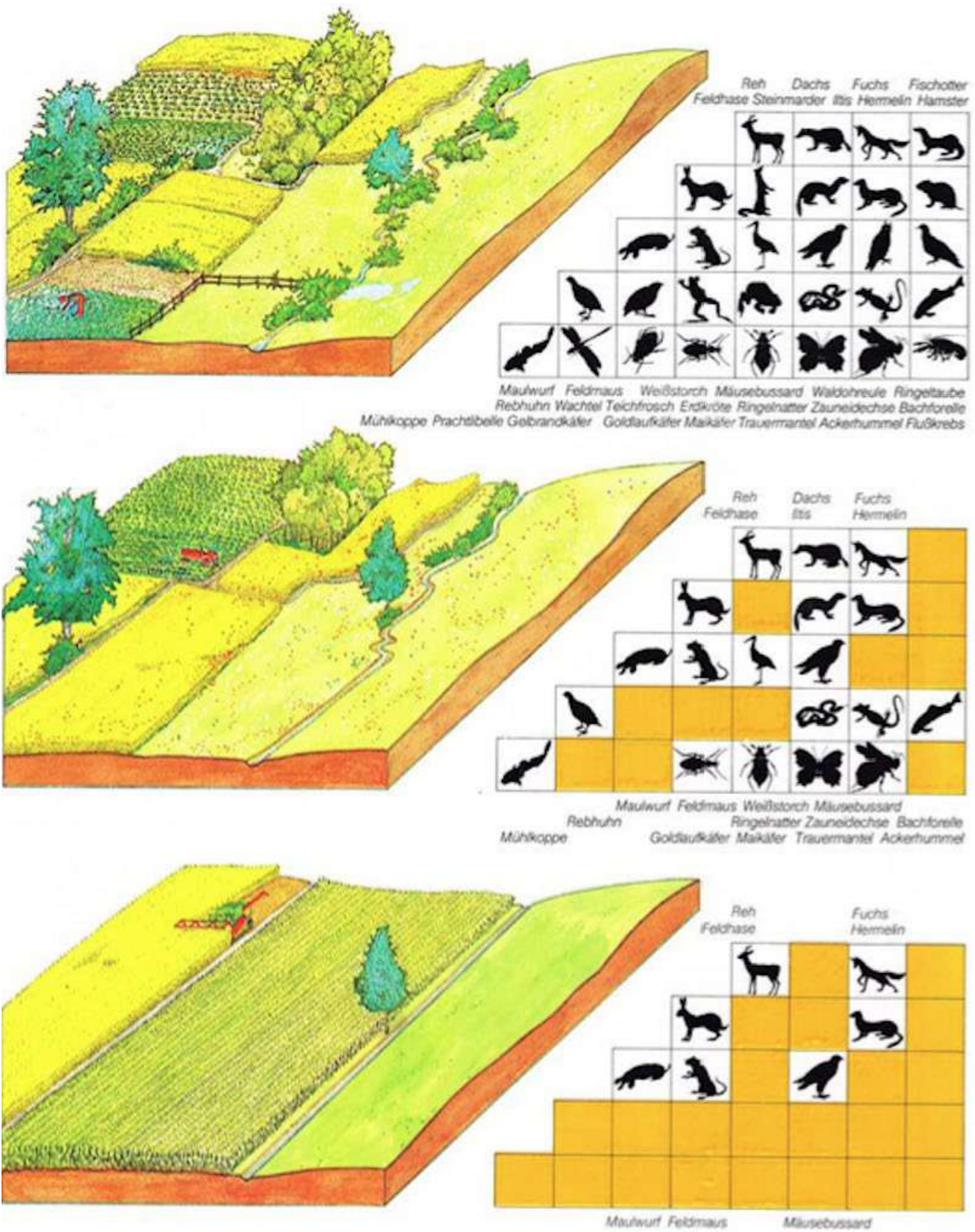
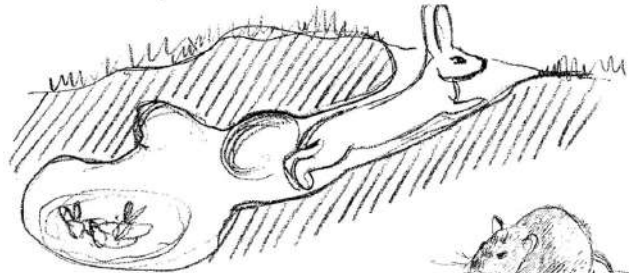
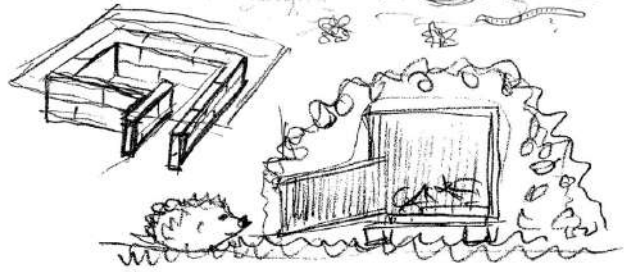
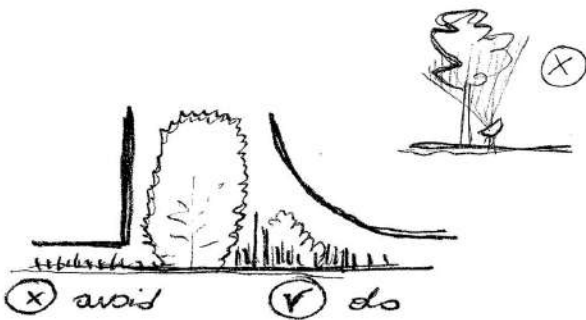
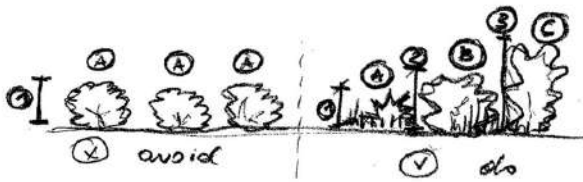
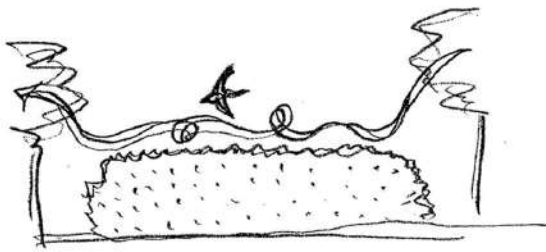
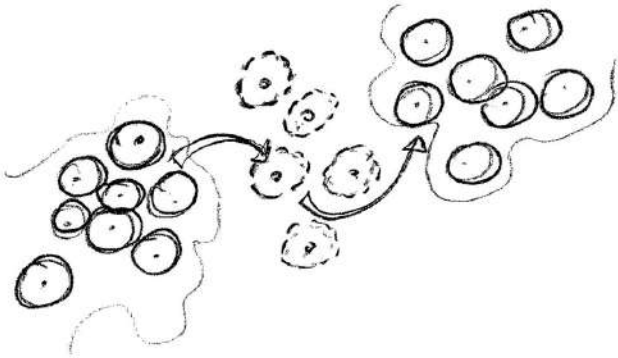
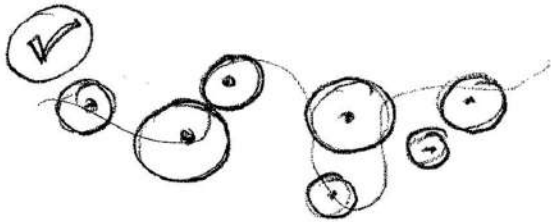
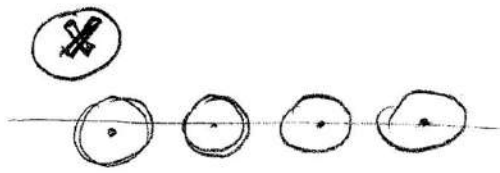


