

Designing for Coexistence

or how to overcome the speciesistic bias in spatial design



Conversation with a Stone

I knock at the stone's front door.
It's only me, let me come in.
I want to enter your insides,
have a look round,
breathe my fill of you."

"Go away," says the stone.
"I'm shut tight.
Even if you break me to pieces,
we'll all still be closed.
You can grind us to sand,
we still won't let you in."

I knock at the stone's front door.
"It's only me, let me come in.
I've come out of pure curiosity.
Only life can quench it.
I mean to stroll through your palace,
then go calling on a leaf, a drop of water.
I don't have much time,
My mortality should touch you."

"I'm made of stone," says the stone,
"and must therefore keep a straight face.
Go away,
I don't have the muscles to laugh."

I knock at the stone's front door.
"It's only me, let me come in.
I hear you have great empty halls inside you,
unseen, their beauty in vain,
soundless, not echoing anyone's steps.
Admit you don't know them well yourself."

"Great and empty, true enough," says the stone,
"But there isn't any room.
Beautiful, perhaps, but not to the taste
of your poor senses.
You may get to know me, but you'll never know me
through.
My whole surface is turned toward you,
all my insides turned away."

I knock at the stone's front door.
"It's only me, let me come in.
I don't seek refuge for eternity.
I'm not unhappy.
I'm not homeless.
My world is worth returning to.
I'll enter and exit empty-handed.
And my proof I was there
will be only words,
which no one will believe."

"You shall not enter," says the stone.
"You lack the sense of taking part.
No other sense can make up for your missing sense of
taking part.
Even site heightened to become all-seeing
will do you no good without a sense of taking part.
You shall not enter; you have only a sense of what that
sense should be,
only its seed, imagination."

I knock at the stone's front door.
"It's only me, let me come in.
I haven't got two thousand centuries,
so let me come under your roof."

"If you don't believe me," says the stone,
"just ask the leaf, it will tell you the same.
Ask a drop of water, it will tell you what the leaf has said.
And, finally, ask a hair from your own head.
I am bursting with laughter, yes, vast laughter,
although I don't know how to laugh."

I knock at the stone's front door.
"It's only me, let me come in."

"I don't have a door," says the stone.

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Graduation Project
P5 Report

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This year I got the chance to learn anything I could that had to do with Urbanism. Luckily Urbanism is such a broad topic that there is an incredibly wide range of topics to be chosen from. My love for learning new things brought me to the topic of this graduation thesis. I was able to research something completely out of the ordinary and I am very glad that I got the chance to do this.

Within this thesis, I was able to combine Urbanism with Philosophy and Ecology and that resulted in a project that became very dear to me.

I was not alone in the creation of this project and there are many people that have contributed to this project as well. Therefore, I would like to thank of course my two mentors, Taneha and Stephen that have guided me through this year. Also, I would like to thank my fellow students from Urbanism that have been my companions in the past year. Finally I would like to thank my girlfriend Charlotte for being there for me at any time

and for listening very well when I was in need of someone who could listen to me and help me think about a sometimes difficult project.

My sincere gratitude to those who have helped me through this long process of learning.

- Jan Gerk, 2019

Executive Summary

And there we find ourselves on that blue marble, living together with millions of other species that together make life possible.

We tend to forget that our humanly created environments are filled with innumerable creatures. Interestingly, these created environments are focused primarily on its functioning for human beings and still many other species are able to live in our worlds. A good example is the rock pigeon, that sees a home in our urban areas due to the similarities it has with the rocky environments that they used to live in. The urban environment even became a more favourable place for them, giving them more safety from predators and also an abundance of food sources. However, not for all species the human environments are as beneficial. It is estimated that around one million species are threatened by extinction in the coming decades because of human activities. Therefore, we can conclude that the coexistence between humans and other species is not optimal in the human environment.

Currently, half of the habitable parts of our planet consist of human land use and this is still increasing, whilst in many places the biodiversity is declining. These losses of biodiversity create even bigger problems for the remainder of the species, including humans, because it affects the resilience of earths' ecosystems. Human land use and specifically the heavily maintained monocultural and impenetrable surfaces have a direct impact on lives of plants and therefore disrupt a whole life cycle from occurring. Furthermore, the activities that happen on these human lands create different kinds of pollution which affect the climate around the world, creating even more problems for biodiversity.

How we use land and how we coexist with other species should be reconsidered in order to turn this trend around. Therefore, a different approach towards spatial design is needed. Instead of focusing on the meanings that we derive from places, a more plural perspective towards space should be adopted; a plural perspective that also

considers meanings that other species would give to places.

All species have different needs that can be fulfilled by their environment. In other words, all species have different meaningful relationships with their surroundings. For example, a roof to humans means a structure that protects against rain but for a pigeon it is a place to sit on watching out over the streets. Here the roof is the same object but has multiple affordances.

For most species, the following basic needs form the main conditions of their environment: shelter, food, water, infrastructure and a specific climate. Shelters can be found in many different kinds of cavities that create a shelter against other species and weather conditions. Food starts in the soil with plant life, since many species eat plants or eat other species that eat plants. Water can be found in water bodies and from precipitation. Finally, infrastructure is important in order for species to move from their shelter to their food sources and to connect habitats. Infrastructures become especially important in times of climate change, making it possible for animals to move to places with a suitable climate and plenty of food sources.

Current human design can limit species from obtaining these basic needs. The heavily maintained types of land use form limitations for plant growth that in many cases make up the sources of food and shelter for many species. In addition, the built space and road infrastructure can create barriers for species to move between one habitat to the other. In order to create spaces where species can coexist better, the following three main design principles have been created.

(1) diversify textures

By having many different textures, there are many opportunities for species to find food and places for shelter.

(2) enrich textures by allowing it to grow

A simple method to create rich and diverse textures is by allowing plants to grow. Heavy maintenance not only limits the life of the plant that is being limited, but also the life

that could have benefitted from the plants.

(3) connect rich textures

This creates the ability to move. Spatial design can be used to plan infrastructures for species, both human and nonhuman.

Through these principles, spatial designers can make frameworks and infrastructures that can be inhabited by other species. They create the possibility for species to fill spaces, similar to how an architect designs spaces that the inhabitants can decorate on their turn. In order to create environments of coexistence, design becomes co-design wherein the environments are improved by design efforts of the cooperation between species.

A case study was performed on the the Thames Estuary. There, the method was tested on different scales. An analysis was created of the Thames focussing on the diversity of textures on specific types of land cover and combined with the limitations of the human constructud environment. The analysis formed the basis of the design together with the three design principles. This resulted in a vision and a spatial strategy consisting of three main phases. An initiation phase that is focussed on the things that can be done immediately, for example, the reduction of maintenance in derelict places. The second phase is the restoration phase where biodiversity hot spots are restored and connected to one another to create a network of similar habitats. The final phase is the transformation phase where current uses by humans are transformed and diversity becomes the main driver of change. Diversity in the last stage forms the foundation for having plenty of affordances that enables improved coexistence.

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Introduction

Life in the urban world(s)

Cities are built for us, humans. Countless landscapes have been transformed by our structures made of concrete, steel and wood. An incredible long lasting effort to provide comfort to a single type of hairless animal. Even more imposing is the amount of land that has been turned into food machines in order to feed that same two-legged creature. Because of the dominance of humans and human built structures in these environments, we sometimes tend to forget about the innumerable amount of other species living in our environments.

But planet earth and our own living environments are full of life. By just taking a minute and observing our own backyard, a local park or even the streets you literally see life sprawling in every corner. Lives that are different from ours, that have different relations with the environment than we have. Life in many different forms, of which many are hidden from us.

Some species benefit from the same structures that bring comfort to our own lives. A good example is the rock pigeon that feels at home in our urban areas due to the similarities it has with the rocky environments they used to live in. The urban environment even became a more favourable environment for the pigeons, giving them more safety from predators and also an abundance of food sources that is formed by the waste that people have laid out for them in the streets. The lives of these pigeons and of all other species are different than ours and from one another. These lives are different because of the different relations they form with the environment. Where we see buildings with apartments or maybe some shops, the pigeon sees a ledge on which it can rest. Or when a young kid would run away from a wasp, trying not to get stung by it, a blackbird sees a flying snack that it can eat.



(1) pigeons on a rooftop ledge

A changing ontology

In order to fully understand our own environments and that of other species, we start with the ontological view that we have on the world. Martin Heidegger states that there are two ways to encounter the world. He calls them *Vorhandenheit* (present-at-hand) and *Zuhandenheit* (ready-to-hand). Present-at-hand can be seen as the attitude of an ideal scientist. When adopting this attitude, one merely observes things or concepts as they factually are. The beholder has no interest in the observed thing or concept Heidegger argues that the primordial attitude we have in the world is the attitude of ready-to-hand. In other words, we encounter things in the first place as tools that have a specific use or meaning to us (Wheeler, 2018). He explains it using a hammer as example. In the attitude of present-at-hand, one could see a hammer as a piece of wood with a piece of metal on it. However, in the mode of ready-to-hand we see the hammer as something to hammer with. We encounter it with its specific use.

Heidegger later gets criticized by Graham Harman for not broadening his theory to encompass more than just humans. Harman is inspired by the tool analysis of Heidegger, but thinks that this way of encountering the world is done by all objects. He thus states that there is no hierarchy or difference between subjects and objects and that everything is an object, a thing that is to be encountered (Harman, 2009).



(2) rocky environment

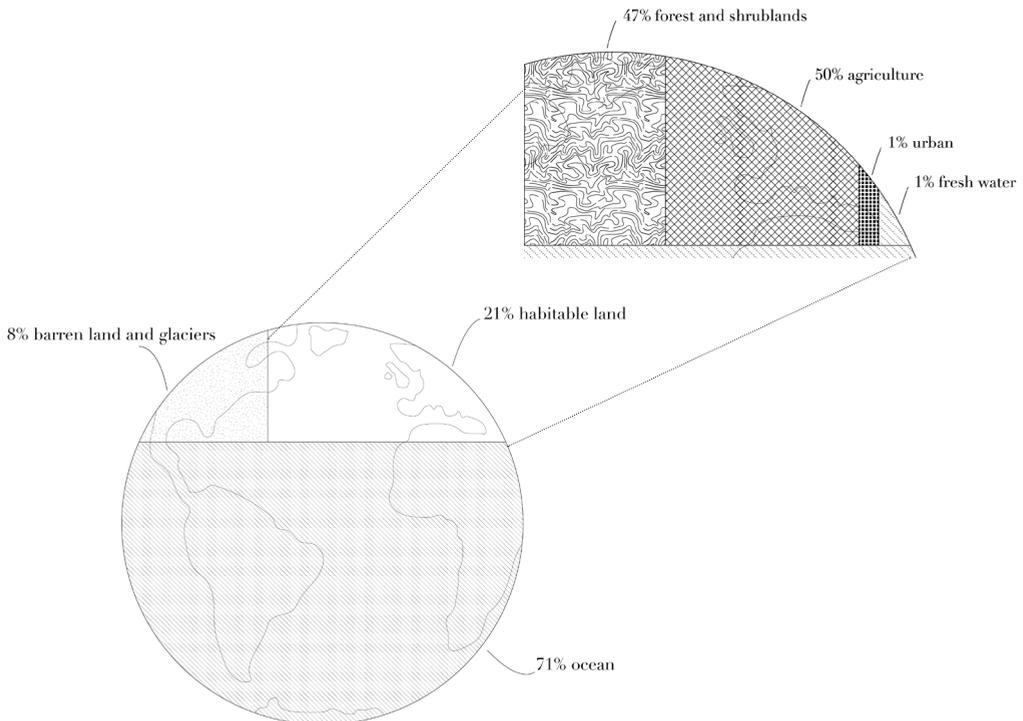
Interestingly, one of Heidegger's inspirations, Jakob von Uexküll, was holding similar views as Heidegger but he also felt that animals have a similar way of looking at things in their environment. He states that every being lives in its own environment and has its own way of perceiving things in the world. Whenever we step into the bubble of some other animal environment, the impression of the surroundings are completely different. Other meanings are given to the things that construct this environment (Buchanan, 2008). His idea can be shown with the example of the hammer that Heidegger uses. If, for example, a fly would encounter a hammer, it might land on the hammer. At that moment, the fly would see the hammer as a nice place to rest on, while it would never occur to us humans to see the hammer as a place to rest. The meaning we give to things thus differs per being. Within this report, we will follow the lines of these thinkers in order to create new and different perspectives on urban design. We will be guided by the encounter mode of ready-to-hand, but we will try to not just see space through human eyes, but

also try to encounter it from non-human perspectives.

The age of mass extinction

The constructed environment has been built by humans and for humans. Within urbanism, spaces are defined, planned and designed with a focus on the needs of the society on a specific moment in time. Developments in technology enabled humans to excel in achieving all societal needs and desires.

Since the agricultural revolution, mankind has been able to alter their environment in such a way that we could generate and extract resources on a large scale. In the periods that followed, the earth faced and is still facing an increasing human population that currently occupies half of the habitable land (Roser & Ritchie, 2018). Everything that we consume requires space. After the industrial revolution, things got out of hand. Through the rise of the steam engine, the



(3) distribution of earth's land cover (based on Roser & Ritchie, 2018)

Species	Earth			Ocean		
	Catalogued	Predicted	±SE	Catalogued	Predicted	±SE
Eukaryotes						
Animalia	953,434	7,770,000	958,000	171,082	2,150,000	145,000
Chromista	13,033	27,500	30,500	4,859	7,400	9,640
Fungi	43,271	611,000	297,000	1,097	5,320	11,100
Plantae	215,644	298,000	8,200	8,600	16,600	9,130
Protozoa	8,118	36,400	6,690	8,118	36,400	6,690
<i>Total</i>	1,233,500	8,740,000	1,300,000	193,756	2,210,000	182,000
Prokaryotes						
Archaea	502	455	160	1	1	0
Bacteria	10,358	9,680	3,470	652	1,320	436
<i>Total</i>	10,860	10,100	3,630	653	1,320	436
Grand Total	1,244,360	8,750,000	1,300,000	194,409	2,210,000	182,000

(4) predicted amount of species

use of fossil fuels and globalization, people started to affect the environment and its climate. This period is nowadays marked as the Anthropocene (Steffen, Crutzen, & McNeill, 2007).

All these factors led to a sharp increase in human activities which is clearly not without consequences. Deforestation, different kinds of pollution and global warming are seriously damaging the ecosystems on the planet. Furthermore, many species have to make way due to different types of land-use, whilst other species are part of the resources that humans use to fulfil their needs. The recent Living Planet report by WWF shows that since 1970 an average of 60% of the vertebrate species was lost. The following is stated: “Earth is losing biodiversity at a rate seen only during mass extinctions” (WWF, 2018). The UN also recently published a report on how biodiversity is declining on our planet and that the rate in which species are going extinct is accelerating. Around a million species are being threatened with extinction in the coming decades (Martin, 2019).

