

# **Nature Inclusive Architecture at Alnaelva**

Pre-diploma, fall 2020

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# Introduction

As the human population of the world grows, more and more pressure is put upon the worlds existing biodiversity. Human development threatens the habitats and territories of other species, and the conflict between human needs and the urgent need for preserving the worlds biodiversity becomes more and more apparent.

There is however a call for the fact that human and non-human habitats is not necessarily mutually exclusive. The city is vibrant with all kinds of life, and Oslo is in fact the most bio-diverse place in Norway. With the continuing need for new structures for human living as Oslos population is ever rising, the need to design our cities and buildings with biodiversity in mind becomes ever more important.



Sophie Jahnke. 2019. *Designing for Biodiversity in Neighbourhoods*. <https://nextcity.nl/designing-for-biodiversity-in-neighbourhoods/>

## Research question

- How can architectural design and methodology preserve and improve urban biodiversity?

This was the question I asked myself at the beginning of the pre-diploma. To answer this question, I intend through my diploma to propose a design for a building where the design is a direct result of adapting measures needed for preserving and improving urban biodiversity in Oslo.

My pre-diploma is then focused on the research and strategies for nature inclusive design needed as the foundation of my diploma.

The building will be a train station in Breivoll right by the Alna river.

Program:

A Nature Inclusive Train Station at Breivoll

# Intensions

The main program is the facilities and conditions created for the biodiversity of the site and surrounding area.

The development of the train station will be given less priority in terms of time spent optimizing it as an isolated typology. The main focus of the building is to show how a common urban typology related to urban densification can accommodate the needs of urban biodiversity.

The underlying goal of the project will be to show how nature inclusive design can improve urban biodiversity and create better qualities for all species inhabiting , including humans.

I want to work with an existing structure(s) by transformation and/or reuse.

# Site

I have chosen to work with Alnaelva. I have chosen Alnaelva because it is a blue green structure in the process of being rehabilitated. The river flows through many areas about to be heavily densified. The area has a great potential for highlighting the tension between the preservation of biodiversity and human habitation.

The area of Alnaelva I want to use as site is located just south of Alna and is called Breivoll. The area consists currently of two strips of industrial buildings and a railway bordering the river. The industrial area is regulated to be transformed into residential areas, and is most likely to get a railway station to accompany the densification.



Pictures from Breivoll taken on a visit of the site.

# Toolbox for nature inclusive design

“To prepare for nature inclusive design in urban areas requires a clear overview of the actors, elements and principals at play”<sup>1</sup>

If we as architects are to be able to design for an improved urban biodiversity, we need to, as we do with anything we build, know for whom we are designing and what conditions and factors must be cared for so that our design work as intended.

The following sections will touch upon knowledge and strategies that can make up a toolbox for how to execute on nature based design, ending with examples on how this can be translated into architecture.

## Content

### Knowledge

- Biodiversity
- Conditions for Biodiversity
- Threats to biodiversity
- Threats to urban biodiversity
- Politics and policies

### Tools and strategies

- Observing the city as an ecosystem
- Mapping
- Biological research
- Species as clients
- Area Neutrality
- Green corridors
- Complexity and diverse design
- Porosity

### References

- Architectural examples

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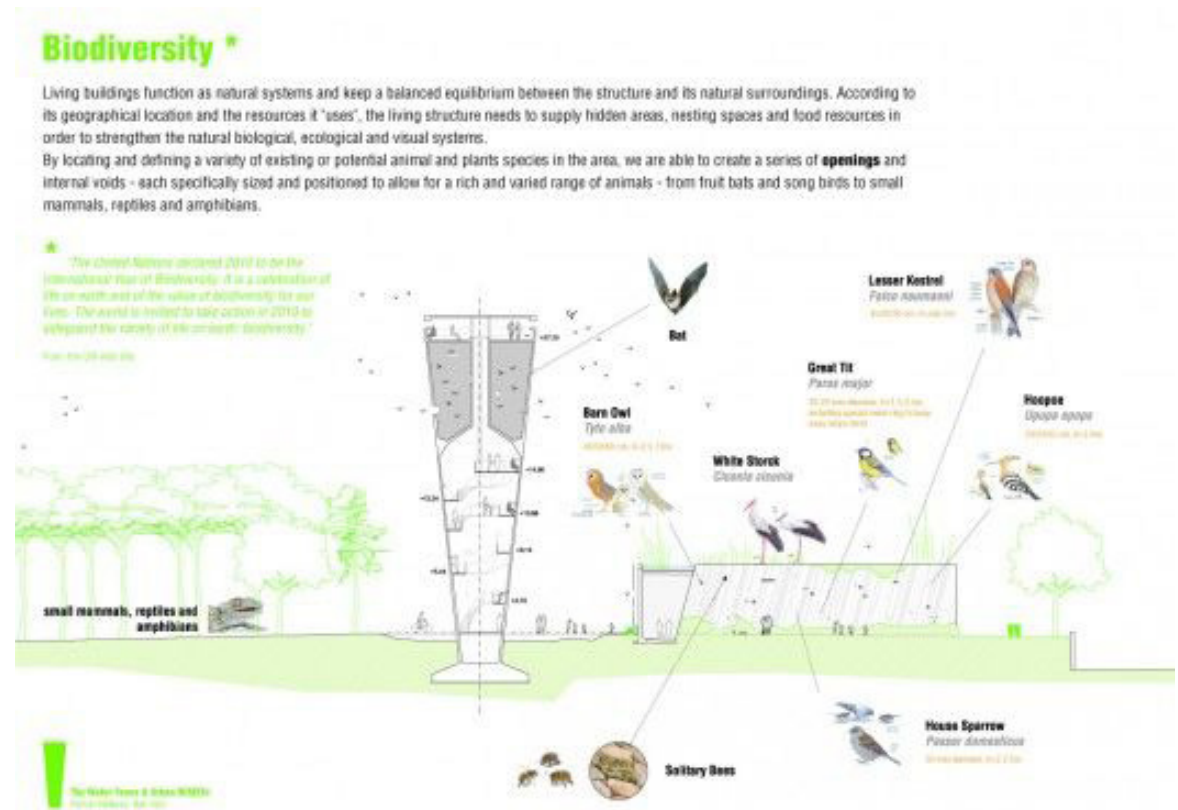
<sup>1</sup> Maïke van Stiphout, . *First Guide to Nature Inclusive Design* (Issuu: nextcity.nl, May 22, 2019) [https://issuu.com/ds\\_landscape\\_architects/docs/firstguide](https://issuu.com/ds_landscape_architects/docs/firstguide).

# Biodiversity

Biodiversity is the diversity of living organisms. The term is used for describing the number of species, the genetic diversity and diversity in biotopes or habitats.<sup>1</sup>

**Urban biodiversity** then is referring to this variety, but in the context of urban settlement, most commonly the city.