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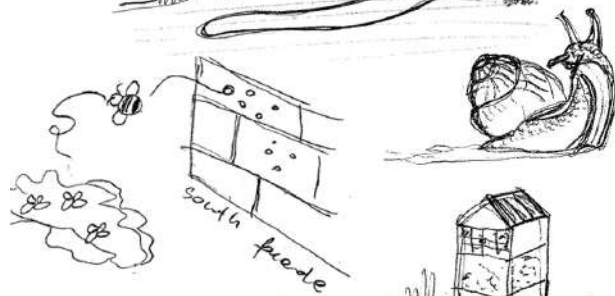
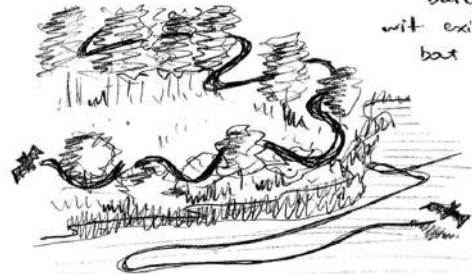
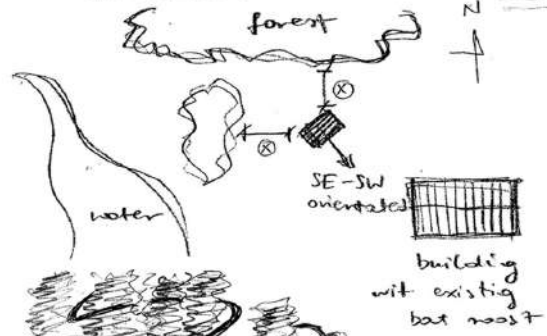