These trends show that our domination on the planet goes on at the cost of other beings. It shows that we have a hard time to coexist with non-human beings on earth, especially when these beings don't answer our societal needs. Most non-human beings are primarily regarded as having a specific

instrumental value for us rather than having value on its own. The higher the instrumental value non-human beings have for us the more likely we are able to coexist with them. But what would happen if we were to value non-human beings as something that has an intrinsic value just like we do with ourselves? We would surely have to consider them whenever we would design something in the environment, especially considering the fact that we as humans are going to use an increasing amount of space on earth. This means that even more habitats will be disrupted by us.

Of course, our built environments also provide opportunities to many different species. Species like rats, mosquitos, sparrows, pigeons and many other birds have adapted very well to the urban ecosystems (Schilthuizen, 2018). These species seem to be tolerated by humans. This illustrates that it is possible for some species to coexist among human beings in the urban environment, albeit only a small fraction of species. Global biodiversity is still declining and that creates problems for our planet's ecosystems and therefore also for the species that live on our planet. Including us.

Towards a design of coexistence

In this report, the objective is to challenge the anthropocentric view we as humans have

on spatial design. The aim is therefore to step outside of our own bubble and include other species in our spatial design process to enrich coexistence. The awareness of their perspectives exposes the spatial bias we have against other species. Therefore, the objective is to find out what the effects of human built environments are on the coexistence between species. Furthermore, the aim is to overcome this bias that we have and make spaces that are suitable for coexistence between species.

Main research question

The main question that will be answered in this report is the following:

How can spatial design be used in order to improve the coexistence between species in the human environment?

Sub Questions

In order to help answer the main question the following sub questions are answered:

1. What is coexistence?
2. What moral obligations do designers have towards non-human beings?
3. What are the basic things that species need in their environment and how are human structures and activities affecting these needs for non-human species?
4. What species are living in the Thames Estuary and what are their basic needs of their environment?
5. What effects has the current design of the Thames Estuary on the species and how is it contributing to their needs?
6. How can the species' needs be taken into account in the current situation of the Thames Estuary in order to improve the coexistence between species?

Overview of the report

The report consists of 3 main parts. First, a focus on the research methodology, the theory behind the project and the introduction of a new approach towards the analysis and design based on this theoretical research are presented. The methodology shows the approach of the project. Here, the research questions are further explained and the methods that are used in order to answer these questions. In the chapter on theory, the first three sub questions are answered. We first elaborate on what it actually means to coexist and what the ideas are of different thinkers. We will also focus on why we would even consider other species. This question refers to the ethics behind the project. Then, we critically evaluate which species should have moral status, implying that we have moral obligations towards them. Finally, we dive into ecology, focussing on the basic needs of species and how these needs are affected by the constructed elements of the human environment. The approach that concludes this part will be a new perspective on conducting an urban design project. This approach is needed in order to design not just for humans, but also allow for life of many of the other species.

The second part focuses on a case study where the approach will be tested on a specific case. There will be an introduction on the context of the case study, being the Thames Estuary. The site will be introduced by a short description on the location, an overview of the climatic conditions and a very brief overview of the governance structure and planning system of the UK. This will be followed by the analysis and design chapters. Here, we will map the basic needs of the species in the Thames Estuary area.

Finally, the report will be concluded by the third part, where the research will be concluded and reflected upon.



(5) earth image of the North Sea

Methodology

Chapter overview

This chapter gives an overview of the methods that have been used in this research project. It starts with an explanation of the basic structure by elaborating on the research questions and the accompanying research methods, objectives and output. This will be followed by a short in-depth description of the research methods themselves. After that, the conceptual and research framework are shown and lastly the research limitations and the ethical considerations are discussed.

Important phrases are highlighted. Spatial design is the discipline from which this research is conducted. It is expected that spatial design can offer an answer in trying to create an enriched coexistence between species. Furthermore, the topic of this research clearly is the coexistence between species in the human environment. Specifically the human environment is directly connected to spatial design., since the human environment is created and therefore designed by a form of spatial design.

Research question

This report aims to research the coexistence between species, both human and non-human beings. The following research question is answered:

How can spatial design be used in order to improve the coexistence between species in the human environment?

Aim

The aim of the project is to increase awareness of other species that inhabit our built environment and to decrease the negative impact that the built environment has on other species. Therefore the ultimate aim is to explore the possibility for species to coexist in an area so that ecosystems and biodiversity are not threatened.

Objectives

The objective is to better understand the influences of the structures of the human environment to the worlds of other species. Besides that, the objective is to create a method that spatial designers and planners can use in order to design spaces that allows for coexistence between species and thereby decrease the degradation of ecosystems and loss of biodiversity.

Context

The chosen location for this research is the Thames Estuary. This location offers a wide range of urbanisation types, namely highly urban areas in the centre of London, but also industrial, rural, agricultural areas are present. Therefore, this research uses several different cases within one context that can be used to test the approach and methods.

General approach

In order to answer the main question, six sub-questions are asked. The sub-questions is explained in this section together with its specific methods and outputs.

sq 1

The first question that has to be asked is the following:

What is coexistence?

The general hypothesis of this thesis is that there is a form of coexistence between species and their environment. But what does this mean and how does it work? This question forms the ontological foundation of this research.

Methods

This question is answered by doing theoretical research into ontology, which is the philosophical study of being. This field concerns itself with the topic of existence and what it means to be in the world. Thinkers like Heidegger and Uexkull, whom have been referred to in the introduction chapter, have been writing about ontology. Other

thinkers that are investigated are Graham Harman of the Object Oriented Ontology movement, a contemporary movement that breaks the hierarchy between humans (often regarded as subjects) and non-human objects, and Bruno Latour who holds similar views as Harman and who has developed the actor network theory, an approach where everything in the social and natural worlds exists in relationships and networks. The output of this sub-question is an enhanced understanding of the coexistence between species and their relations with one another in a written chapter.

sq 2

The second question that is investigated elaborates on the why of the project. Why should spatial designers have to help other species? This question is an ethical question that focusses on our actions and their consequences.

What moral obligations do designers have towards non-human beings?

With this question, the project defines the ethical grounds for how we should treat non-humans. The question is focused on who or what should have moral status and what kind of moral obligations we have towards these beings. In other words, how should we interact with non-humans and what should we do for non-human species?

Methods

Similar to the first question, this question is also answered mainly by means of literature review. The literature that is reviewed is literature in the field of ethics, focused on moral status, moral obligations and the concepts of intrinsic and instrumental value. First, one has to understand what it means to have moral status and what the grounds are for something to have moral status. A specific field that discusses this question is the field of environmental ethics.

Relevant findings are combined in a theoretical review paper concerning urbanism and environmental ethics. This forms an extra layer of argumentation to consider the value of non-human inhabitants in the human environment. Furthermore, this part can help choose the right design

solutions to solve design conflicts.

sq 3

The third sub-question focuses on species and their environment. All species have certain needs from their environment in order to live.

What are the basic things that species need in their environment and how are human structures and activities affecting the affordances for non-human species?

This question not only investigates what is needed for species to live but also tries to find out how humans impact space and how this is either limiting or contributing to the lives of other species. This chapter starts with a general inquiry into the very basic needs of species, since nearly all of them need things like oxygen, water and food. After that, an inquiry into the effects that human design can have on non-human lives follows. This question thus serves multiple goals. First to create a resourceful orientation on what should be analysed in the case study. Secondly, the question puts emphasis on the problem at hand: how is human design decreasing the possibility of life and the loss in biodiversity?

Methods

To answer this question, the focus is mainly be on literature review. Specifically, literature that focusses on the basic needs of species for survival and the effects that human spatial structures and activities have on biodiversity is used. The output is a written part on the basic needs and how these needs are affected by human design.

sq 4

The last three sub questions elaborate on the case study of the Thames Estuary. The first of these questions is the following:

What species are living in the Thames Estuary and what are their basic needs of their environment?

With this sub-question we try to get a basic idea of what kind of species one would find in the Thames Estuary. Several species are selected and are analysed on their

environmental needs and where these can be found in the Thames Estuary.

Methods

A mix of methods is used in order to answer this question. Firstly, a stakeholder analysis is made of the different species focussing on what their spatial needs are, how they behave and where their needs can be found on the location(s). The stakeholders will be analysed by means of mapping the previously mentioned. Besides that, the case study area is visited to observe the different locations and species by performing a transect and taking photographs and short videos. Main focus points of the stakeholder analysis are the mapping of the habitat of the beings and to know what their needs are (e.g. food).

Output

Maps are made consisting of vegetation, water and aquatic systems, soil condition, open space, built space etc. Furthermore, an inventory of the stakeholders with their specific habitat and needs is made. Because in the end one species might live because of another; think of animals eating plants, animals eating animals. Additionally, habitats are constructed by specific materials and different cycles like the carbon and hydrologic cycles.

sq5

The second analysis question that is answered is:

What effects has the current design of the Thames Estuary on the species and how is it contributing to their needs?

Especially when constructing the relations between the different entities, one can see how the human environment is influencing the non-human environments. Here we want to find out what effects human design have, either positive or negative, on the non-human lives. This question will combine earlier retrieved information and will conclude the analysis, forming the basis of what needs to be (re)designed in order to improve coexistence.

Methods

The main research tool for this question will

be mapping, mainly by combining the maps made during the analysis of the stakeholders. The focus within this question is on the different scales. On a regional scale, land use and infrastructures will be investigated. On the city and neighbourhood scale, the focus will be on morphology, being the amount of built area versus green area, open space and urban typology. Finally, also the smaller architectural scale will be investigated using the specific streetscape and the building typology.

Output

The limits the constructed human environment imposes on other lifeforms are shown in maps on different scales.

sq6

How can the species' needs be taken into account in the current situation of the Thames Estuary in order to improve the coexistence between species?

With the knowledge gained by questions three and four, the project aims to propose solutions to counteract the negative effects that human design has on non-humans. This is the main design question.

Methods

The most important method used to answer this question is research by design.

Output

The expected output for this question is a specific design in different scales. i.e.: a strategic regional plan, an urban design on neighbourhood level and specific details on a more architectural scale. From this, several design principles are derived that can be implemented in other places to contribute to the coexistence between humans and non-humans.

Research Framework

The research framework is shown on the next page. Within this framework one can find a diagram summarizing the approach to the research. Furthermore, one can see the connections between the research questions,

methods, outputs and their influence on the problem statement and research aims.

Research Methods

Literature Review

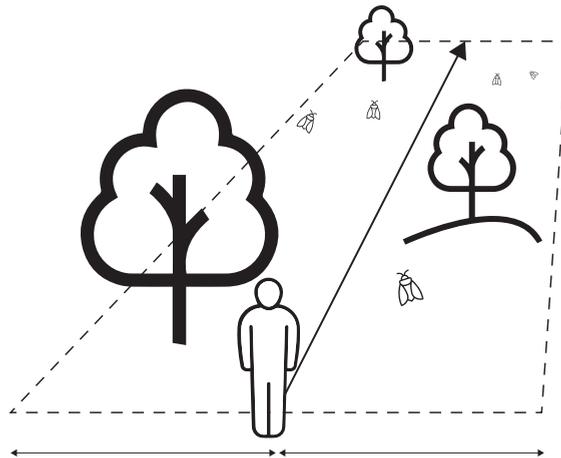
The main research method at the start of this project is research into the existing body of knowledge; the literature review. According to Webster and Watson (2002, pp: xiii), "A review of prior, relevant literature is an essential feature of any academic project. An effective review creates a firm foundation for advancing knowledge. It facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed."

In the literature review, the theoretical base of the project is given. This helps to develop the problem statement and the methodology. Within this specific project, the literature review will be done in philosophical, ecological and urbanism studies. Within philosophy, ontology and ethics concerning the 'non-human' will be investigated. Within ecology the focus is on ecosystems to find the connections between the different species. Next to that, research into keystone species will be done in order to find out what the essential species are for the Thames Estuary.

Stakeholder Analysis

The project takes on the idea of the stakeholder analysis in order to combine both the interests of the human as well as the non-human in the urban development. Stakeholder analysis is a technique in which stakeholders are identified and their needs and interests are analysed (Says, 2018). In this specific case, both human and non-human stakeholders will be selected based on their importance in the ecosystem. After identifying the stakeholders, their needs will be researched and analysed by mapping.

According to Says (2018), "Project stakeholders are individuals and organizations that are actively involved in the project, or whose interests may be affected as a result of project execution or project completion". Many of the current stakeholder analysis excludes non-human stakeholders.



(6) transect

However, there is an upcoming debate among theorists whether the natural environment should be considered as stakeholders in spatial development since it is surely affected by our human development (Haigh and Griffiths, 2009; Starik, 1995).

Mapping

It is undebatable that mapping is the urbanists main research tool. By mapping urbanists are able to create and build the world as well as measuring and describing it (Corner, 1999). For this particular project, mapping becomes a tool to show not just our human understanding of the world but also that of several non-human species. Maps will be made with the beforementioned stakeholders and their needs.

For example, if we would examine bats as a stakeholder, one needs to find out what their basic needs are, what characteristics their habitat has and what the things are they eat. Bats tend to live under roof tiles in our rural landscapes and like to eat mosquitos. Mosquitos can live in almost any environment that has some water in the neighbourhood. In this case, maps can be made of the buildings with roof tiles that show their habitat and water areas where the bats catch their food (note that this is an oversimplification of the process to show the general idea of mapping process).