The city is an ecosystem in itself, consisting of different biotopes and species with a large variety of biotic (living) and abiotic (not living) factors that "...functions in a complex system of mutual relations".<sup>2</sup>



1 "Biologisk mangfold," Irja Ida Ratikainen, 2019, [https://snl.no/biologisk\\_mangfold](https://snl.no/biologisk_mangfold)

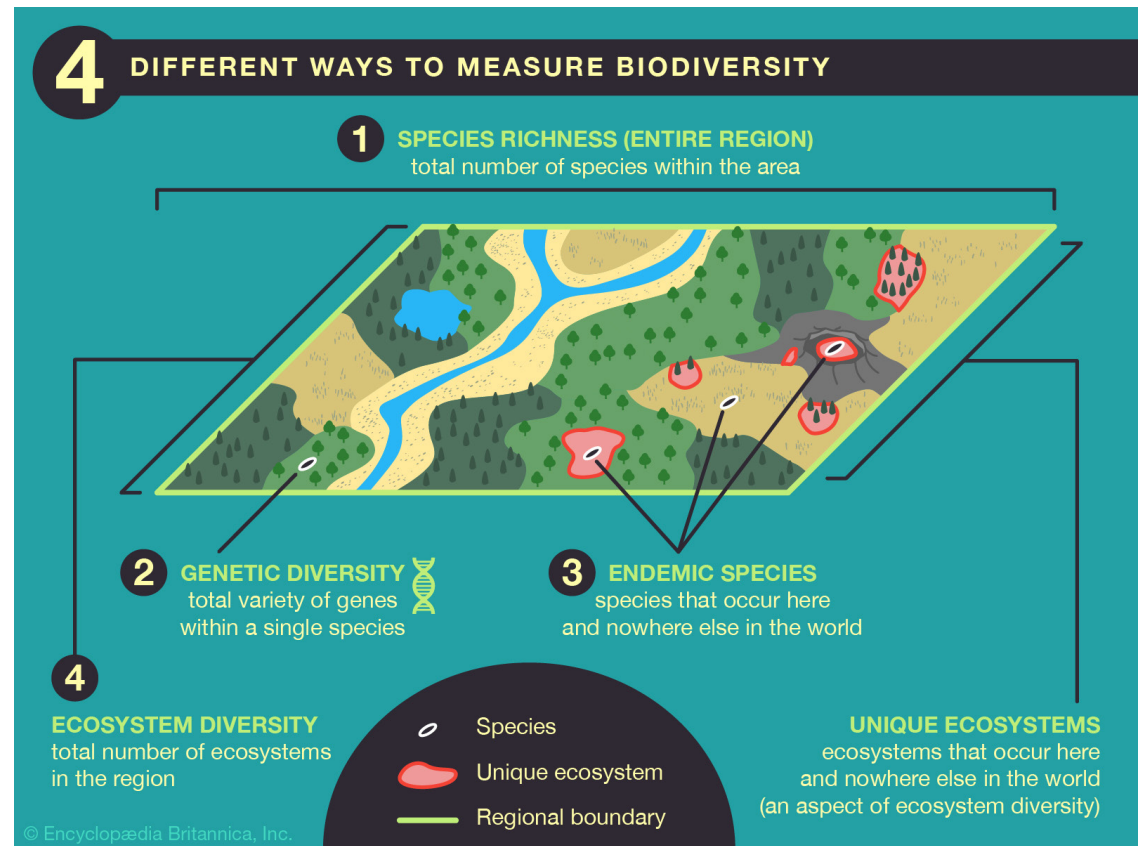
2 Jacques Vink, Piet Vollaard, and Niels de Zwarte, *Making Urban Nature* (Rotterdam, Netherlands: Nai010 Publishers, 2017), 31.

# Conditions for biodiversity

The diversity of living organisms is dependent on the complex interactions between living organisms and their environment. The removal of one species from an ecosystem could disrupt it, leading to loss of species<sup>1</sup>

The genetic diversity is essential to a species survival. Variety in a gene pool means higher chances of adapting to new environments and climate changes. A high genetic diversity is dependent on a populations ability to migrate and transfer genetic material with other population (gene flow).<sup>2</sup>

The diversity of living organisms and genetic variety rely on different biotopes or habitats, as they have adapted to their specific conditions.



1 "Naturmangfold," Sabima, <https://www.sabima.no/hva-er-natur-mangfold/>

2 "Genetisk mangfold," Ariane Karlsen, [https://snl.no/genetisk\\_mangfold](https://snl.no/genetisk_mangfold)



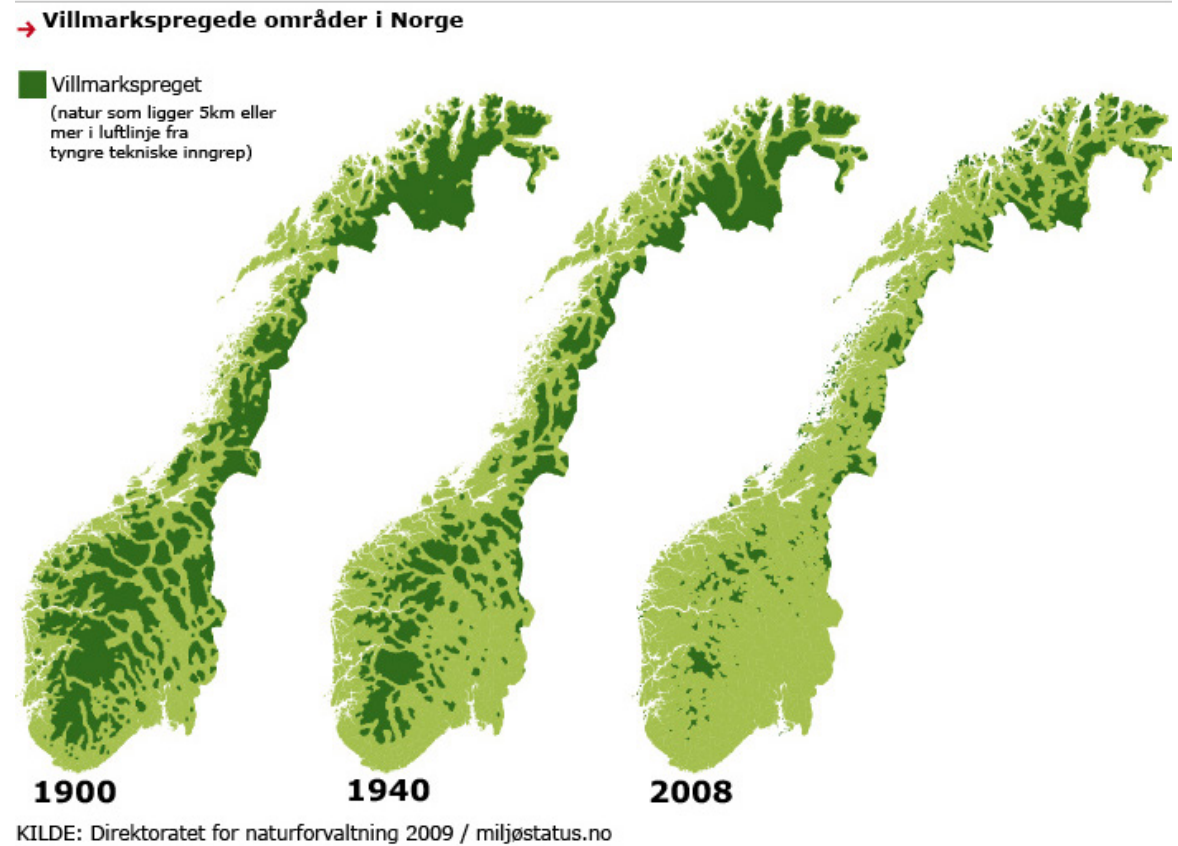
# Threats to biodiversity

There are many factors threatening biodiversity: pollution, changes and industrialization of agriculture and the introduction of new species. The largest factor, however, (and the one especially concerning architecture) is change, reduction and fragmentation of habitats caused by human development.<sup>1</sup>

Changes in a biotope can remove the basis of life for a species, removing it from the ecosystem. As the ecosystem is a fine masked network of interdependent factors, this could have devastating consequences.