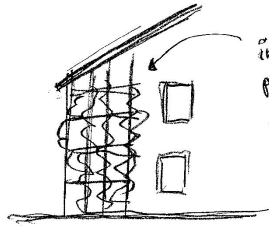
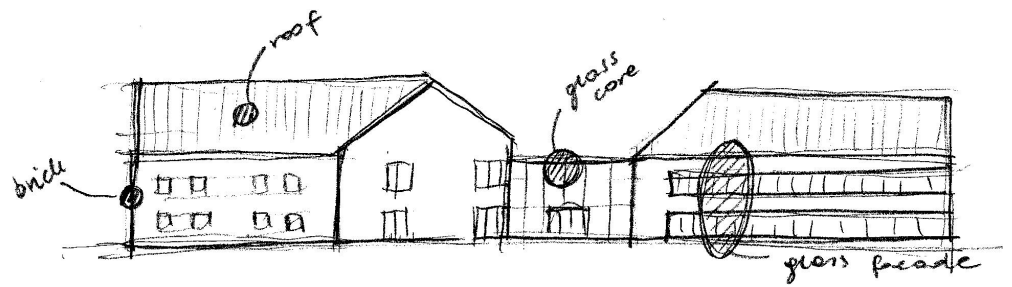
Figure 20. Dedák, D., & Zsoldos, M. (2021). Biodiversity friendly garden. Magyar Rovartani Társaság. <https://www.rovartani.hu/termeszetsbarat-kertunk/>

PERSONAL SKETCHES



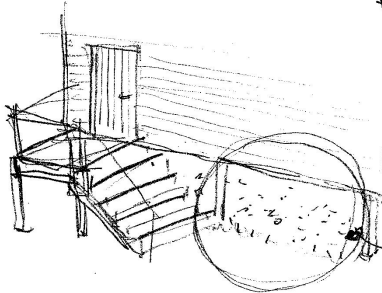
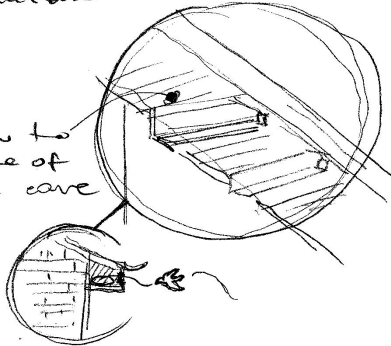
BAT HOUSES