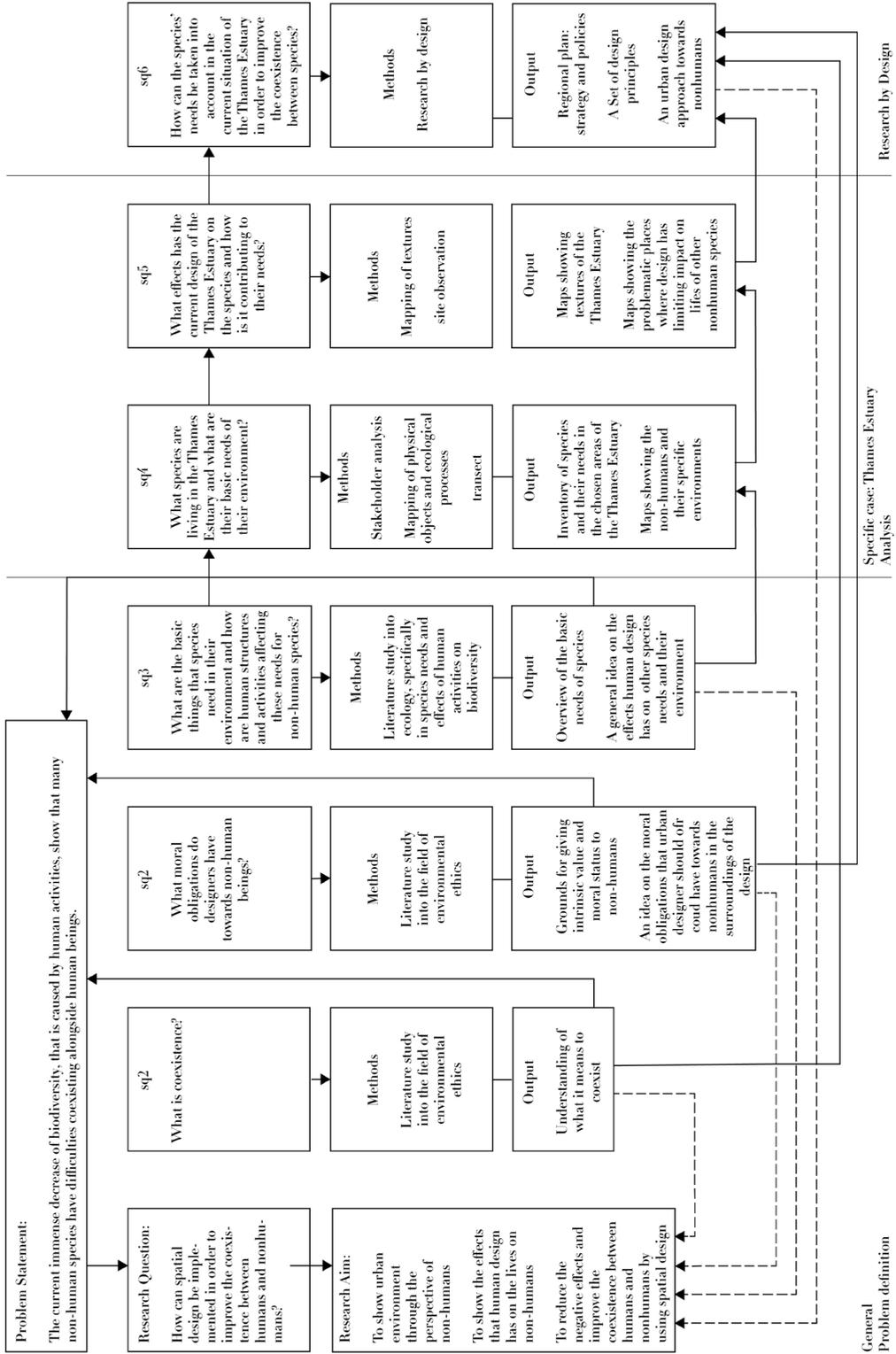
On-site observation

During the on-site observation, the case area will be visited, examined, recorded and analysed, specifically the things that cannot be seen on maps. In the case of this project that would mean focusing on the smaller entities and moving organisms that are not shown on the map. To record the data, photography, film, drawing and writing are used.

Transect

Transect is an on-site observation technique where the researcher walks along a fixed path through a landscape and counts and records the organisms that he/she sees along that path. The systematic approach of the transect makes it possible to make assumptions of the densities of the specific species that are found in the surroundings.

There are two main types of transect methods: line transect and belt transect. In a belt transect one would widen the line of the line transect and divide the line into a series of quadrats. The line transect is better at showing gradient or linear patterns along which communities of species change. The belt transect on the other hand is a more useful technique to investigate the relative densities of the area (Countrysideinfo, 2018).



(7) research framework

Conceptual framework

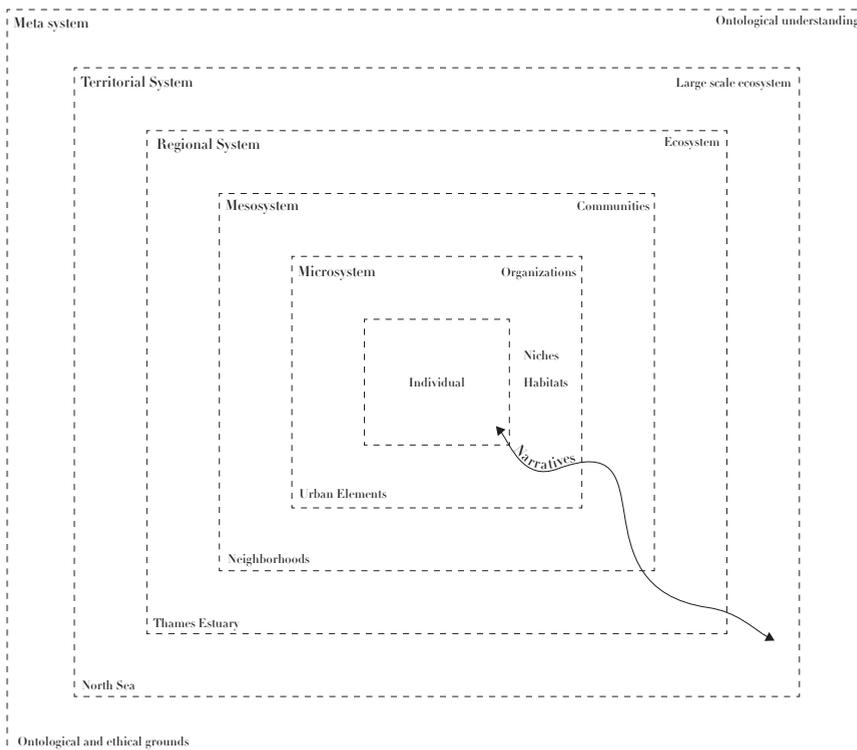
The project focusses on different scales. The natural processes of larger ecosystem are researched and mapped in order to get a grip on the location. The main focus lies on the processes within the Thames Estuary. The Thames Estuary is largely defined by its own context: the territory of the North Sea. These are the larger scales, namely the regional (Thames Estuary) and the territorial (North Sea). Next to that, there will be specific focus areas that will show the different types of urbanization, this will be called the Mesosystem scale. Finally, the smallest scales are the Microscale where the focus is on the specific urban and landscape elements and the individual scale of the stakeholders. Furthermore, on the exterior of the conceptual framework the meta level is added. The meta level consists of the ontological and ethical foundations. These foundations will have great influence on the perspective and ethical viewpoint one has on this project.

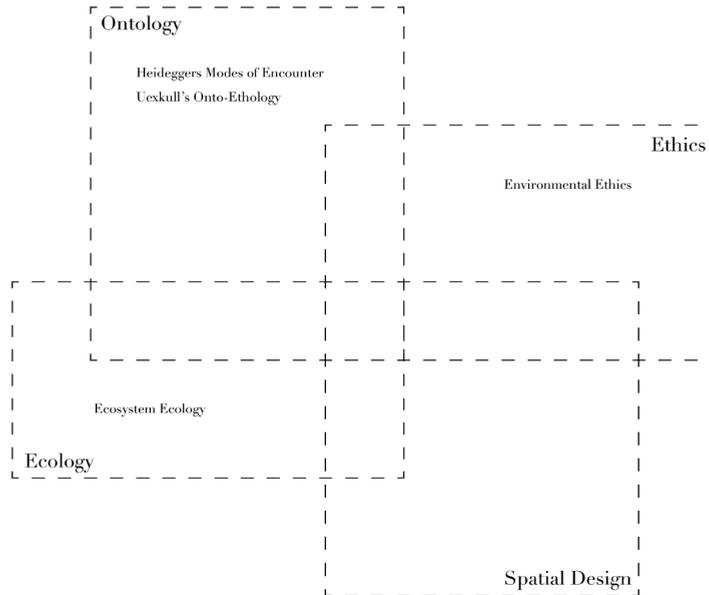
Theoretical framework

The research focusses on 4 main fields of study. The main motivation is found from the combination of different ontological theories. Namely the modes of encounter of Heidegger; the Onto-Ethological theories of Uexkull and the Object Oriented Ontology of Graham Harman. Furthermore, the ethical backbone of this project will be formed by theories of environmental ethics. Thirdly, to answer many of the questions considering the 'stakeholders', ecological theories will be researched. Finally, the project concludes with a spatial design, therefore also bodies of knowledge of spatial design and relating fields of landscape architecture / urbanism will be researched.

Research limitations

Due to the limited amount of time and in some cases limited knowledge on specific topics, the research has several limitations. A first major limitation is the lack of





(9) theoretical framework

quantifiable assessment tools. Only within the transect method it will be possible to generate numbers on populations etc. However, this project is undertaken from an urbanism perspective. The research will instead primarily focus on qualitative aspects of the human design influencing non-human species. The focus of this study will be on behaviour of species rather than their actual numbers, thus no specific calculations of populations and biodiversity.

Next to that, due to time constraints, only specific species will be selected. In other words, not all species that actually live in the specific areas will be analysed. Five different species will be chosen to test the research approach. The research will not be all-encompassing, but rather an informed abstraction of the actual ecosystem.

Furthermore, not all methods give a full overview of the stakeholder analysis. Some species are just too small in order to see them. For these species, a more speculative approach is needed. Examples of these

species will be specific animals that might only live in the specific places at night, but also smaller entities like insects, bacteria and species living in the subsoil.

Ethical considerations

Ethical considerations are important for this project, as it considers non-human beings to have moral status. When we consider non-humans to have moral status, this has as consequence that we have specific moral obligations towards them. Who or what has moral status and what kind of obligations we have towards them are key questions for designers. More information can be found in the theory chapter concerning environmental ethics and urbanism.

Coexistence

Coexistence

This chapter elaborates on the question what coexistence is and how it should be understood on a philosophical level.

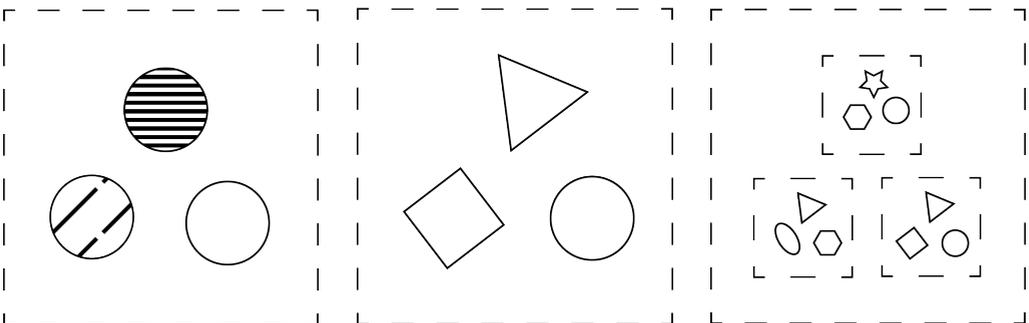
To exist is to coexist

Coexistence means to live together at the same time or in the same place (Cambridge English Dictionary, n.d.). Different species (and also other objects) need to coexist in order to exist in the first place. All species need other species in order to live and therefore exist. The food web is one of the prime examples that shows how all species

are dependent on one another. Other good examples are atmospheric cycles like the carbon and the oxygen cycle. Without these kind of cycles we would lack the very basic characteristics that make this planet liveable. For these cycles to occur, the planet needs both plants and animals to coexist. Plants convert carbon dioxide into oxygen and animals convert oxygen back into carbon dioxide.

Biodiversity

There is also a clear link between coexistence and biological diversity. When a lot of different species are able to live together



(coexist), there is a high biodiversity and vice versa. High biodiversity results in more resilient ecosystems and is therefore good for the (co)existence of species. In this sense, biodiversity could be seen as the richness of coexistence. Biodiversity happens on three different levels that are all necessary in order to create a more stable ecosystem and a healthy planet. There needs to be diversity within the species itself, this is the genetic diversity between individuals of a species. This diversity makes the species more resilient, because it will prevent harmful genetic traits and will make a species less susceptible to diseases. Secondly, the most common type of biodiversity is the diversity between species. By having many different types of species that can fill a specific ecosystem, there will be more species that can maintain the ecosystem if one type of species goes extinct. The final type of biodiversity is the diversity of ecosystems. On our planet, one can already find many different types of ecosystems that are the result of the different circumstances on different places like different climates and ground conditions. Every ecosystem, on its turn, has a different community of organisms that are accustomed to the specific conditions of that ecosystem. A higher number of species does not only benefit biodiversity, it also creates resilience in moments of climatic changes (Naveh, 1994; Preshoff, 2015).

Breaking up with an ontological tradition

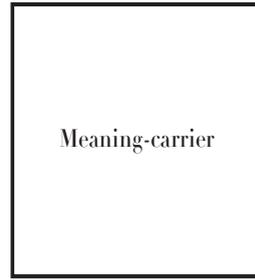
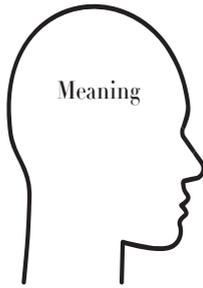
However, this is primarily the biological notion of what coexistence means. Different views on coexistence and the place we humans have in the web of coexistence have exist. In contemporary philosophy, many thinkers critique the classical notion of ontology that has been with us since the enlightenment. Contemporary thinkers like Latour, Harman and their followers especially have difficulty with the subject-object distinction, where usually humans are seen as subjects and everything else as objects. Subjects are seen as entities that have the ability to see their environment which is filled with objects, which are rather lifeless entities that are to be encountered. They find

this distinction rather problematic since the same division tends to create a hierarchy where one (the subject) is seen superior to the other (the object). Comparable to this dualism are the dichotomies like culture/nature, human/animal etc. Harman has been trying to develop a new type of ontology, the object-oriented ontology, in which there are no subjects and the hierarchy between things has been removed. Latour puts the emphasis more on the relation between things in his actor-network theory (Harman, 2011, 2018; Latour, 2012, 2017).

Currently, these ideas are gaining lots of followers, especially now that we are living in a period of fast changes in climate and biodiversity and therefore the whole earth system. More and more we realise the immense impact that all human activities combined have on the planet. It is also this period that we start to adopt terms as Anthropocene and anthropocentric, focussing on the human-centeredness of our (ontological) worlds and the immense impacts that the human activities have on the planet and the creatures living on it (Crutzen, 2006). These terms that are used to show the human-centred mindset that we have had in the last couple of decades (or maybe centuries depending on the starting point of the Anthropocene).