Fragmentation leads to isolation of individual species, This hinders population migration, reducing their genetic pool and their change of survival.<sup>2</sup>

Reduction of biotopes reduces the variety of habitats. The speed of this reduction happening today means that species won't have time to adapt.<sup>3</sup>



1 "Arter på land," Miljødirektoratet, miljodirektoratet.no, 2019.  
<https://miljostatus.miljodirektoratet.no/tema/arter/>

2 "Genetisk mangfold"

3 "Naturmangfold," United Nation Association of Norway, fn.no, 2020.  
<https://www.fn.no/tema/klimate-og-miljoe/naturmangfold>

## Threats to urban biodiversity

In addition to fragmentation of habitats and the reduction of nature types caused by human development, the way we build our structures is a threat to the many species that have adapted to urban environments.

Different types of birds (like sparrows and swifts) and bats have for centuries used our buildings for their nests and as landmarks and hiding places while traversing through the urban landscapes.

As we built more compact structures without openings and use sleek surfaces and design with flat glass facades, many of the conditions upon urban species rely on are being taken away.



# Policies for biodiversity

Politics have a great impact on our built environment, and is something architects must in one way or another have in mind when designing. Knowledge about the existing framework enables us to establish a position in relation to the established. So what then are the policies and regulation related to biodiversity?

The main legislation that protects biodiversity in Norway is “Naturmangfoldsloven” and it applies to all sectors that manage or take decisions that has consequences for biodiversity. This makes it apply to “Plan og Bygningsloven” as well.

The municipalities in Norway has a large say in how they implement the law. Oslo has stated its goals regarding biodiversity in the City Ecological Program 2011-2026.

5.1.1 Ta sin del av det nasjonale ansvaret for å redusere tapet av biologisk mangfold. De biologisk mest truede naturområdene skal sikres og utvikles. Det skal satses på økologisk forsvarlig restaure-ring og skjøtsel. Det skal være et spesielt fokus på ansvaret for å sikre overlevelsen til rødlistede arter.

5.1.2 Revidere kunnskapsgrunnlaget om Oslo biologisk mang-fold kontinuerlig for bruk i kommunens saksbehandling.

5.1.3 Arbeidet med å redusere forekomsten av uønskete frem-mede arter skal prioriteres.

5.1.4. Oslo skal verne og rehabilitere økosystemer, naturlige habitat og levedyktige bestander av truede arter i henhold til Bern- og Riokonvensjonens målsetninger. Iverksette særlige tiltak for å bevaring av særlig truede naturtyper i Oslo.

From “Byøkologisk plan 2011-2026” regarding biodiversity<sup>1</sup>

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<sup>1</sup> Oslo kommune, *Byøkologisk program 2011-2026*, Oslo 2011, 14, <https://www.oslo.kommune.no/getfile.php/131594-1456925023/Tjenester%20og%20tilbud/Politikk%20og%20administrasjon/Milj%C3%B8%20og%20klima/Styrende%20dokumenter/By%C3%B8kologisk%20program%20for%20Oslo.pdf>

Despite high goals, the implementation of policies does not always translate into action. As we densify our urban environment, important biotopes are being removed when environmental considerations are weighed against other necessities.

At Fossumdumpa in Stovner we find a special ravine type, a type that has been reduced with over 30 % in eastern Norway. It will now be replaced with a new swimming hall. 4 acres of valuable agricultural landscape must step aside for a new facility for water supply at Husebyjordet.<sup>1</sup>

Fig 1



I dette området, på Stovner, den såkalte Fossumdumpa, skal det bygges nye idrettsanlegg på bekostning av naturen. Foto: Helge Høifredt / Wikipedia

– Naturområdene i Oslo bygges ned bit for bit. Og det er vanskelig for oss politikere å stå imot

Fig 2



Venstres Odd Einar Derom (med caps) var en av aksjonistene som demonstrerte utenfor Oslo rådhus. Foto: Naturvernforbundet Oslo Vest

– Blåser det rødgrønne byrådet i jordvernet når det bygges ny vannforsyning på Husebyjordet?

Newspaper articles showing the conflicts arising when different interests collide with nature preservation issues.

Fig 1. An article about the political struggles against nature loss. <https://vartoslo.no/byutvikling-husebyjordet-naturvern/naturomradene-i-oslo-bygges-ned-bit-for-bit-og-det-er-vanskelig-for-oss-politikere-a-sta-imot/268677>

Fig 2. An article showing public protest against new development on agricultural land. <https://vartoslo.no/colin-murphy-hele-oslo-huseby-skole/blaser-det-rodgronne-byradet-i-jordvernet-nar-det-bygges-ny-vannforsyning-pa-husebyjordet/101382>

<sup>1</sup> “Naturområdene i Oslo bygges ned bit for bit. Og det er vanskelig for oss politikere å stå imot,” Sofia Rana, vartoslo.no, 2020, <https://vartoslo.no/byutvikling-husebyjordet-naturvern/naturomradene-i-oslo-bygges-ned-bit-for-bit-og-det-er-vanskelig-for-oss-politikere-a-sta-imot/268677>

# Policies for Breivoll

First and foremost, Breivoll will be affected by the Oslos plan for the restoring of the Alna river.

Breivoll is also part of the densification plans for Oslo.

As of now, the most detailed plan for Breivoll is a VPOR. Despite being a long detailed document, it does not mention how it will confront biodiversity and the proposed structures closeness to nature (other than how it could benefit the qualities of recreational activities for people).

There will be a need for more public transportation to support the increased amount of people moving in to the new areas. There is a push for a train station at Breivoll because of the existing railroad and the need to provide public transport to this area.

fig 3. [https://od2.pbe.oslo.kommune.no/pages/vedlegg/vpor/breivoll\\_dok.pdf](https://od2.pbe.oslo.kommune.no/pages/vedlegg/vpor/breivoll_dok.pdf)

fig 4. <http://www.oslonord.com/BreivollStasjon.html>

fig 5. <https://www.oslo.kommune.no/getfile.php/1360425-1553524642/Tjenester%20og%20tilbud/Plan%2C%20bygg%20og%20eiendom/Overordnede%20planer/Kommunedelplaner/Kommunedelplan%2018%3A%20Alna%20milj%C3%B8park%2C%20plankart.pdf>