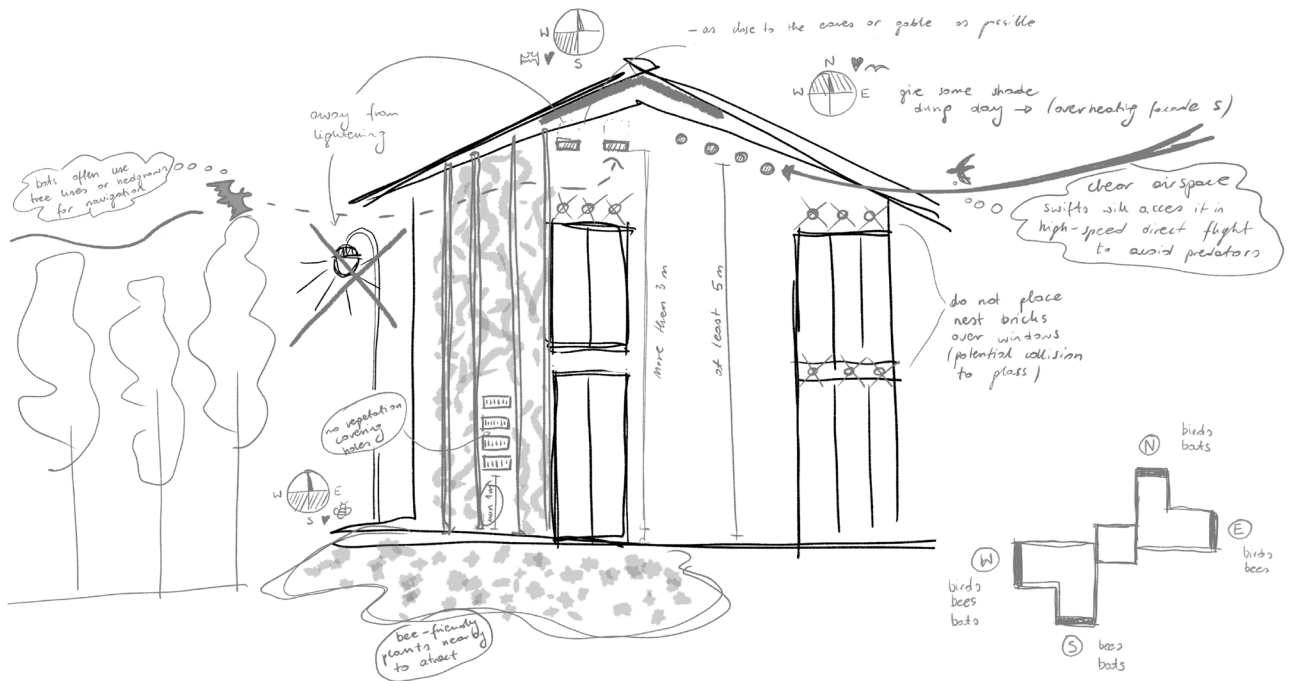
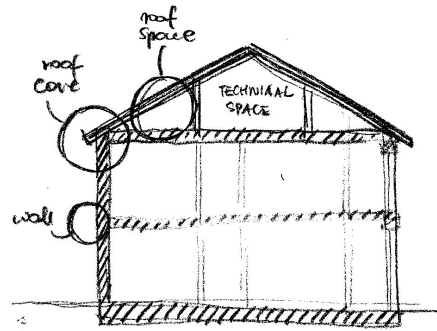
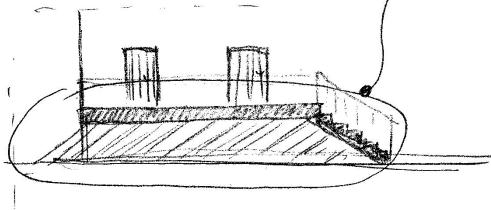