Relations between objects

Harman got his inspiration for his ideas from Martin Heidegger. Even though he is also critical about Heidegger's ontology, he uses the tool analysis that Heidegger puts forward in his famous work *Sein und Zeit* (Heidegger, 1996). This tool analysis has already shortly been explained in the introduction of this report. This analysis is used by Heidegger in order to explain what the meaning of being is. Heidegger's approach is developed as critique on the classical notion of presence from Plato, stating that we are merely seeing images of the real world. Heidegger opposes this by stating that the primordial way in which we encounter the world is by means of understanding. We experience things mostly as equipment, having a specific use for something. We understand things



(11) meaning and meaning carrier

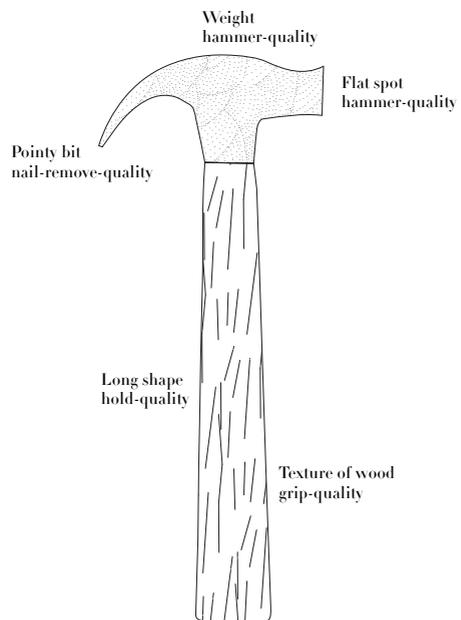
through its use for us. He names this way of encountering the world 'zuhandenheit' or in English 'ready-to-hand' and it opposes 'vorhandenheit' or present at hand, a view that is similar to that of an ideal scientist, one that searches for theoretical universal knowledge.

Following these ideas it is easy to see that both coexistence and existence are all about relations, the relations between things. As humans we are also related to many things in our environments. Environments with many objects that have a certain value or meaning for us. A normal day is full of specific objects that have a specific value and use for us. We wake up in a bed in a house full of other objects. We take a shower to wash ourselves, we dress ourselves in clothes. Later we eat breakfast that is taken from a refrigerator, eat it with cutlery, then we brush our teeth etc. In this short morning habit, we cross already a ton of different objects that are tools in order to achieve something. All these objects therefore have a specific value for us. We are subjects within a specific environment, an environment filled with objects that we can perceive.

Jakob Von Uexkull (1957) argues that this phenomenon is not just happening within human environments but that it is also happening in all other animal worlds. We can consider every living being to live in a specific bubble, its environment. All these environments differ from one another, because for every being there are different objects in the environment that have a meaning for that specific being. Take for example a dog that lives in a human house.

Most of the tools that we use have another meaning for the dog.

That means that depending on the subject, the perspective changes, and therefore the meaning of each object as well. Therefore, subjects have different relationships with different objects. Let's follow Uexkull and name the object a meaning-carrier while the subject holds the meaning in its mind. Although the meaning of an object changes from subject to subject, the object itself does not change (apart from it being broken or anything in that sense). The properties of the object do not change in the end. And it is these properties that allow certain affordances. Take for example a stone beach.



(3) a hammer and its qualities



(12) man throwing a pebble

You can take a stroll along the beach and then the stone would be used to walk upon, its strength would allow someone to walk on it. Thus, it gives a certain walk-quality. But sometimes someone wants to pick up a stone and throw it on the water to see how many times it can skip on the water. By doing this, the meaning of the stone has completely changed from a part of a path to a throwable object. And now the property that stands out are its proper size and weight. And in this specific case the form is just as important since the flatter stones usually perform better at skipping over the water. Therefore, the flatter the stone, the higher its water skipping quality is.

The meaning that species derive from certain objects are key properties. Properties of neutral objects cannot be rank-ordered, but whenever a specific meaning is given to the object, key-properties can be defined. One can distinguish between essential properties for that meaning and inessential properties for that meaning.

Within this graduation project, this idea will be adopted and we will see the world as filled with numerous amounts of subjects living in an object world. Every object is also a subject: the subject is the observer and the object the thing that is being observed by a subject. All these subjects/objects are coexisting with each other. One needs the other in order to exist as mentioned earlier. Between these different entities, some relations are stronger and more meaningful than other relations. Together these relations form networks and networks of networks wherein all the different actors are directly or

indirectly connected to each other via their relations.

A web of interests

Within these networks, every being has specific interests. One of the most basic interests that can be found in all species is a certain will to live. The will to live brings up other more concrete interests, like physiological needs like the need for food, water, warmth and safety. The food web in particular illustrates this web of interests very well. For example, many insects are plant-eaters. They feed on leaves, roots, seeds, nectar and wood. These insects are then sometimes eaten by larger animals like birds or bats, and these tend to be eaten by even larger predators. When these species die, the leftovers (and also the leftovers of the other species) are decomposed by the so-called decomposers that feed on dead material. The decomposed material then becomes nutrition for plants again. Here, one can see a fully connected web of interests, where all different species are connected to each other according to their needs. The more species there are, the more complex this web of interests becomes and the more relations there are. However, besides the complexity, the web itself also becomes stronger, because living species need other living species in order to live. The more different living species are present, the higher the potential for other species to live.

Hierarchies

In these networks of interests, there are always some species that are better at achieving their interest than others. We can clearly see this in human environments, where humans are using many different kinds of technology which enable them to alter many environments in order to fulfil all their needs. This mostly happens at the cost of many other species that are not fulfilling their interests, making humans a more powerful species. This type of competition does not just happen between species, but also occurs within a species. Already within the human species, different hierarchies are to be found, where one individual or a group is more powerful than the other. One can think of racism and sexism. Also in animal worlds similar hierarchies can be found. Take for example a colony of wasps where one can also define a hierarchal structure. In this powerplay, the more powerful group is able to control the others and limit their agency.

Is there a right to exist?

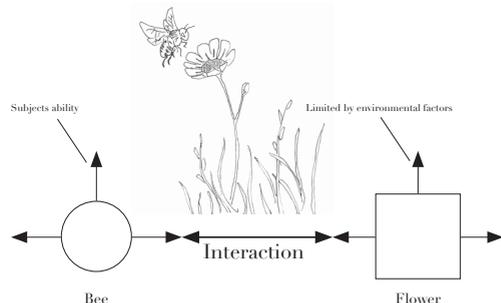
For humans, this power has given us a lot of benefits. Especially in the western world, people live in places that are incredibly safe, we do not have any predators and the biggest enemies we have are humans. Also our other basic needs, like food and water, are fulfilled without much effort. However, the footprint of our activities also have an incredible downside as well. Lots of species find it increasingly difficult to live and animal populations are continuously dropping in numbers, leading to enhanced biodiversity loss in many places in the world.

The ethical question that arises is thus: should humans have more right to exist than other species? From a human point the answer could sometimes be yes, but objectively speaking the answer leans towards no. Additionally, this question is ridiculous from any other species' point of view. The species homo sapiens did not always exist, making it hard to argue that humans have always had more right to exist than other species in the pre-human era. Also, most other species would not care if

there would be humans or not. Most other species do not crucially depend on us, so as a species we do not seem to fulfil a crucial role on the ecosystem of the planet. So far, we have been more destructive than helpful.

Agency as a key

In order to improve coexistence between species, agency seems to be a key element, with agency being the capacity of an actor to act in a given environment. In human environments, many species do not have any or only a very limited amount of agency. Humans have been able to create a tremendous amount of agency for themselves as a species by the work we have done as a species. Think of all the technologies, infrastructures and worlds we have created for ourselves that keep us secure and generate food for us. The conditions that allow for certain species to live in a certain place are in many cases eliminated by humans. Deforestation is a clear example. An incredible number of species live in forests, making them one of the most biodiverse places on the planet. Whenever we remove a large part of a forest we also damage the living conditions of many species living in these places. By removing these conditions, certain actors are not able to act in that given environment anymore, because their basic needs are not fulfilled anymore. These limiting effects will later return in the subchapter on the effects of the human habitat on that of other species. It is clear that by increasing human agency in places reduces in many cases the agency of the other beings in that same place. The following subchapter elaborates on whether human should consider other species to have moral status and what kind of obligations humans have towards them.



(13) interaction and agency of a bee and a flower



(14) the Thames and Saint Paul's Cathedral

Ethics

Chapter overview

The following chapter focusses on the second sub question: what moral obligations should designers have towards non-human species?

Introduction

The human dominance on the planet in the last centuries has resulted in an extreme loss of biodiversity. Researchers have claimed that our planet is facing a sixth mass extinction event (Carrington, 2017; Ceballos et al., 2015). Numerous animals have already changed their behaviour because of our dominance. For example, many mammals are now shifting their active phase from day to night due to increased human activities in their surroundings. This especially occurs within the built environment (Gaynor et al., 2018). Next to that, the space on earth that is used by humans is still increasing as more and more land is used for agriculture and urbanization (Roser and Ritchie, 2018). The immense loss of biodiversity on the one hand and the increasing land use by humans

on the other hand are signs that the human habitat is not always suitable for non-human inhabitants.

This shows that humans are not very well at coexisting alongside other species. Our behaviour clearly has an impact on many species on the planet. Since this impact on others is caused by our actions, the problem becomes an ethical problem. Especially within spatial design fields of, for example, urbanism and landscape architecture (note here that the terms urbanism, urban design, landscape architecture will primarily refer to a general idea of spatial designers, the designers that directly reshape human environments), it becomes necessary to analyse the coexistence of humans and non-humans. The way we as humans act and the way we design our environment undoubtedly has a big environmental impact. But what, in that sense, would be a good design? And to whom do we have obligations to design for? These questions are ethical questions which are addressed in the field of environmental ethics.

Within the field of environmental ethics, an important distinction is made between instrumental and intrinsic value (Brennan and Lo, 2016). This discussion becomes most interesting when considering non-humans: should they have mere instrumental value or should we consider non-humans to have intrinsic value? Another quite similar ongoing discussion in the field of environmental ethics concerns the notion of moral status, or in other words, to whom do we have moral obligations to and to what extent (Cochrane, 2006)? Applied to urbanism, this question would transform to ‘who do we design for?’.

The aim of this paper is to open up the discussion on this question. If other species would have moral status, i.e. that we have moral obligations to them, should we then have to include them in our spatial designs as species can clearly be affected by our spatial interventions? Therefore, environmental ethics and its importance for urbanism will be reviewed. The first chapter will be on the main idea behind environmental ethics and how these came about. The next chapter will focus on value theory, describing what could or should be given value and why. Then the paper will discuss moral agency and moral status, two main components of ethical theories that describes who has a moral obligation to whom. Finally, this part will conclude with what implications these theories have for urbanism. Here, we will consider the urban environment as a constituent within the field of environmental ethics. This regards the considerations of urban designers, as the built environment has actually been neglected by many of the main figures in the field of environmental ethics (Light, 2001).

Why environmental ethics?

Ethics is the study of moral principles, concerning what is right and what is wrong, what a good act is and what is not. According to Oxford Dictionaries (2018), the definition of environment is given as follows: “The surroundings or conditions in which a person, animal, or plant lives or operates”. Combining these words would mean

that we would study the moral principles that we have towards our environment. Brennan and Lo (2016) describe it as follows: “Environmental Ethics studies the moral relationship of human beings to and also the value and moral status of, the environment and its non-human contents”.

The rise of environmental ethics as a new philosophical discipline started in the 1970s of the previous century. Its growth was fuelled by the rising awareness of the effects of the development of technology, industry and population growth in that period. Main questions that are being considered within environmental ethics are ‘what moral obligations do we humans have with regard to the environment and why?’ and ‘Should we do it for the sake of the environment itself apart from the services it gives to us or should we do it for the sake of human beings (Cochrane, 2006)?’ A similar question could also be addressed to urbanists: should we only be focused on the human client, or should the ones that are affected by spatial plans also be included in the design?

Most of the philosophers within the field of environmental philosophy propose theories that are considered less anthropocentric, i.e. human-centred. Of course, every ethical theory we make as humans is anthropocentric, because as far as we know only humans are able to reflect upon ethical matters. However, within environmental ethics, anthropocentrism has a more specific definition. An ethical theory that only considers human beings as having moral status, is considered anthropocentric. Whenever we consider non-humans to have moral status and to have a value in themselves apart from the services they give to humans, we could consider that as less anthropocentric or non-anthropocentric (Cochrane, 2006). But what grounds are there for giving non-humans value in themselves? A first insight can be provided by the discussion on the value of non-human entities.

Merely instrumental value?

A notable aspect of environmental ethics

that is discussed by many people in the field is the distinction between the concepts of instrumental and intrinsic (or inherent) values (Brennan and Lo, 2016; Callicot, 1984; Hargrove, 1989). In particular, whether we should give intrinsic value to non-human species.

Instrumental value is the value of things as a means to an end. For example, we eat apples as a means in order to gain energy as an end. Also, within the field of urbanism, urbanists deal with many things that have an instrumental value for humans. A road is a place that brings us from A to B, a building keeps us warm and dry and gives us privacy, trees can give shade but also have aesthetic value. At the same time, these same places also have an instrumental value towards non-humans. Trees, for example, have an instrumental value for birds who build their nests in them. Even ecosystems could be seen as having instrumental value for us and for others. Ironically, these services are given the name ecosystem services. Because of the functioning of ecosystems, not just humans but also non-human organisms are able to live. In the same fashion, humans can be seen as having an instrumental value as well, as they contribute to the functioning of these cycles.

It is clear that instrumental value can be found in anything. The question that still remains is whether things should or could have an intrinsic value as well. And more specifically, if we humans can have intrinsic value, can non-human beings have it as well? Having an intrinsic value means that something is an end in itself apart from being an end to something else. Many philosophers have already argued that we should always see humanity as an end in itself, thus humans should have an intrinsic value. This is most notably stated in Kant's humanity formula, which says the following: "Now I say that the human being and in general every rational being exists as an end in itself, not merely as a means to be used by this or that will at its discretion; instead he must in all his actions, whether directed to himself or also to other rational beings, always be regarded at the same time as an end" (Kant and Sullivan, 1996).

For many of us, it is normal to give intrinsic value to humans. However, it becomes harder for us to imagine non-humans having intrinsic value. But why would specifically only humans have intrinsic value? The same thing is questioned by Rolston (2012): "[...] it seems arrogant of humans to suppose that nothing of value was present before *Homo sapiens* arrived".

A notable theory of environmental ethics that argues that non-humans should have intrinsic value is Deep Ecology. Deep Ecology has to be seen as the counterpart of shallow ecology. Shallow ecology could be seen as an anthropocentric ecology that is primarily concerned with pollution and resource depletion (Cochrane, 2006). Deep ecology, on the contrary, dismisses anthropocentrism. Deep ecologists aim for a biospheric egalitarianism (Næss, 1973). In other words, deep ecologists say that all living beings are similar in having value in their own right, thus having intrinsic value. One of the main critiques on the theory is precisely on the aspect of biospheric egalitarianism. Especially when considering that human interests count the same as the interests of natural things. "Næss failed to explain in any detail how to make sense of the idea that oysters or barnacles, termites or bacteria could have interests of any morally relevant sort at all (Brennan and Lo, 2016)". Also, what about larger systems like rivers or forests, can they be seen as having interests?