Fig 3

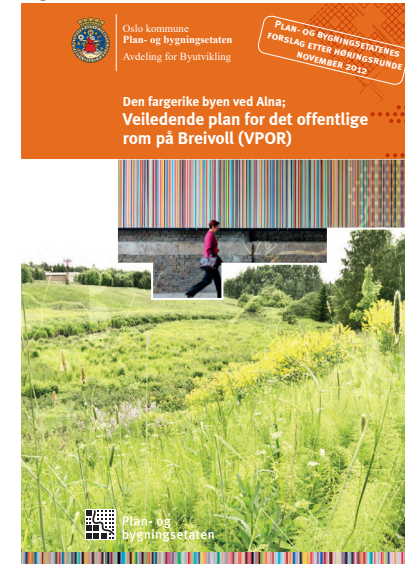


Fig 4

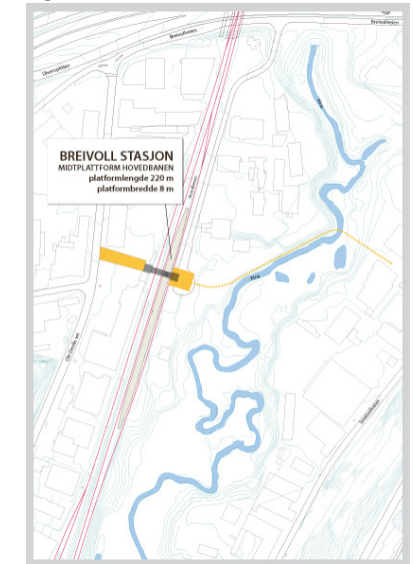
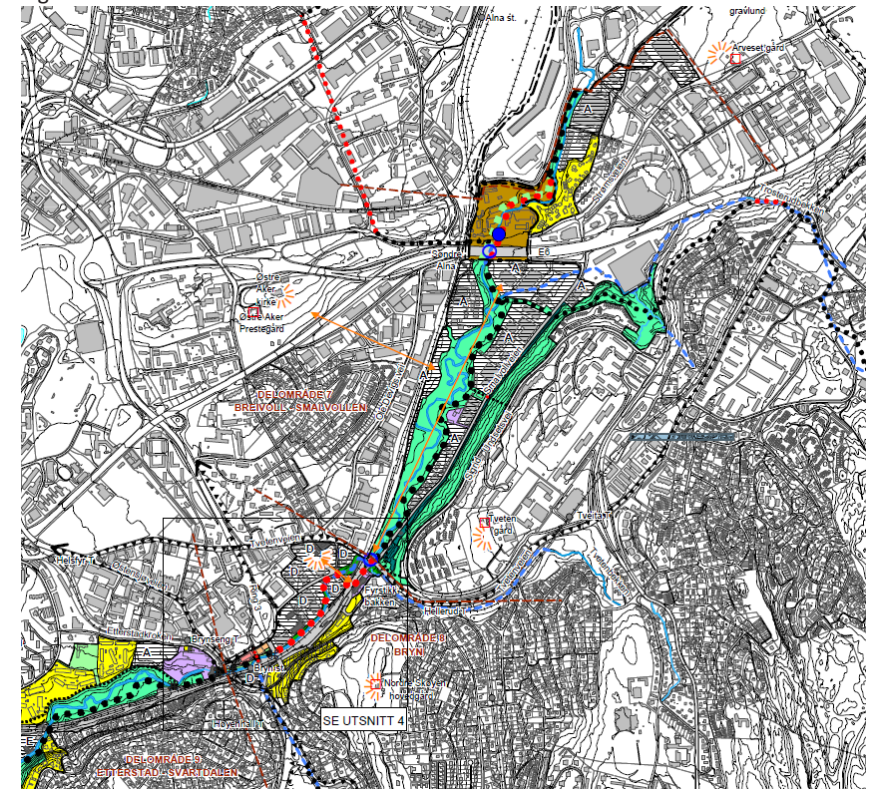


Fig 5



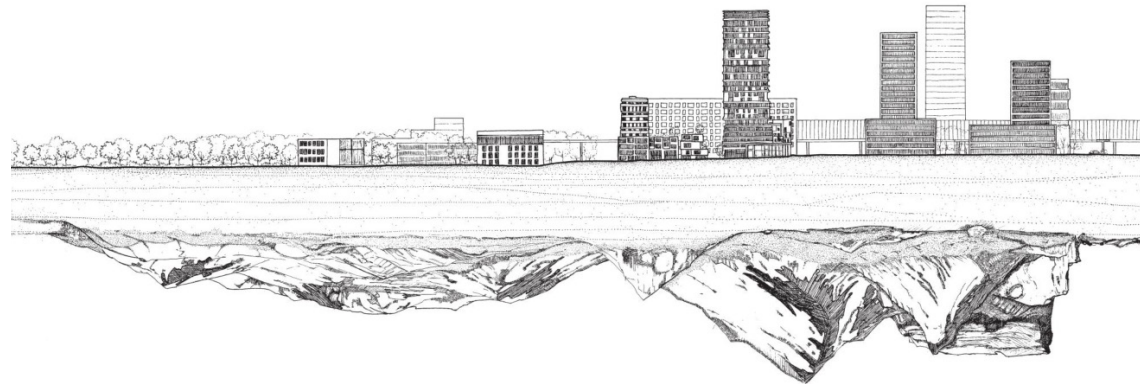
# Observing the city as an ecosystem

80% of the species we have in Norway can be found in Oslo.<sup>1</sup> The city is a dynamic biotope in constant change, and no one has a full overview of how it is all connected.

To help understanding some of the mechanisms involved we can look at observations to get a glimpse of the often hidden life of the city.

Even though anecdotal in nature, these observation can kickstart our imagination and start seeing the city the way other species do.

fig. 6. Illustration by DS Landscape Architects. [https://issuu.com/ds\\_landscape\\_architects/docs/firstguide](https://issuu.com/ds_landscape_architects/docs/firstguide).



“The common swift arriving in the city does not see parks, apartments, offices or hotels. It sees a mountain-like scene with numerous potential sites for establishment. It perceives the city as a single landscape with dense, alternating patterns of rocks, plains and water bodies.”<sup>2</sup>

1 “Rødlisterarter i Oslo,” Stiftelsen Norsk Naturarv, accessed 16. november 2020 <https://www.naturarv.no/roedlistearter-i-oslo.50464.no.html>  
2 Stiphout, . *First Guide to Nature Inclusive Design*, 93



fig. 7

Fox hunting hot dogs at Hovedøya. Still from the documentary "Oslos Ville Hjerter"



fig. 8

Sparrowhawk using the spires at uranienborg kirke as vantage point when hunting. The prevalence of prey such as city pigeons has made the city a hunting ground for predatory birds.

fig 7. <https://tv.nrk.no/serie/ut-i-naturen/2017/DVNA50000714>

fig 8. <https://vartoslo.no/anders-hoilund-geir-sverre-andersen-ketil-knudsens-vandrefalk-er-sjefen-over-byens-luftrom-majorstua-uranienborg-vaterland-og-okern-er-falkens-jaktmarker/215798>

# Mapping

Mapping can be used as a way of organizing the intricate network of living organisms and biotopes of the city. Artsdatabanken provides data on observations of species and types of nature. By systemizing the many layers of info available we can start to grasp the needs of a site, and how to approach it with biodiversity in mind.



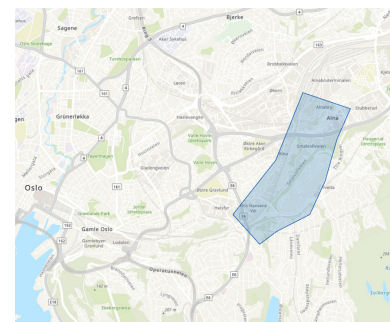
Screenshot of an example on sorting data in artsdatabanken. Here, the filter shows all species in Oslo city center listed with the conservation status “least concern”.