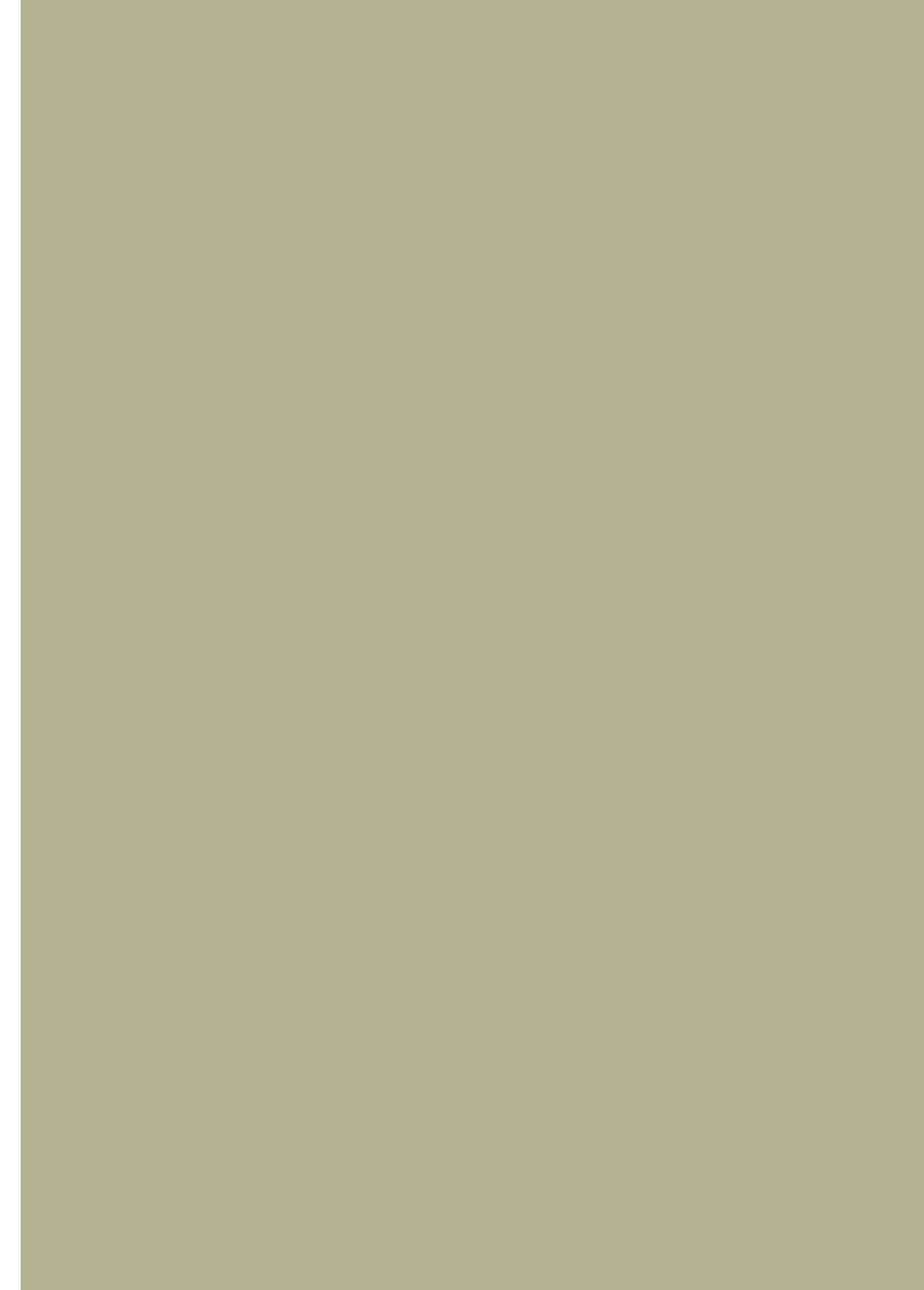
in existing building
provide wall structures
for "climbers"

how to
use area of
the roof eave



gaps under the building
are potential places for "birds"







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