One of the main reasons that environmental ethicists would like to acknowledge that non-humans have intrinsic value, is that when something has intrinsic value it is widely considered that moral agents have a moral duty towards those entities that have intrinsic value. In other words, the entity has moral status.

Who has moral status?

Moral status defines who we (the moral agents) have moral obligations to. There are several ways of determining who has moral status. Within this chapter the focus will be on: human beings, sentient beings, living

beings and holistic entities.

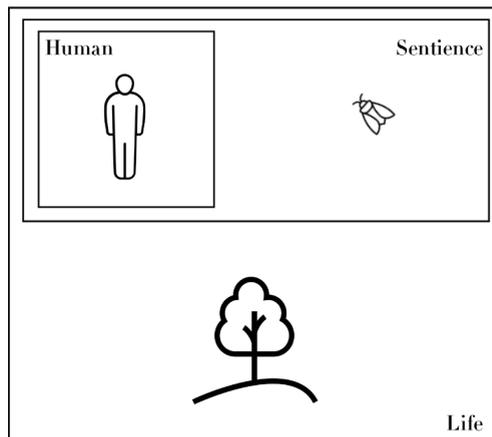
Human beings

Historically, people thought that only human beings have moral status. This is considered as the most anthropocentric view on moral status. Even an environmental ethicist can adopt an anthropocentric view on moral status. Within environmental ethics, moral status usually also includes future generations as well. This has been introduced due to the fact that many of our actions now have impact on future generations, where you can think of climate change and resource depletion (Cochrane, 2006).

But why would humans be more special than non-humans? Different reasons are given in order to answer this question. For example, because we have rationality, language or other cognitive capacities (Jaworska and Tannenbaum, 2018). Peter Singer (2009), argues that no matter which capacity we pick, we can always find a similar capacity in a non-human animal. He goes even further by stating that these capacities can sometimes be better developed in non-humans. And on the other hand, some humans lack these capacities, for example, infants or mentally handicapped persons. The only thing that would remain is that we are all members of the species *homo sapiens*. This would imply pure speciesism, where one species would just be considered superior to other species without having strong reasons to do so. This would be no different than sexism or racism (Singer, 2009). They are all forms of prejudice that favour of one group over another group solely on the membership in a particular biological category.

Sentient beings

What Peter Singer thinks that brings moral status is sentience. In other words, the capacity to feel pleasure and pain (Singer, 1974). A reason that he gives is that you need to be sentient for it to matter how your life goes. For Singer, beings that are sentient should be given equal consideration. However, differences between individuals should still be considered. Tom Regan follows the ideas Peter Singer but uses the term 'subjects-of-a-life'. He sees subjects-of-a-life as conscious beings that possess



(15) categories of moral status

intrinsic value. Regan, however, focuses on the 'moral limits' of what someone can do to a subject-of-a-life, which is a different approach than the utilitarian approach of Singer, that promotes the well-being of the greatest number. These moral limits could be seen as rights. This view is a main view in animal ethics (Regan, 1987).

One of the main arguments against this view is given by Goodpaster (1978), who says that sentience is just one of the tools that evolution gave to species that enables them to survive. Why should the ones having sentience be privileged over others that happen to survive in a different way?

Living beings

This brings us to the next ground, the one that Goodpaster considers as the basic ground for 'moral considerability', namely life itself (Goodpaster, 1978). That would mean that all living organisms would have moral status. This would then include human beings, non-human beings but also plants.

Taylor (2011), follows this view. He believes that living things have a good of their own, an intrinsic value. For him that means "full development of an organism's biological powers (Cochrane, 2006)."

But what would it mean for us as moral agents if we would consider that all living beings have moral status? What then would be our moral duties towards them? In the end we do need living things in order to

survive ourselves. Taylor (2011) tries to answer this question by setting up principles. First, moral agents are permitted to protect themselves against harmful organisms. The second principle is about prioritizing basic interests over the non-basic interests of moral agent. The third principle focuses on the clash of interests. Whenever interests clash, moral agents do not have to sacrifice themselves for the sake of others.

This view however, is incredibly demanding. It would mean that whatever plant we would pull out of the ground for other reasons than our own basic survival would be considered as a bad thing. To conclude, the view of life as a ground for moral status still faces different challenges. Before going to the holistic entities, we will discuss one of the main challenges for focusing on living beings: the discussion between individuals and wholes.

Individuals vs wholes

The ongoing debate of individuals versus wholes is where environmental ethicists clash with animal rights ethicists. The animal rights ethicists are concerned with individual lifeforms. For example, on how individual organisms should be treated. On the contrary, environmentalism and ecological fields are primarily focused on whole species or ecosystems, rather than on individual organisms. For them it is important that the population of the specific beings stays healthy. So, for environmentalists it is not a problem that a certain species might become extinct, as long as the ecosystem stays stable it would not become a problem for them. This would, however, become a problem for animal rights ethicists.

Holistic entities

That brings us to the last consideration of moral standing. Moral status for holistic entities. (Leopold, 1949) was one of the first who argues that we should give moral status towards holistic entities like rivers, ecosystems, mountains or complete species. In Leopold's 'land ethic' he sees relations between living things through all the flows of energy. Energy that flows through soil, plants and animals in different forms. He therefore states that we need to move towards this 'land ethic', which to him means granting

moral standing to the land itself and not just to individuals. To him a thing is right when it contributes to the community.

And with all the other grounds until now, also this view has been criticized. A criticism on the theory of Leopold is particularly why community should have moral standing. "What is it then about the biotic community that makes it deserve moral standing?" (Cochrane, 2006).

And what about urbanism?

Who or what has moral status is an important question for whoever designs space, especially for urban designers and planners, who are one of the main spatial designers of the human environment. Spatial design doesn't just affect the life and behaviour of the client, but also of other humans and non-humans. When we consider the impact that the human environment has on non-human environments, it would not be hard to argue the importance of (environmental) ethics for urbanists. Therefore, one should understand who one is designing for and who is affected. More ethical awareness among designers could be a first step into improving the coexistence between humans and non-humans.

Depending on who or what is considered to have moral status, the way designers shape our environment will differ. If we would see non-humans as merely instrumental, our focus could be on ecosystem services, where ecosystems are seen as having a specific instrumental value for us. However, what kind of obligations would we have when we consider non-human entities to have moral status? For example, it would be incredibly difficult for humans to adopt the principles of Taylor (2011), since these principles are very demanding.

Also, the aspect of the built environment needs to be further researched as a constituent of environmental ethics. Until now, many environmentalists seem to focus primarily on the 'wilderness' and the preservation of it, whilst they are neglecting the urban environment (Brennan and Lo,

2016; Light, 2001). For Morton (2009), the problem lies in the image we have of nature itself. For him, nature is an anthropocentric concept that distracts humans from the idea that they are actually part of their larger surroundings. Additionally, even in cities you may find many types of wildlife. And as Schilthuizen (2018) shows, species living in our everchanging cityscapes are evolving much faster than similar species in non-human environments. That shows that whatever we construct in our environment, some non-humans will always be part of the things that we design.

Conclusion

All the options that are given in the current theories of (environmental) ethics are debatable. There is still an ongoing debate on who and what will get moral status and what kind of value non-human entities have. Many environmentalists have tried to adopt new ideas on intrinsic value towards non-human entities and setting up moral standing for non-human entities like animals, plants, species or even ecosystems. A strong point is made by criticizing the anthropocentric approach to moral status as it is just a type of speciesism, where one group is seen as superior to another merely based on the fact that they are part of another biological group. For this same reason we can question our anthropocentric way in which we now design our environments.

It is up to designers to embrace a new ethical awareness regarding the environment. Designers should look for the most plausible way of looking towards moral status and the values that they seem to embrace in their designs. And even though someone still holds the anthropocentric ideas on moral standing, it is still necessary for them to embrace an environmentally friendly approach, since we depend on the environment as well.

Because of this last statement, it seems that there is a specific threshold to be met when designing for species. This threshold is the minimal obligation we as humans have towards other species when designing

environments. When this threshold is met, lives of other species are not threatened by an ecosystem damaged by human interventions. Someone who values life itself as something intrinsically good, would feel more obligations towards species and would go further than the mere threshold.

Land use and effects

Chapter overview

In this chapter we focus on the third research question: What effects can human design have on the coexistence between species? The question focuses on literature research focusing on the impact of urban elements like infrastructure and urban land use on biodiversity.

According to Benítez-López, Alkemade, & Verweij (2010): “The main drivers of biodiversity change are land-use and land-cover change, climate change, pollution, fragmentation and infrastructure development”. In their latest report for the UN, researchers of IPBES state that the 5 main drivers of biodiversity loss are as follows: “(1) changes in land and sea use; (2) direct exploitation of organisms; (3) climate change; (4) pollution and (5) invasive alien species” (Martin, 2019).

Altering Environments

Whenever something is build, it alters the

environment. Usually this is improving the human environment by providing new buildings for people to live or new infrastructures that we can use in order to move more easily to distant places. However, it is not just altering our own environment, it is also altering the aspects of the environments of all the other living creatures that live in the proximity of the built environment. These alterations are in nearly all cases both negative and positive depending on the species. Take for example all the species living in the urban habitat like rats, pigeons and all the other birds that you can see in the cities. These species have become used to living in the urban environment. People even gave a name to these kinds of species: synanthrope, species that live near and benefit from humans. They are able to feed on the waste of humans, or the specific plants that humans grow in their backyards.

Land use changes

One of the most important impacts on

biodiversity are land use changes (Benítez-López et al., 2010; Poschlod, Bakker, & Kahmen, 2005; Reidsma, Tekelenburg, van den Berg, & Alkemade, 2006). Land use changes have been there since the existence of humans. It started in the period when humans shifted from nomads and started to settle in places and use agriculture as the way to create food. Interestingly, until the enlightenment, phytodiversity (diversity of plants) increased because of the land use change by humans. This was caused by the diversity of human landscapes. From the age of the enlightenment onward, arguably in 1800/1850, one can see a decrease in biodiversity. Due to many technical innovations in that period, humans started to intensify the lands where they settled with new irrigation systems. Another important period was in the 1960s and 70s when there was a period of economic growth. “Cheap imports of agricultural products from more distant regions and even from overseas [...] caused further land use changes” states Poschlod et al. (2005).

Removal of plants automatically changes the habitat. Not only the life of the plant, but also lives of the species that live on the specific plants have changed. Similarly with deforestation. Modern day agriculture usually consists of fields with only one type of species or grazing fields that are continuously maintained by grazers and thereby not allowing plants to grow. This we can call monotonous land use.

Another important land use impact on biodiversity are impenetrable surfaces. These surfaces, in the form of paved structures, asphalt, concrete and build structures, have the ability to stop life of plants in those spaces (Schilthuizen, 2019).

Of these impenetrable surfaces, infrastructure development is an interesting case to look at. In many cases, infrastructure development are in the form of long line shaped structures that cross landscapes and separates different habitats from each other. Not only is this a physical barrier for plants, also for many animals this forms a barrier (Benítez-López et al., 2010).

Secondary effects

The physical changes of land use also comes with several secondary effects. These effects occur because of the activities happening on that specific land use. In very urbanized areas with highly concentrated human activities these effects appear to be even stronger, therefore “cities can be considered as a type of ecological island isolated from the other city islands by the surrounding landscape” (Čeplová, Kalusová, & Lososová, 2017). One of the aspects is the urban heat island. This effect causes the urbanized area to be a few degrees warmer than its surrounding landscape and occurs because of the many impenetrable surfaces made up of asphalt, concrete or pavement together with heat and smog pollution. Because of the higher temperature than its surrounding landscape, it is predicted that it does affect the composition of species in the urban habitat (Čeplová et al., 2017). Not much has been written about the impacts of urban heat island effect on the level of biodiversity, however, it seems reasonable to assume that because of the higher temperature, species that like higher temperatures will thrive in these places. A study by Schmidt, Poppendieck, & Jensen (2014) has demonstrated that this occurs.

Another impact of the activities that happen in the human habitat is air pollution. Air pollution comes in many different forms and also has different impacts depending on the ecosystem. Sulphur and nitrogen emissions for example, result in acidification of water and soil which on their turn affects the vegetation making it a threat for its ability to function and grow. For aquatic ecosystems, “air pollution causes or contributes to acidification of lakes, eutrophication of estuaries and coastal waters, and mercury bioaccumulation in aquatic food webs” (Lovett et al., 2009). Other materials that are also highly pollutant are heavy metals that are used in industries (Oliveira & Pampulha, 2006).

Like there are many pollutants, there are also many sources for this pollution. This pollution can be caused by human activities as well as non-human activities (due to

volcanos or forest fires for example). A main source is mobility in the form of cars, busses, airplanes etc. Another important source is industry, especially heavy industry emits a lot of pollutants. Furthermore, pollutants can also be emitted by the agricultural sector through the use of fertilizers and pesticides (Stern, 1977).

Another side effect that has an impact on the behaviour of animal wildlife is noise pollution created by the human cacophony. Krause (1993) proposes the idea of the niche hypothesis. He proposes the idea that every animal has a certain voice that is recognizable by animals from that species. Because every species in an ecosystem has their own voice, a sort of soundscape is created. Due to activities such as construction or mobility, these soundscapes are interrupted by loud noise, making it harder for animals to communicate with each other.

Finally, artificial light also forms an interesting impact on animal behaviour. Some sources of light can attract migrating bird species (van laar 2007) but it also attracts species like moths. This happened for example in the Euro 2016 finals when the lights of the stadium were kept on overnight, attracting a lot of moths. The stadium had to be vacuumed thoroughly to get rid of the moths (Barkham, 2016).

Conclusion

It is very clear that biodiversity is affected by human activities, especially the way humans alter environments influence biodiversity. Not only do these actions change the physical habitat of other species, they also create side effects like pollution, that create even bigger threats to biodiversity. Even though there are always some species that might benefit from a specific pollution or landscape alteration, the overall negative impact these changes have on biodiversity make these factors absolutely non-negligible.



(16) farm and arable field in Cliffe

Approach

Chapter overview

The following chapter focusses on the analysis and design approach that has been developed by combining concepts of the theoretical research. This approach uses general characteristic of objects in order to make a design that is meant for different species and therefore different perspectives.

Texture inventory

As noted in the chapter on coexistence, it is necessary to step out of our human perspective and look at space in a more neutral way in order to design for coexistence. Therefore, the focus is on the more neutral characteristics of things that we from now on will call textures. These are different from the characteristics that we would normally see as one normally identifies things with its human meaning, being the equipment of things like buildings or road structures. Therefore, when analysing textures one needs to focus more on the

material aspects like the substance of the road surface or its form rather than its specific function.