Naturtype

- |   |   |   |                  |
|---|---|---|------------------|
|  | Gråor-heggeskog                                 |  | Rik edellauvskog |
|  | Kalkskog  |  | Store gamle trær |
|  | Gammel barskog                                  |  | Viktig bekkedrag |
|  | Gammel boreal lauvskog                          |   |                  |
|  | Naturbeitemark                                  |   |                  |
|  | Parklandskap                                    |   |                  |
|  | Kroksjøer, flomdammer og meandrerende elveparti |   |                  |



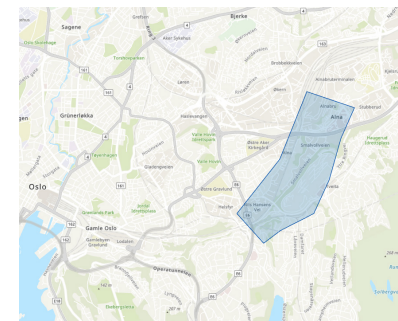
VUSårbar

- lomvi
- ulv



Nær truet

- |  |   |   |   |
|--|---|---|---|
| <span style="color: pink;">●</span> bergirisk      | <span style="color: red;">●</span> havelle          | <span style="color: purple;">●</span> ringgås       | <span style="color: green;">●</span> taksvale       |
| <span style="color: lightgreen;">●</span> dverglo  | <span style="color: teal;">●</span> hønehauk        | <span style="color: blue;">●</span> komkråke        | <span style="color: orange;">●</span> toppdykker    |
| <span style="color: lightblue;">●</span> fiskemåke | <span style="color: yellow;">●</span> gulspurv      | <span style="color: lightpurple;">●</span> lerkfalk | <span style="color: lightgreen;">●</span> sandsvale |
|  | <span style="color: lightblue;">●</span> praktærugl | <span style="color: yellowgreen;">●</span> lirype   | <span style="color: lightblue;">●</span> sivspurv   |
|  |   | <span style="color: pink;">●</span> nattergal       | <span style="color: purple;">●</span> tyrkerdue     |
|  |   | <span style="color: lightblue;">●</span> svartand   | <span style="color: lightgreen;">●</span> ærfugl    |



# Biological research

The data from artsdatabanken shows us observations of species and a superficial view of the types of nature. To get further into detail, a proper biological investigation is needed. NIVA (Norsk Institutt for Vannforskning) released in September this year a study of the Alnariver with suggestions for measures for improving the quality of the blue green area and consequences for different measures.

The research concluded that the water in the Breivoll part of the river was polluted with low support for biodiversity.<sup>1</sup> We can assume then, that as the future measures taken to improve Alnaelva will drastically change the ecosystem from the state we find it today.



NIVA 7529-2020

Tabell 4.7.A Kunnskapssammenstilling for Breivollen – Smalvollen delområde. U.T. = ukjent tilstand. VM = Vannmiljø.

Delområde	Delstrekning; sidebakk	Påvirkning		Miljøtilstand			Åpen bekk / elv	Rekreasjon / turvei	Kulturmiljø /-minner	Tidsperspektiv	Utfordringsnivå
		Forurensning	Fysisk	Kjemisk tilstand	Økologisk tilstand	Naturtype /-verdier					
Breivollen – Smalvollen (7) Fra utløp av kulvert ved Terminalveien til Tvetenveien.  Sidebekker: Haugerudbekken, Trosterudbekken med sideegner, Dedichenbekken og Stubberudbekken	Hovedløpet Alna	Sannsynlig forurenset vann fra observerte overvannsledninger og fra øvreliggende områder.	Kulvert under E6, Strømsveien, Persveien.	Ikke god tilstand.	Cyanobakterier og kiselalger, sterkt påvirket (Løvstad og Wold, 2018).	Nasjonal verdi; strandsump, elveskog, grønn heggeskog.	Åpent løp.	Mangler turvei-forbindelse på tvers av E6.	Tveten gård, gammelt kulturlandskap og Søndre Alna gård.	Vannkvalitet: omfattende tiltak krever langt tidsperspektiv.	
		Veivann fra E6 går via overvannsledning til Alnaelven. Forurenset grunn, fyllinger. Avrenning fra industri.	Få påvirkninger.	Svært dårlig tilstand, fisk og bunndyr (ASPT) 2017 (VM 006-9001, 006-56472).		Flott turvei starter sør for E6, unikt område. Brudd i turvei ved Tvetenveien.		Et unikt natur- og kulturmiljø i storby på europeisk skala.			
	Trosterudbekken (Haugerud-, Sølvdals-, Stubberud- og Dedichenbekken)	Diffus avrenning fra næringsområder, E6 og Stubberudfyllinga.	Store deler i rør.	U.T.	U.T., antagelig under miljømålet. I rør.	Skogsterreng	I rør.	Turvei fra Østmarka.		PBE velger trasé 4 med ronsødam som prinsipp for Haugerudbekken. Innspill fra Statens Vegvesen; Bekkeåpning langs E6 er usikker og avhengig av fremtidige planprosesser for E6. Gjenåpning av Trosterudbekken vurderes ikke videre for dette prosjektet.	
	Haraldrudbekken	Haraldrud gjenbruksstasjon, fra rør.	I rør under jernbanen.	U.T.	I rør.	Få verdier registrert.			Få verdier registrert.		

Table 1. from <https://www.niva.no/en/projectweb/alnaelvaprosjekte>

1 *Alna - kunnskapssammenstilling og mulighetsstudie*, Ingrid Nesheim, Therese Fosholt Moe, Sissel Brit Ranneklev and Ingvild Skumlien Furuset, NIVA, 2020, accessed 16. november 2020, <https://www.niva.no/en/projectweb/alnaelvaprosjektet>, 70-76

# Species as clients

“Anyone who works on designing the city, want to make city policy or wants to understand the complete city as an ecological system, should first get to know its inhabitants. We know what people need and how they behave, or at least we assume so... ..We are less familiar with the other inhabitants: the animals and plants, while these are just as much part of the urban whole”<sup>1</sup>

There is a variety of different species with different needs, from species that grow in the soil to species that feeds in the sky. Researching them to know their exact needs for nesting, roosting, feeding grounds and other abiotic factors removes assumptions when designing for them.

Designing for nature inclusive design at Breivoll will require facilities for multiple species. Here, I have presented one research example of a species that have adapted to our urban structures, showcasing how to work with the needs of that species.

requirements for animals

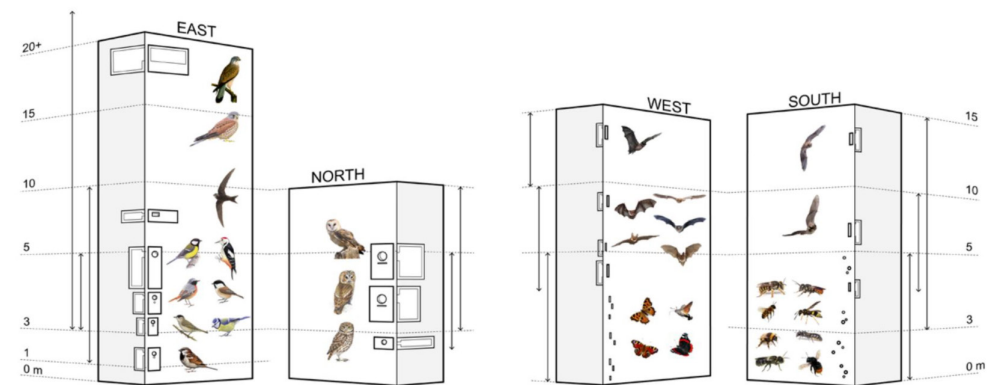


fig. 9. Illustration by DS Landscape Architects. [https://issuu.com/ds\\_landscape\\_architects/docs/firstguide](https://issuu.com/ds_landscape_architects/docs/firstguide).

## Example study: Bats

Bats are an example of a species that adapted to man made change of environment. They took to roosting in houses, church lofts and other voids in human structure, but “modern trends related to densification and shifts in construction methods are nonetheless making natural enrichment of the ecosystem harder. They find less nesting sites with the increased use of glass facades and tight insulation materials.”<sup>1</sup>

### Nesting

Bats do not build their own nests and are entirely dependent on existing cavities<sup>2</sup> Every bat needs a roost to sleep and find shelter during the day. Additionally three different functions are required; three different roosts each in a different place:

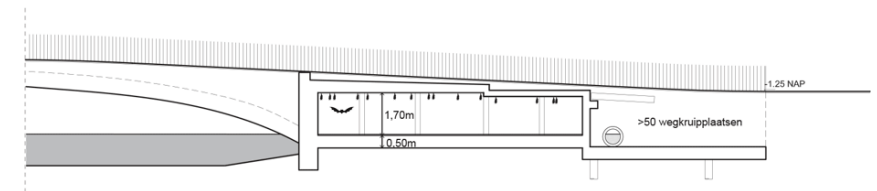
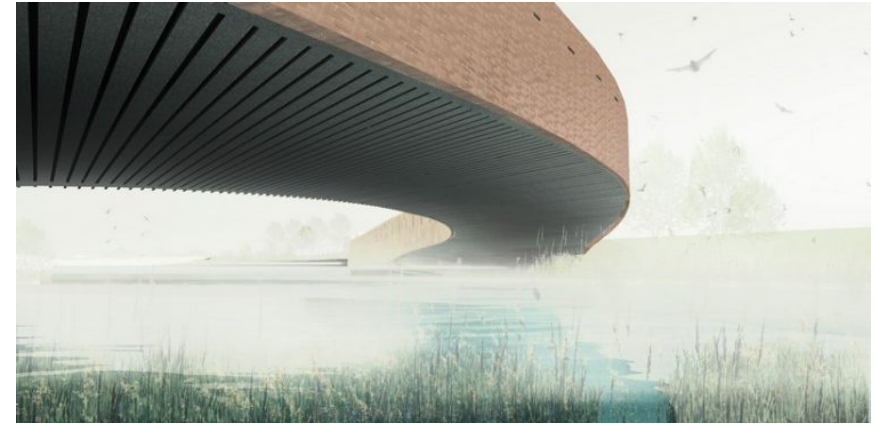
1. A building for mating
2. Nesting place for breeding colony
3. Nest for hibernation during winter

### Feeding

In terms of feeding ground, bats are most likely to be found in habitats that support an abundance of insects<sup>3</sup>

They want the foraging area to be as close to the nest as possible to save energy. Preferred areas are quiet and relatively dark. The flight path between the nest and foraging area are important, and are often tree-lined lanes providing wind protection.<sup>4</sup>

Artificial lightning causes disturbances at the roost, feeding behavior and their use of commuting routes.<sup>5</sup>



Bat bridge by Next Architects  
<https://www.dezeen.com/2015/10/26/ecological-bat-bridge-next-architects-completed-habitation-holland-monster/>

1 Carol Williams, *Biodiversity for Low and Zero Carbon Buildings: a Technical Guide for New Build* (London, England: RIBA Pub, 2010), 81.

2 Jacques Vink, Piet Vollaard, and Niels de Zwarte, *Making Urban Nature*, 65

3 Carol Williams, *Biodiversity for Low and Zero Carbon Buildings*, 1

4 Jacques Vink, Piet Vollaard, and Niels de Zwarte, *Making Urban Nature*, 69

5 Carol Williams, *Biodiversity for Low and Zero Carbon Buildings*, 91

# Area Neutrality

Area neutrality, or land degradation neutrality (LDN for short), aims to maintain land-based natural capital. This is done by counterbalancing expected losses of nature with measures to achieve equivalent gains within the same land type, or measures taken to avoid building on unused land altogether.<sup>1</sup>

In short: where it impossible to transform or re-use already developed area, you give back to nature the same area you take from it. The philosophy is based on assuring the diversity of biotopes does not decrease. Other concepts that relates to this strategy is transformation or reuse of already built structures, and rewilding; the act of restoring previously destroyed nature.

<sup>1</sup> Annette L. Cowie et al. "Land in balance: The scientific conceptual framework for Land Degradation Neutrality." *Environmental Science & Policy*. Volume 79, January 2018. <https://www.sciencedirect.com/science/article/pii/S1462901117308146>

## Naturperlen i Lofoten skal som første kommune i Norge bli «arealnøytral»

I Flakstad i Lofoten har de bestemt seg for bevare sine vakre naturområder i stedet for å bygge ut. – Svært gode nyheter, mener miljøorganisasjon.



Kvalvika på Moskenesøya i Flakstad. Lofotkommunen har blant annet nydelige strender, og nettopp det vil den nye ordføreren bevare.

FOTO: TRYGVE SKOGRAND



**Andreas Budalen**  
@Andreas\_Budalen  
Journalist



**Kai Jæger Kristoffersen**  
@Fergekaiaen  
Journalist

Publisert 12. okt. 2019 kl. 09:01  
Oppdatert 12. okt. 2019 kl. 09:04

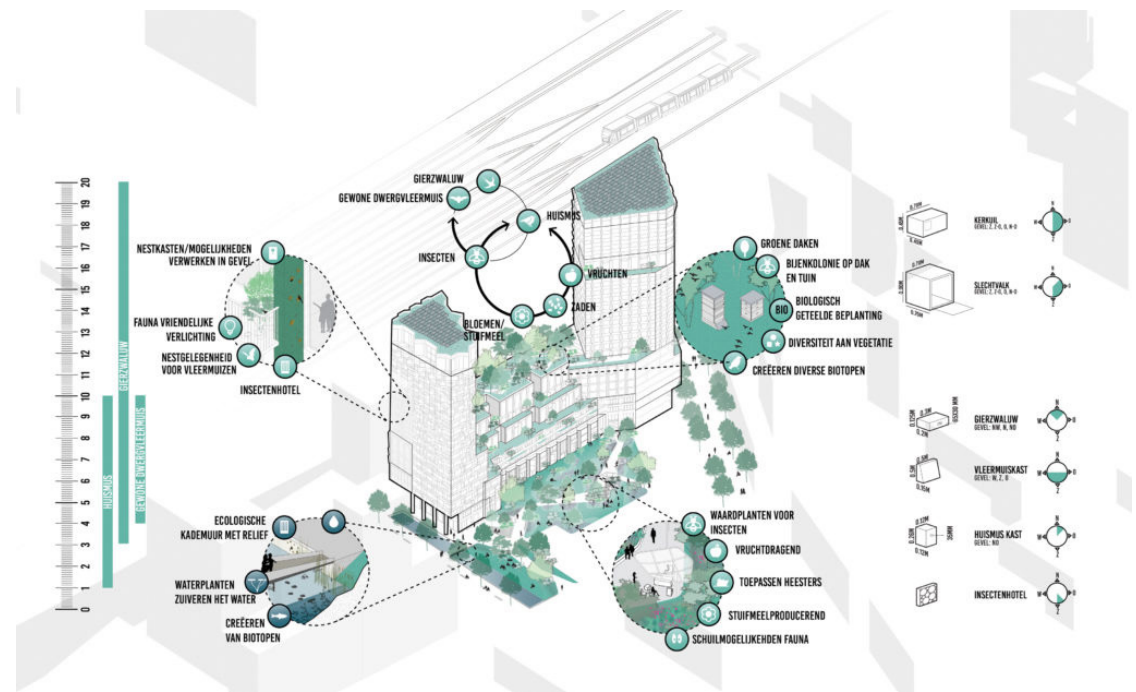


Artikkelen er mer enn ett år gammel.