What is texture?

Textures have been defined as: “the quality of something that can be decided by touch; the degree to which something is rough or smooth, or soft or hard” (Cambridge English Dictionary, 2019). The word itself comes from the Latin word ‘textura’, which means weaving. The meaning in this sense seems to be just a word that is used for the appearance of an object through the eyes of humans as something that could be touched. However, for this approach, the meaning of the word texture is broadened. In this report, textures are the physical structure of a material that is determined by conditions like size and shape and the arrangement of its parts. Textures can also be found on different scales. A leaf has a texture, but a tree on which it hangs also has a texture, as does the forest in which the tree stands. The forest then is a set of

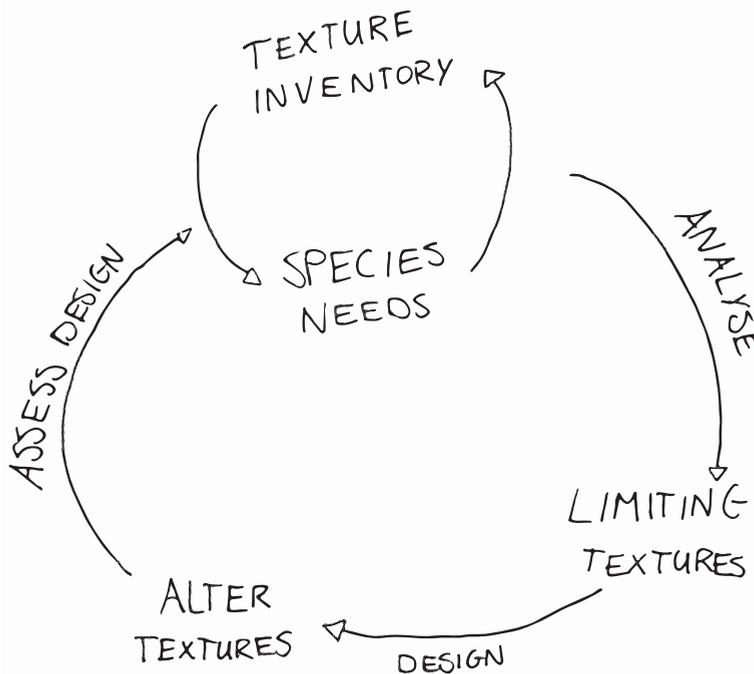
textures, namely that of all the different elements of which it consists. Depending on the scale, the texture becomes more defined. On a larger scale, the chosen textures are abstracted to sets of smaller and possibly different textures. First, one will see trees as separate textures and when we zoom in even more, one sees the textures that together constitute a tree, like leaves. On these larger scales, typical land cover maps come in handy. They show the land cover of a place in a general way, showing also a combinations of different elements that form a specific type. A texture on these scales would be a type of forest, a specific type of agriculture or even a typical human environment like a suburb, as long as these is a typical form that exists under similar conditions and textures. For the larger scales it is important to analyse the structures that the textures have through space. On the very large scales, for example a river estuary or even a whole country, the things that stand out are the infrastructures. Also the composition of the textures is important: which types of texture fill the area and to what extent? For larger scales it

is necessary to focus on defining the more intangible aspects like climate and ground conditions.

If we scale down, the large textures become more defined. The focus will be more on the arrangements of textures within a texture and how they behave through time. On the meso scale it is important to look at the transition between one texture (or a set of textures) to the other. On the micro scale textures become even more nuanced. In this scale, sections can be drawn to show the vertical textures. In this scale, categorization of the textures happens.

Relation to species

There are two ways to approach the analysis of species. The first way is to make a selection of important species and to define their needs. Then, these needs can be analysed by their related textures to see if an area provides these needs. It is then not a hard task anymore to design these specific



elements for these species. This approach would be particularly useful when one wants to conserve very specific species or to give an ecosystem a boost by introducing or removing a certain species. However, one could argue that this is not always the most efficient solution for biodiversity, because of this focus on specific species. Each species has very different basic conditions that it needs which makes designing specifically for all species nearly impossible. Furthermore, it seems close to impossible to choose the right species wisely from the thousands of species that live in an area. Lastly, this approach also does not take into account species that do not already live in the area but could very well contribute to the local ecosystem.

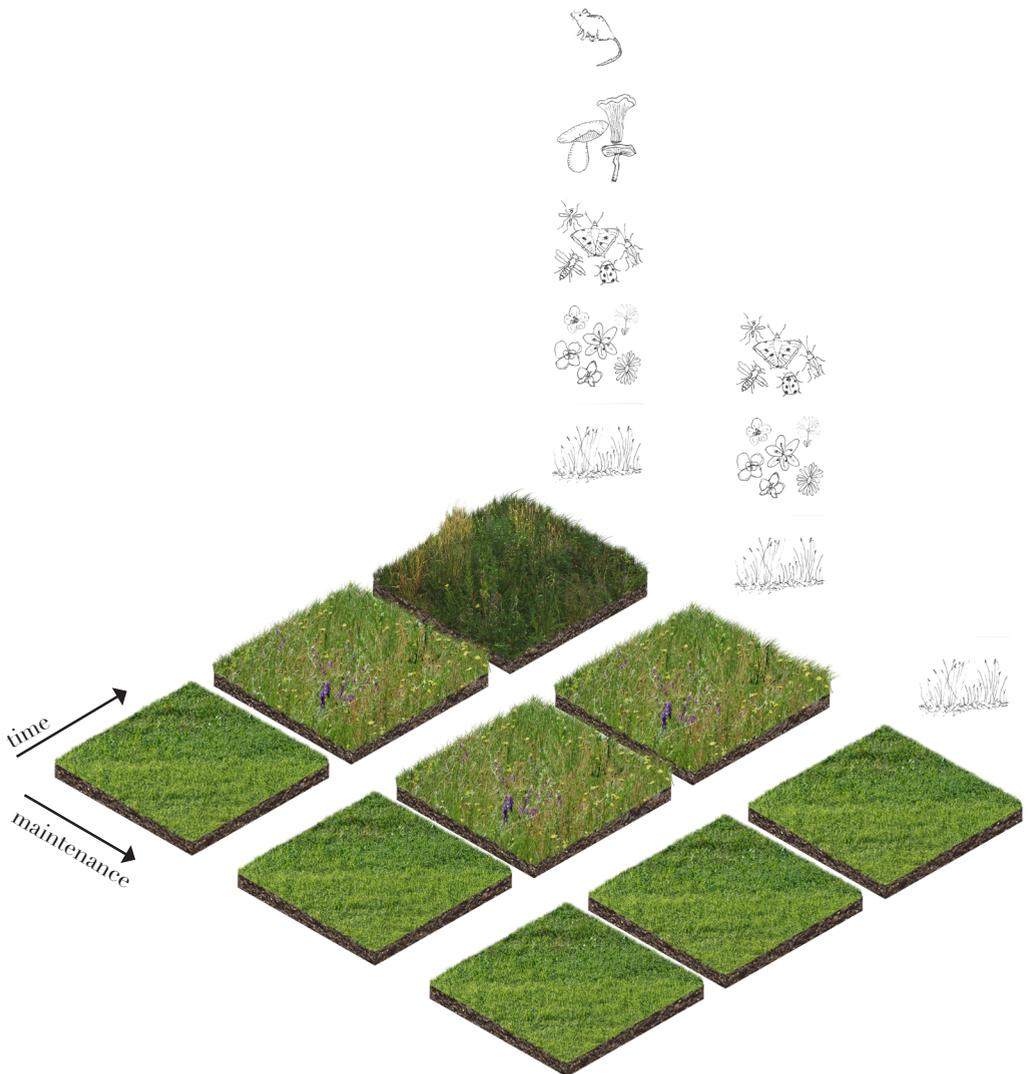
The other way of designing with textures would be to start with the textures themselves and see them as a generator of affordances. Affordances are what the environment and the things in a species' environment offers the individual. We have already seen this happening in the introduction chapter, where the fly would see a hammer as a place to rest on whilst a human sees it as something to hammer with. Both of these actions we can call affordances. This example shows that a texture can also have multiple affordances at once. Therefore, we can also say that some textures are richer in affordances than others, for instance a tree has many different textures and accompanying affordances, namely leaves, branches, seeds, flowers etc. Using this way of designing, one also needs to be aware of species' needs. However in this case, species' needs can easily be generalised and connected to the textures.

One can define the following general needs: food, water, shelter, climate and infrastructure.

Food & water (1) speak for themselves, this is the nutrition, energy and hydration source for species. Shelter (2) is the place where the species can withdraw and where they have a certain protection from other species or from climatic and weather conditions like temperature and rain. It is at these places that the species can rest. For most animals, a shelter is a form of cavity. These can be

found in a very diverse array of places. A tree, for example, already hosts multiple types of shelter. Birds may rest on the branches, some insects rest on the leaves, some trees also have cavities in their trunks. Other places that are used by species is the soil, by making lairs. Animals also tend to use existing structures. In an urban context, one can see animals benefitting from houses or sheds. For plants shelters work slightly different, but in the end all plants need a certain place to root themselves which could also be considered to be a shelter. Furthermore, species live in a specific climate (3) that suits their needs. Climate is seen as the more intangible aspects of an environment. This concerns the chemical structure of the atmosphere, lithosphere and hydrosphere. To clarify this point even further: not all species can survive in dry areas, and some don't perform well wet or windy conditions. Some need a lot of sun and some need a specific soil type (note that soil conditions have also been taken into account in climate). Finally a species needs a certain infrastructure (4) in order to move from place to place. For some that means migration, like many bird species do. For them, the sky functions as infrastructure. For others, a more sheltered corridor of interconnected woodland functions as infrastructure. For fish species, it is the connected bodies of water. Infrastructures can also be used to move from the shelter to a food or water source. This seems that this condition is only meant for animals that are able to move. But also for plants, infrastructure is important. In principle, individual plants remain in the same place. However, as a species, plants grow by reproduction from one place to the other. Plants then need wind, water or even animals to move seeds from the plant to a new place.

By connecting species' needs to the already inventoried textures, it is easy to see the richness of affordances that a texture gives. By connecting this notion to the research on the effects of human structures and activities of the previous chapters, it becomes possible to see when specific textures are limited by actions or by other textures. Additionally, it becomes easy to see what kind of textures have an overall limiting effect on the species.



(18) types of maintenance and their textures that it affords

It is important to note that we do not always have to abolish limiting textures. All textures have at least a certain benefit to some species as well, because in the end some species can even live very well under very harsh conditions. For example, deserts are known to have very little biodiversity, but still there are some species like scorpions that perform rather well in a desert and even prefer living in those circumstances. This of course is an extreme scenario, but it could also be seen in something as basic as the maintenance of an area. When maintaining very heavily, one disallows life for many species. This occurs for example on agricultural fields. On the other side, we can completely stop maintaining areas. These areas would slowly evolve into a forest, which are usually very rich textures that create many affordances. However, even here the texture can be even richer by creating some places that are relatively maintained, since maintenance creates conditions that are suitable for other species and extra affordances are added on top of the ones that are already there. As mentioned before it is good to have diversity in different ways and ecosystem diversity is one of them. Climatic conditions themselves already create many different ecosystems by their basic conditions in places. Humans have been able to alter these ecosystems, and have been transforming its biodiversity both in a positive and a negative sense, but primarily in a negative sense as we have already seen. Therefore we need to focus on improving the textures that have an overall negative influence on biodiversity.

Limiting textures

Thus, concluding the analysis is mapping the limiting textures, the textures that have an overall negative influence on biodiversity. Some of these effects have already been shown in the previous chapter on the effects of the urban habitat. The analysis will also show which areas are rich and which are poor in affordances.

Different aspects are seen on different scales, as mentioned in the first paragraph of this chapter. This also holds for the analysis on the limiting textures. On the larger scales, the

analysis is more focused on the composition of sets of textures that form ecosystems and the infrastructures. On the smaller scales, the research is also focussed on the composition and therefore the diversity of affordances that an area has.

Altering textures

The most important measure to increase biodiversity is to allow for more niches to come up. Ecological niches have been described as “a term for the position of a species within an ecosystem, describing both the range of conditions necessary for persistence of the species, and its ecological role in the ecosystem” (Polechová & Storch, 2008).

When describing ecosystems, every species seems to live in a certain niche within that ecosystem. This niche can be described by the basic needs that the species has in order to sustain its live. In design terms, the term could also be translated to the term affordances, with affordances being the use or meaning that a thing can have. In that sense everything has a certain affordance. As humans, we have been designing places that have affordances for us. We use roads as an infrastructure for our vehicles. Roads having the affordance to carry vehicles and vehicles having the affordance to move humans and other things faster from place to place. This same thing can be seen from the perspective of other species. A tree for example, brings certain conditions and textures that have value for many different species. In his famous study in 1961, Richard Southwood investigated how many insect species are associated with certain trees. In his findings he saw that there are 284 types of insects associated with an oak tree. Even though this is not for one single oak tree but for oak as a species in Britain, it is still incredible to see how many different species are attracted by one type of trees. This oak tree is then included into the niches of all these different insects and therefore giving affordances to the different insects. Some insects see the leaves as a food source while others rather focus on the nectar and pollen of the flowers. But how to design affordances for all the

different species?

Interestingly, a study by Fæth, Bang & Saari shows that humans primarily have direct control on plants, but only a limited control on other species (2011). This makes another compelling argument for not designing for specific species, but rather to create the possibility of affordances. Textures themselves offer specific affordances of their own, like the oak tree that already has many different types of textures and forms.

The affordances themselves can be designed with the basic needs that have been mentioned earlier. Plants are the main food source, also since a lot of species eat species that eat plants. To create many affordances for species, it would be wise to plant a wide array of different plants and trees. The more different plants, the more affordances for food. For shelter, plants also meet the needs of many species, but also in human structures you can find species' shelters and of course in the soil itself. The climatic aspects are primarily focused on limiting the human impact on climate through pollution. This can of course be stopped by limiting or removing the source of pollution. This is primarily done in the industries and human activities and have to be stopped by different

kinds of policies. There are also more spatial design oriented solutions for pollution, for example by remediating the soil, air or water. Furthermore, there are also spatial ways to limit climatic effects, like noise barriers and light blockers. Also the design can play a role by creating cover for rain and the sun when there is a direct connection with the need for shelter. Infrastructure has more to do with the interconnectivity of the similar sets of textures and is becoming increasingly important in the current era of climate change (Change, I. C., 2014).