fig. 10. [https://www.nrk.no/nordland/naturperlen-i-lofoten-skal-som-forste-kommune-i-norge-bli-\\_arealnøytral\\_-1.14737677](https://www.nrk.no/nordland/naturperlen-i-lofoten-skal-som-forste-kommune-i-norge-bli-_arealnøytral_-1.14737677)

# Complex and diverse designs

The resilience of an ecological system benefits from complexity and diversity. A design that can incorporate habitats for a large number of different species and facilitate complex relationships and connections is better than simplicity and homogeneity.<sup>1</sup>



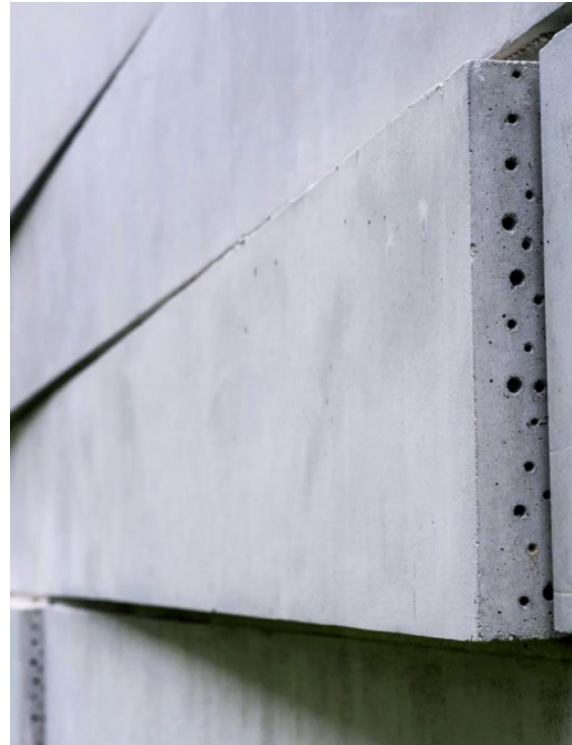
winning proposal for residential building in Zurich by DELVA Landscape Architecture Urbanism, MVSA Architects, VMX Architects, <https://www.dearchitect.nl/architectuur/nieuws/2019/09/de-puls-geselecteerd-als-winnend-concept-voor-braakliggend-terrein-sc-buitenveldert-zuidas-amsterdam-101230633>

# Porosity as design principle

As a guiding design principle I want to use porosity.

Porosity can be how a footprint allows for greenery to permeate a site

Porosity can be how materials allows for insects or grass to inhabit a structure



Pictures taken from *First Guide to Nature Inclusive Design*. Unknown Photographer. [https://issuu.com/ds\\_landscape\\_architects/docs/firstguide](https://issuu.com/ds_landscape_architects/docs/firstguide).



# Architectural examples of nature inclusive design

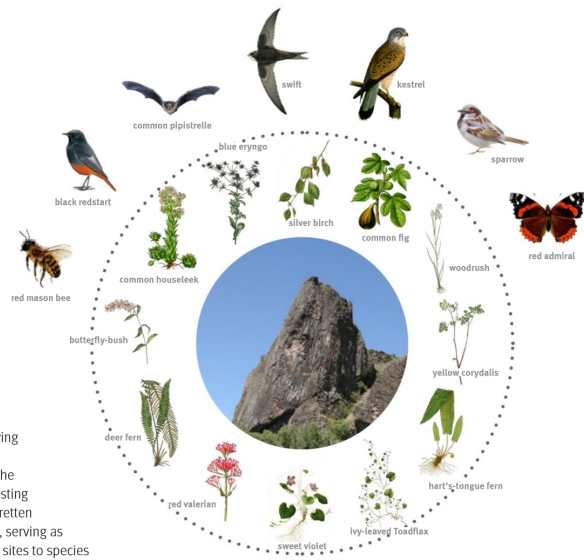
“Vertical” by NL Architects, Studio DVMB, Space Encounters and Chris Collaris Architects is a good example of how to take abstract knowledge and give it a design answer. The concept is based on the idea of taking inspiration from natural biotopes and recreating them in form of a residential building. The facade is designed with intentional nooks and crevices as well as built in nesting structures. This is combined with facilitating for the right vegetation for the biotope they wish to emulate.

The urban biotopes chosen for Vertical



fig. 11

### The rock biotope



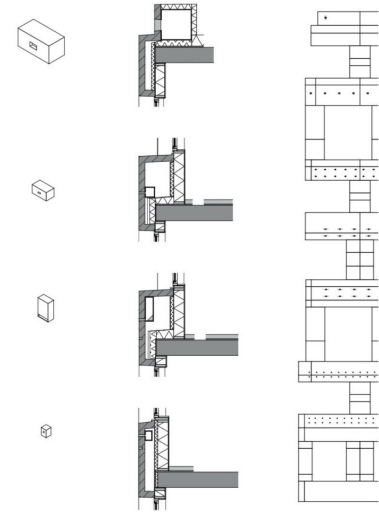
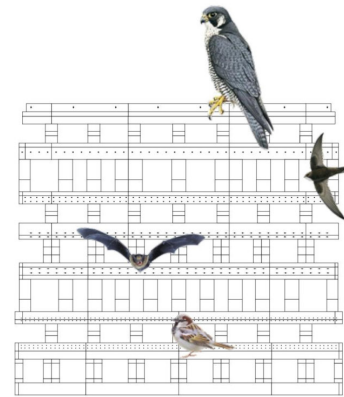
Sloterdijk consists mainly of buildings, paving and infrastructure: the rock biotope. The designed cracks and holes of the walls of the tower N1 from Vertical provide plenty of nesting places. This tower has no plants, but the Bretten biotope is situated at its foot. The building, serving as a giant rock provides shelter and breeding sites to species that feed in the surroundings.

This illustration provides a representation of the kinds of species that could be considered while designing for an urban rock biotope.

100 101

fig. 12

The translation of knowledge of biodiversity to design concept.



Tower N1, Vertical, Amsterdam, Donna van Milligen Bleike

fig. 13

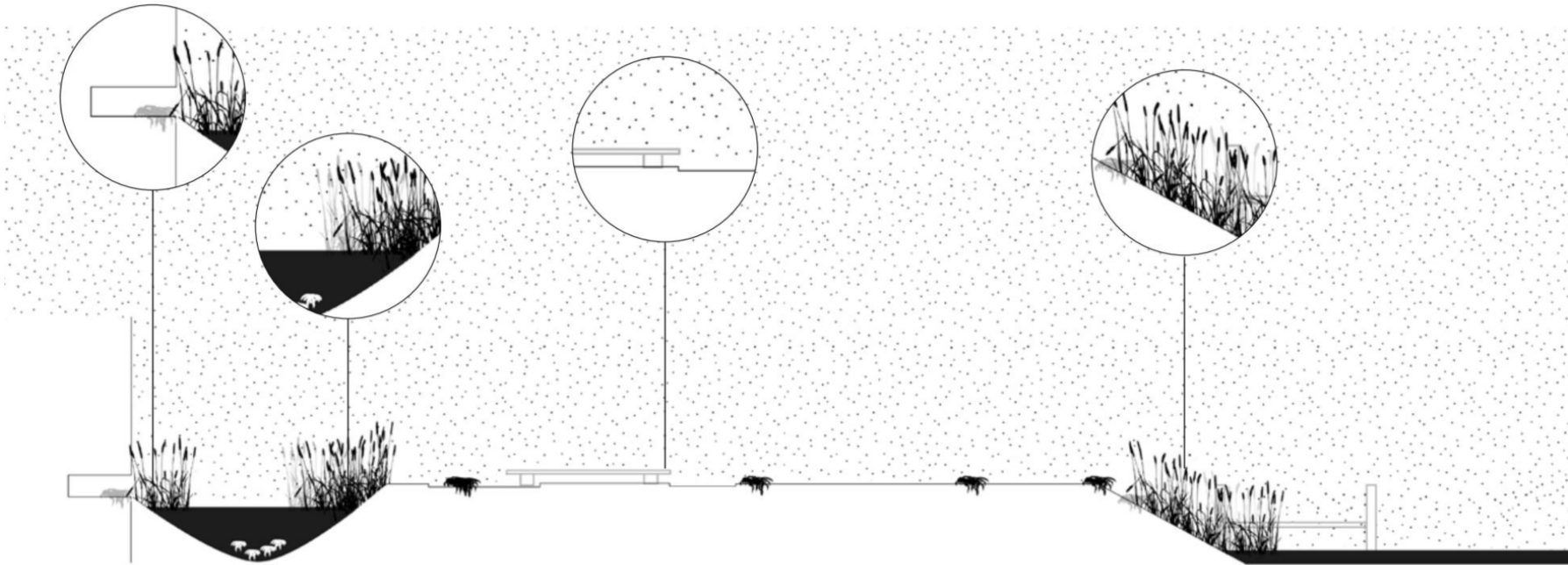
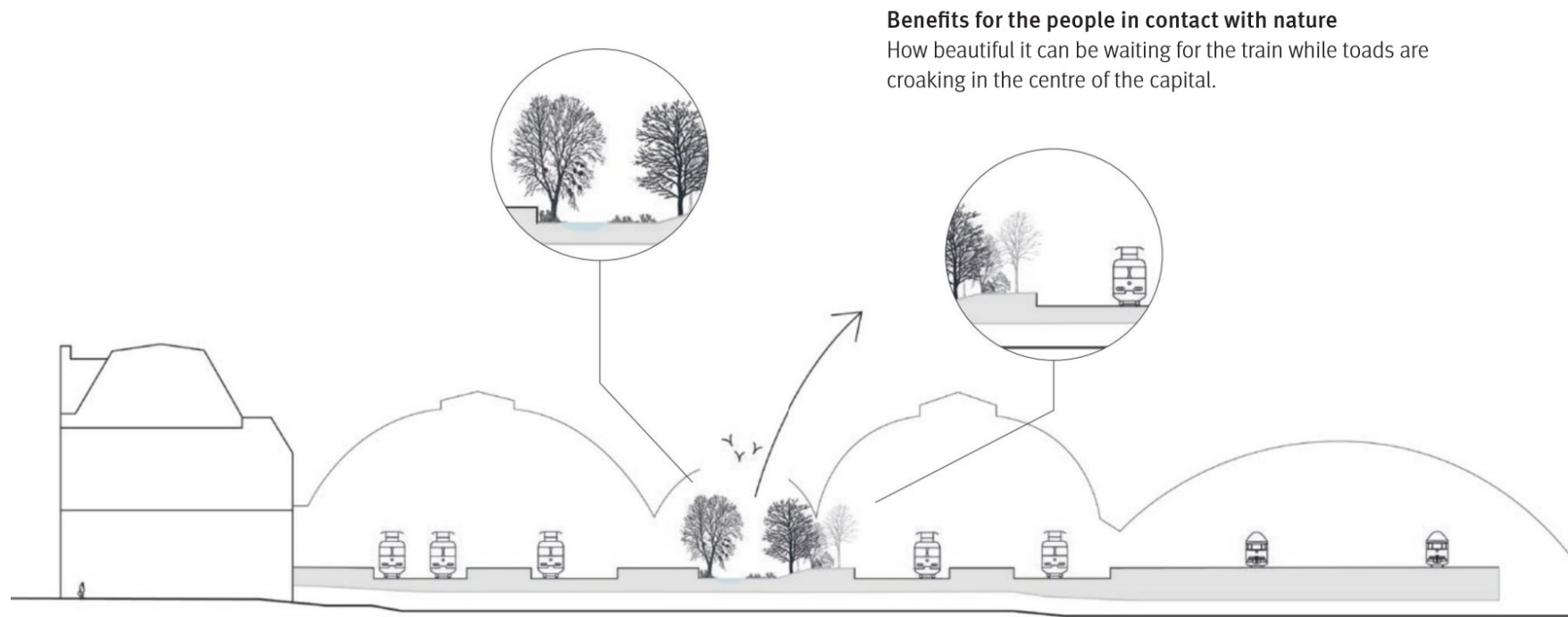


fig. 14

Oba square for humans and crayfish by Joske Van Brugel shows how the building mass (to the far left of fig. 18) meets the river and its inhabitants by including a flat surface with a protective overhang. This creates the perfect conditions for the rivers crayfish during flooding.<sup>1</sup>



**Benefits for the people in contact with nature**

How beautiful it can be waiting for the train while toads are croaking in the centre of the capital.

fig. 15

Platform for nature by Anne Van der Graaf is an example of how a railway station can increase the qualities for the people boarding their trains and the surrounding biodiversity. Openings in the roof lets birds visit the trees that surrounds a corridor for frogs.<sup>1</sup>

## Summary and further work

The most important conclusions to take into the diploma is the fact that there are numerous tools and strategies to include nature into architectural design. The challenge lies in synthesizing this into a working coherent architecture and will be the main focus throughout the diploma.

To decide the requirements of the train station, some more research into the typology of train stations and the development plans of Breivoll and of and connected areas are needed.

I intend the design to include facilities for several species, and defining which early in the diploma will therefore be important.

## Schedule

### January

- Research: Train Station and Breivoll
- Deciding: species included in the project

### February

- Constructing model and underlying drawing material
- Volume, footprint and site studies (sun, wind, other abiotic factors)
- Write: Program

### March

- Development of technical solutions, facade and material
- Programmatic distribution

### April

- Final decisions
- Program revision if needed

### May

- Production of presentation materials, drawings, final model, manuscript

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