Basic design principles

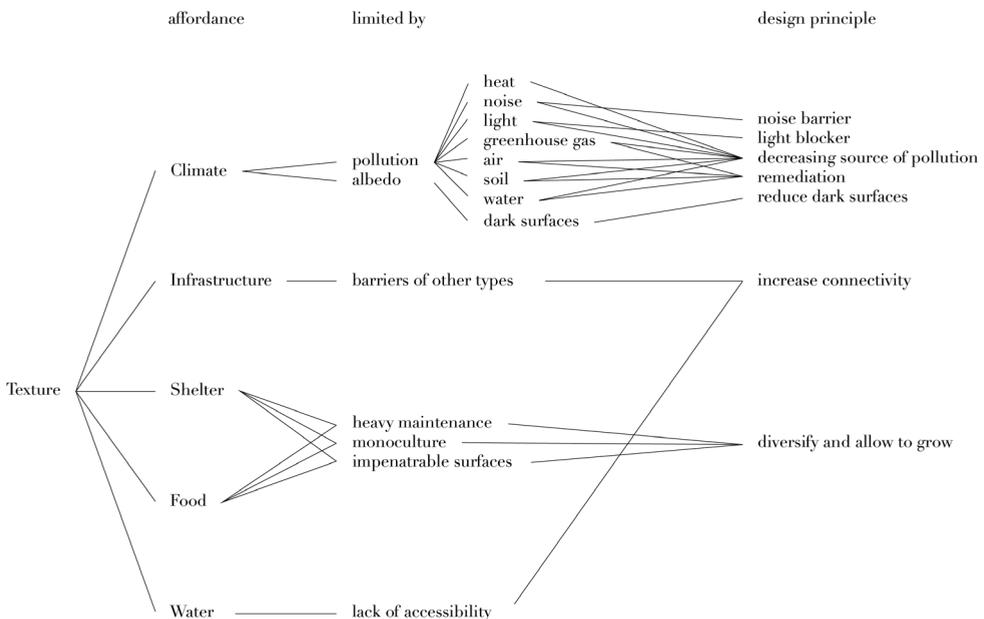
The following simple design principles can be created by connecting textures, their affordances and the things that limit the affordances.

Create diverse and rich textures

It speaks for itself that one has to diversify textures in order to create more affordances and thereby allow for more species to live in an area.

Let it grow

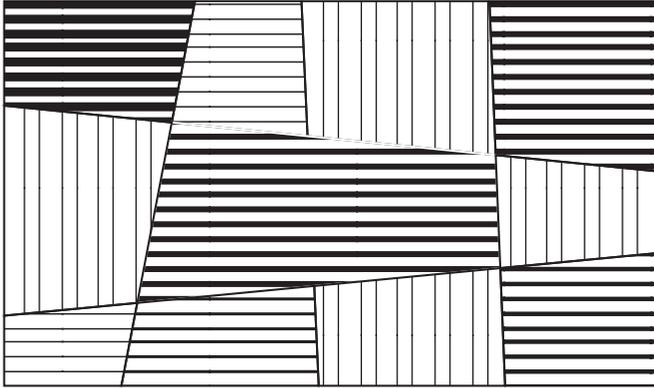
A simple way to create a more diverse texture is by reducing maintenance or even stop



doing maintenance. Even though people have been really effective with placing plants in a certain place, this will not always end up in attracting more species and will not always be successful. When reducing maintenance and letting plants grow, it usually creates a lot of benefits to the area. More diverse plants will start to bloom and there will be a whole succession happening in the same place that would otherwise be constantly maintained to have the same plants continuously. Furthermore, the plants that will grow there are the ones that were able to grow there for a reason, because the conditions fitted them well. Finally, we also have an ethical reason for doing this as we have seen in the previous chapter.

Connect rich textures

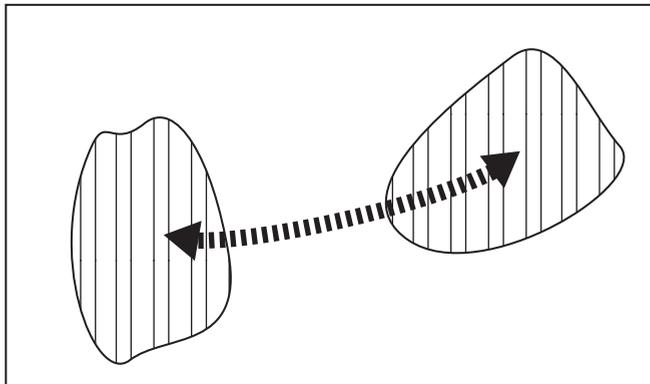
It is important to create infrastructures between areas that are rich in affordances. This allows for species to migrate when some places are low on food and other needs. There are different kinds of infrastructures and therefore a diversity of the infrastructures is also needed.



(20) diversify textures



(21) let it grow - ecological succession



(22) connect rich textures

Context

Chapter overview

This chapter focuses on the location and the specific sites within the chosen location. First the chapter will start with the criteria for the specific location. This will be followed by an introduction to the main location; the Thames Estuary. The chapter will end with the two specific sites and focus on the smaller scale of the project. Of the specific location and its site maps will be shown that are specifically interesting for the project. In these maps the properties will be shown of the objects that are within the Thames region on two main scales: the Thames tidal section and the two main sites. The focus therein will be on human built structures; roads and buildings, and green and blue structures and a more specific focus on the woodland and tree types. Finally the climatic and soil conditions of the context will be explained by maps.



(23) map of the North Sea

Main location choice

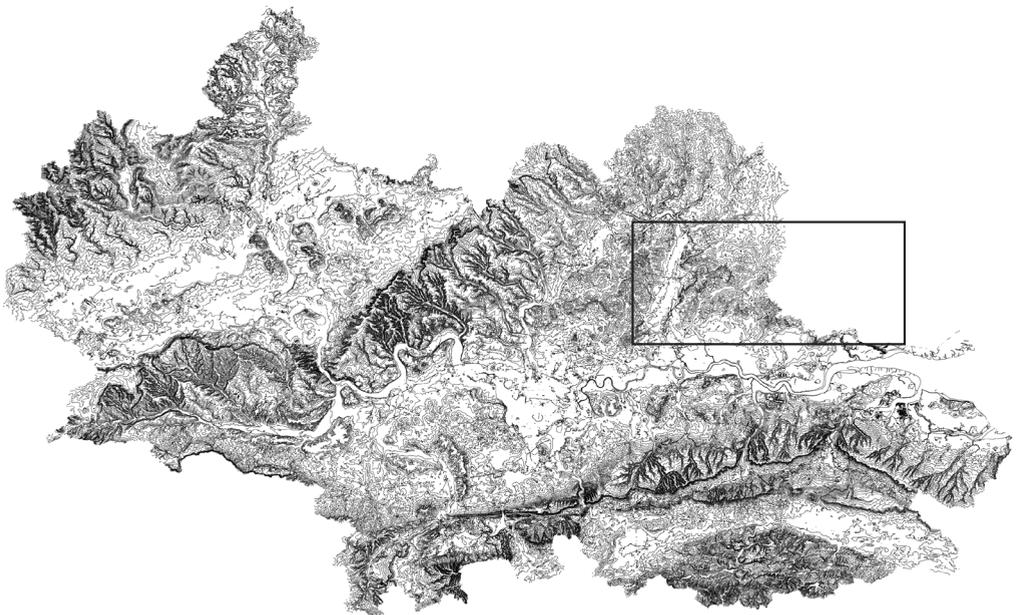
In order to choose a specific research location, the following criteria are addressed:

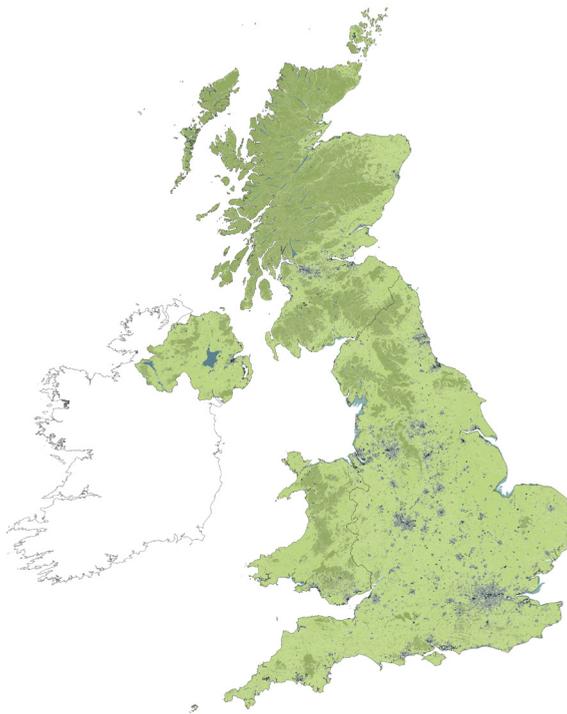
- The location should be in relation with the North Sea
- The location should have different types of urbanization (ie: city center, industrial rural, agriculture and nature reserves)
- Ecological connections between the different types of urbanization. (ie that it could be considered as an ecosystem on itself)
- Location with a possible high nutrients and therefore high possible biodiversity

Locations that would best fit these criteria would be a river delta. Since river deltas are on the one hand connected to the oceans and on the other hand through their fertile soil and diverse vegetation. Within the context of the North Sea the most likely deltas for this specific project would be either the Dutch delta or the Thames Estuary. In both cases there is the proximity of a large city, Rotterdam & London, and large industrial sites. The main difference between the two deltas is that in the case of the Rotterdam area, the harbor is simply

dominating the site completely whilst in the Thames Estuary there are many different types of human and natural environments. For this research, the Thames Estuary will fit best.

The project will focus on different scales. The natural processes of the larger ecosystem need to be researched and mapped in order to get a grip on the location. The main focus lies on the processes within the Thames Estuary. The Thames Estuary is largely defined by its own context: the territory of the North Sea. These are the larger scales, namely the regional (Thames Estuary) and the territorial (North Sea). Next to that, there will be specific focus areas that will show the different types of urbanization, this will be called the Mesosystem scale. Finally, the smallest scales are the Microscale wherein the focus is on the specific urban and landscape elements and the individual scale of the stakeholders.





(25) UK land cover

Thames Estuary

As mentioned in the introduction, the main site for this project will be the Thames Estuary. The Thames estuary is the meeting point of the River Thames, England's longest river, and the North Sea. Although the limits of the Thames Estuary are defined differently in many occasions, this project extends it toward London. The Thames itself is a tidal river, i.e. the flows and the level of the river are influenced by tides. The tidal limit, the section that is affected by the tides, reaches up to Teddington Lock, a lock in the south western part of Greater London.

London

The first site for this project is the highly urbanized site. In the heart of London, the City of London is located on the northern site of the Thames. The City, as it is also often referred to, is the historical and central business district (CBD) of London. The total area of the City of London is 2.90km².

Cliffe

The area of Cliffe is located on the north west corner of the Hoo Peninsula, a peninsula located on the far east side of the Thames. The peninsula separates the estuaries of the Thames on the north side and the Medway on the south side. The name Cliffe originates from the small village with the same name. At the north west corner of the area a former Explosive factory still has several remnants lying around. Now the site is used for grazing for sheep. Also located in the area are the RSPB Cliffe Pools nature reserve. In this protected area different types of birds find their (temporary) home in the brackish pools, saline lagoons and grasslands.



(26) Thames Estuary aerial

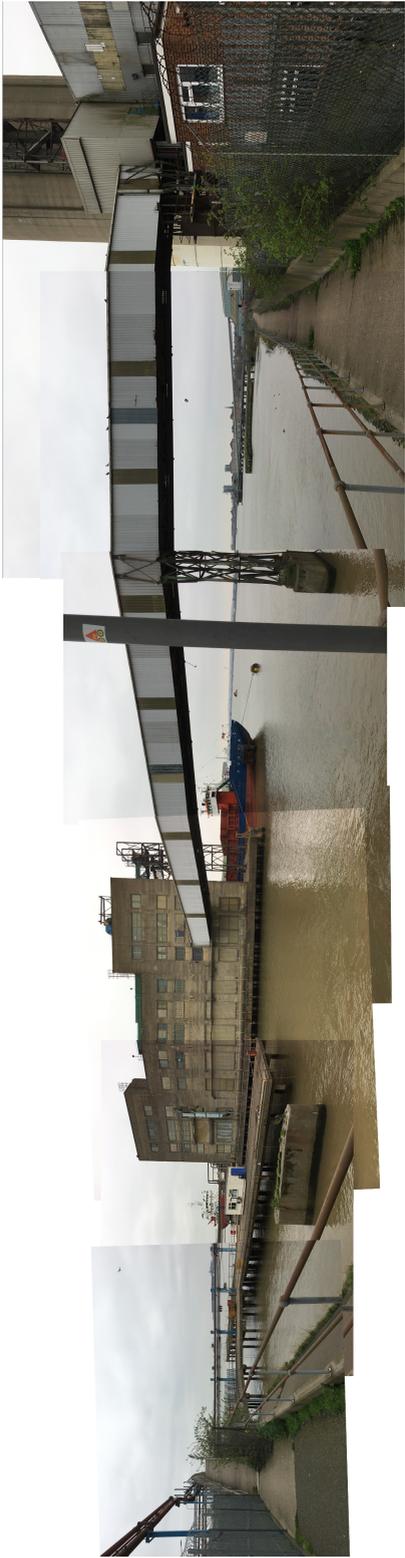


(27) London aerial



(28) Cliffe aerial





(29) panoramas taken along the Thames



(30) counties and unitary authorities

Politics and planning

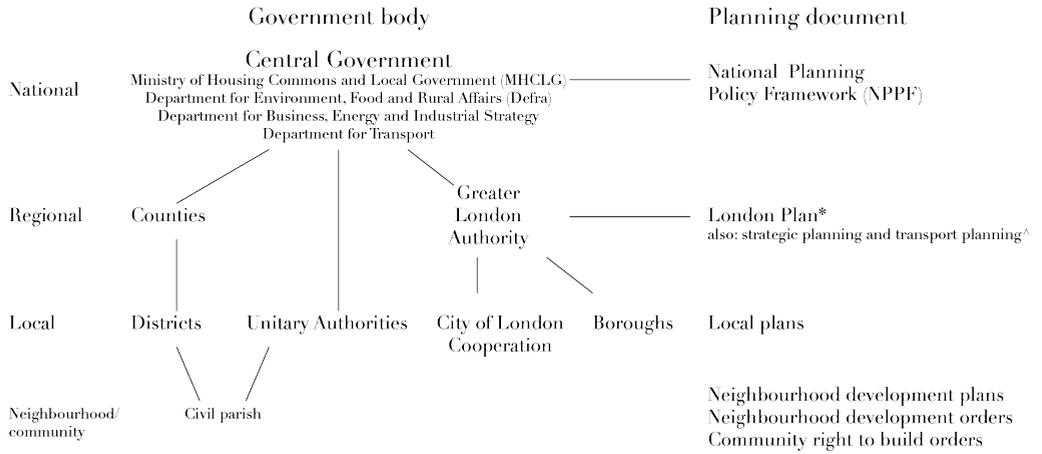
The UK has a rather complex government structure with different levels of authority. The UK itself already consists of different 'countries' with England, Scotland, Wales and Northern Ireland with all their own subsystems of planning and governance. The main department in the UK government that is responsible for planning in the UK is the Ministry of housing communities and local government (MHCLG). This ministry creates general policies that are adopted by local planning departments. For this the ministry creates the National Planning Policy Framework. Other departments that are closely related to the MHCLG are Department for Environment, Food and Rural Affairs and Department for Business, Energy and Industrial Strategy. The first is focussed on topics of agriculture and forestry, whilst the other is focussed on industries and aspects of climate

change.

At regional level, the country is divided into counties, unitary authorities and the Greater London Authority. On this level there is only one actual body that can make legislative plans: the Greater London Authority, that has the obligation to make the London Plan. The London Plan is a spatial development strategy for Greater London and all its boroughs.

At local level the planning department can be found at the councils of the districts, unitary authorities and the boroughs of London. There the local development plan functions as the main legislative planning document.

Finally, there is the neighbourhood plan, to help local communities and businesses to influence the planning decisions.



(31) governance and planning scheme



(32) districts Thames

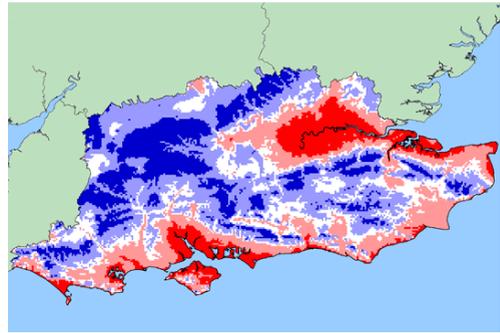
Climatic conditions

The area has a marine climate following the Koppen classification. The winter is relatively mild only coming close to a mean temperature of 3.2-4.2 degrees in the higher more inland regions. The warmer areas can be found along the coast and in the urban areas. Especially in London it is clear to see a heat island effect occurring showing always up in highest category of temperature. Compared to a few kilometers outside the urban area the temperature difference is usually a few degrees celcius.

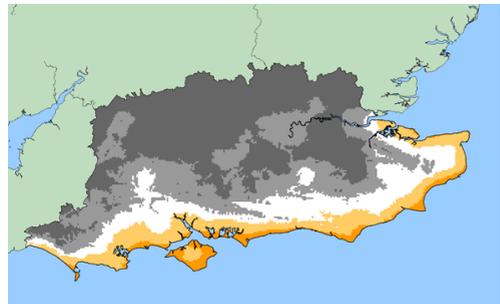
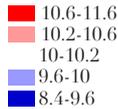
Most of the rest of the estuary shows a similar temperature as London since large parts along the Thames are also built space. There are however some places where the temperature is in a lower category as the Thames, meaning that there might be a difference of maximum 1 degree in these places.

Looking at sunshine we can see again that the coastal areas get the most sunshine in the year compared to more inland areas. The difference between the south coast and the south of London is around 200 to 500 hours less. There is also a difference of sunshine along the Thames visible. There you can see gradually less sunshine when going up the river. At the height of the Hoo Peninsula there is annually approximately 100 hours of sun more than in the centre of London.

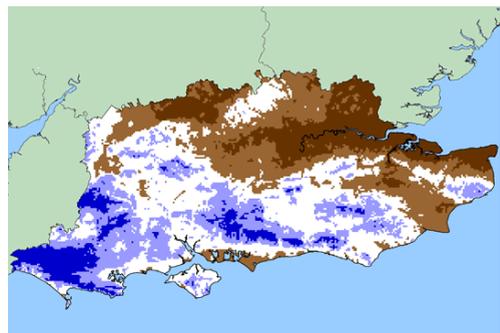
England is seen as a country where it rains a lot. It is also a property of the Marine climate that there are not really any dry seasons throughout the year. Only in winter it tends to rain a bit more than usual. But nearly all seasons have at least 100 mm of rain in all places. The area of the Thames is the part with the lowest annual precipitation of the region, having an annual precipitation of 450-650 and every season only 100-200 mm of rain.



(33) annual mean temp (°C)

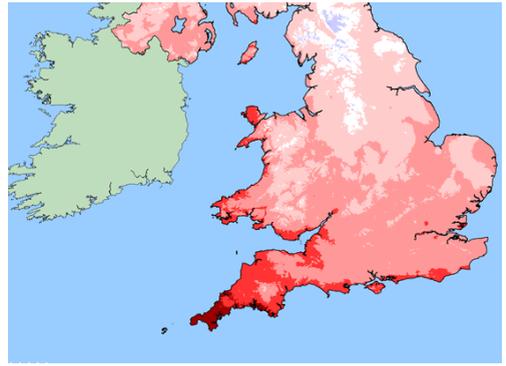
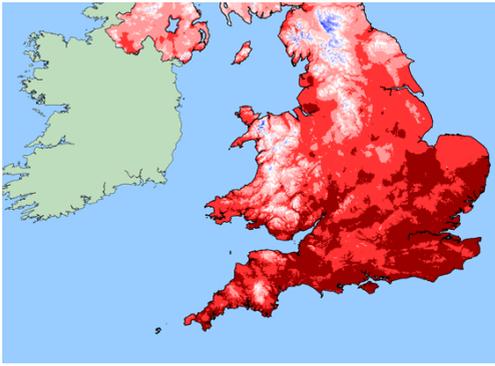


(34) annual sunshine (hours)



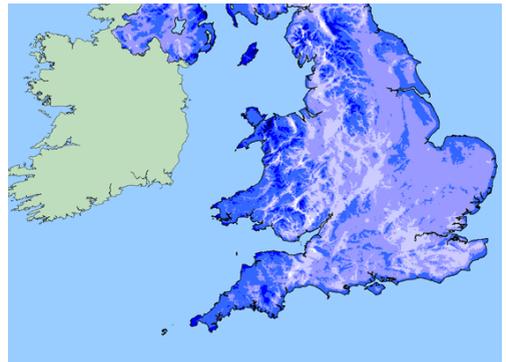
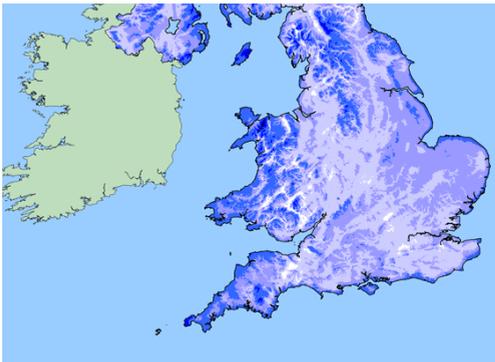
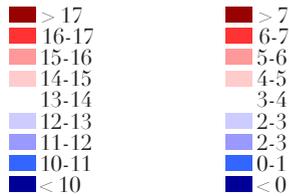
(35) annual precipitation (mm)





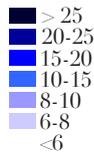
v

The mean soil temperature shows a similar pattern as the mean temperature. The Thames estuary falls in the highest category as measured by MetOffice. This means that the mean temperature is in winter above 7 degrees and in summer above 17 degrees. The given maps do not give any nuance of the specific area.



(37) wind speed (knots) annual and winter

The wind speed is highest in proximity of the coastline and lowers when going inland along the Thames. The mean wind speed in London is around 6-8 knots, whilst at the far end of the Thames it is between 8-10 knots. During winter the winds are faster than during other seasons making the average wind speed in many places 2 knots higher than other seasons.



The soil texture says something about the composition of the sand. Specifically the proportion of sand, silt and clay sized particles in the soil. Sand particles are larger than the others and are therefore more porous than for example clay which is very fine Silt is inbetween the two particle sizes. Most soil in this area is known as loamy which is a combination of the three particles but mostly silt and sand. Some areas have a little bit more sand in them whilst others have more clay in them. The clay rich areas are primarily along the Thames and other rivers. The soils with more sand in them are only found on the south side of the Thames in the south east of London.



(38) soil texture

- loamy and clayey
- loamy
- sandy and loamy

Soil fertility shows the natural lime status of the soils but also shows the acidity of the soil. Soils that have very low fertility are very acid and have lower amount of soil living organisms, however, these soils do support heathland and acid woodland habitats. Soils that have low fertility are acid, they can be found in a wide variety of habitats. Moderate soils are slightly acid to neutral and can support a wide variety of habitats. Soils with high fertility support base rich pastures and woodlands. Lime-rich soils are full of chalk and limestone and support herb rich pastures and limestone woodlands.



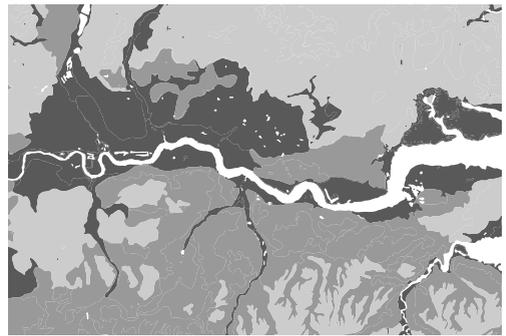
(39) soil fertility

- very low
- low
- lime rich
- lime rich to moderate
- moderate
- moderate to high
- high

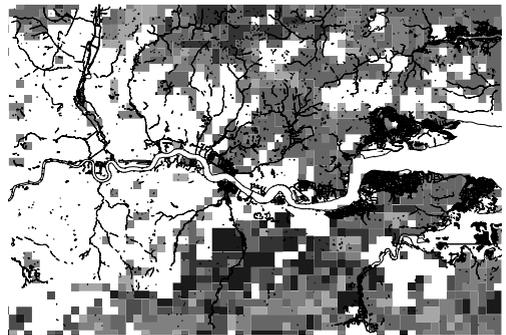
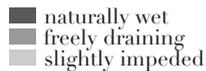
Drainage is the way water is absorbed in the soil. There are three types of drainage in the Thames Estuary. First the areas that are naturally wet. These are primarily found in the low lying parts. Along the Thames you can find these, but also some of the siderivers that have their mound in the Thames have this type of drainage. In these areas the ground water level is already high. Secondly are the soils that are freely draining, there the water moves freely through the different soil layers. Finally the higher areas along the Thames have slightly impeded drainage, these soils are more tight and therefore impedes water to run through the soil. During heavy rainfalls there is a chance of waterlogging in these areas.

Soil pH shows the acidity or basicity. Soil acidity is an important variable in soils since it affects the chemical processes that occur in soils. Fertilizers are able to alter soil acidity. 6.5 - 7.5 is seen as neutral, below 6.5 is acidic and above 7.5 is basic.

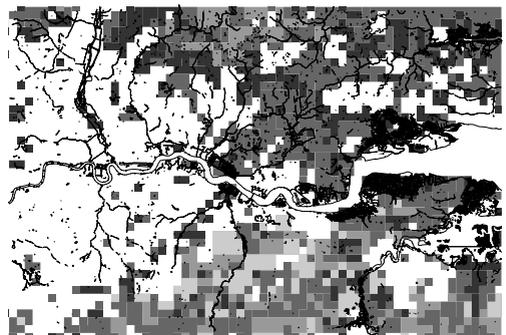
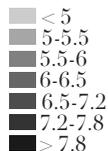
The soil moisture shows the water content of the soil presented in percentage of volume. Depending on the soil moisture content plants will different plants will grow, that are in need of different amounts of water.



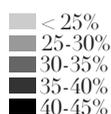
(40) drainage



(41) soil acidity (pH)



(42) soil moisture



Analysis: Species

Chapter overview

The analysis will focus on different methods of analysing the coexistence of species. The first type of analysis is focused on specific species. An overview of the species is given in order to find out what conditions the species needs and where it can be found. As has been said in the previous chapter, this approach was not sufficient to create higher biodiversity. Therefore, a second approach will be tested focussing on textures and their affordances. The textures are analysed on their richness in support of the biodiversity. Finally the chapter will conclude with a focus on the elements that limit biodiversity.

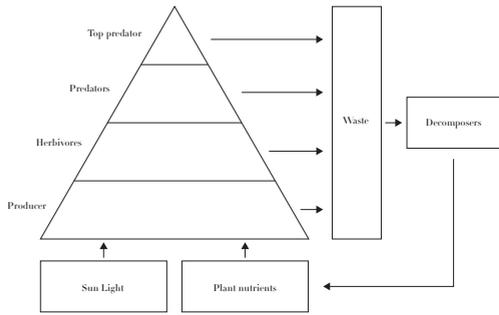
Selection of stakeholders

Starting with the elephant in the room: the amount of species there are in the area. There are different estimates of the amount of living species there are. Even though the amount that have been discovered is around 1.2 million different species, scientists

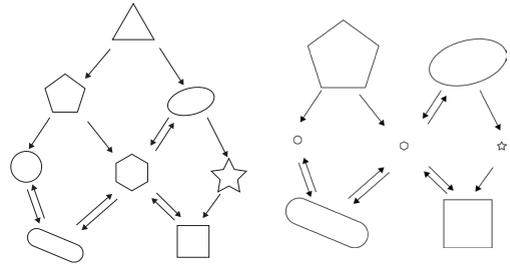
predict that there are around 8.7 million species (Mora, Tittensor, Adl, Simpson, & Worm, 2011). This suggests that 86% of the species still need to be identified.

Of course when focusing solely on the area of the Thames, this number is much lower. According to data from NBN Atlas (2019) different institutes have recorded more than 15.000 species in the given extents of the Thames [see image on the other page]. (disclaimer: most records are from birds)

Still this number is far too high to conduct for this research. In order to get to a doable selection a selection is needed. In the ideal situation we would be able to use certain keystone species. These type of species have a relatively important role in the ecosystem. Without this type of species an ecosystem would become rather unstable. However, finding out what the keystone species are in the urban habitats is rather difficult and it might be that the only species that could be considered keystone are humans themselves because of the way they maintain the habitat



(43) food pyramid

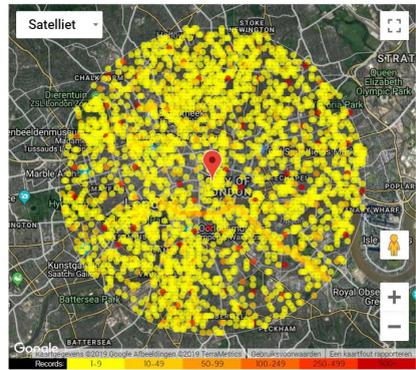


(44) keystone species

Showing records for: 1 Patemoster Row, London EC4M 7DX, Verenigd Koninkrijk

Display records in a 5 km radius [View all records](#) [Download](#)

Group	Species	Species : Common Name	Records
All species	1957	1. <i>Abraxas grossulariata</i> : Magpie	3
Animals	1509	2. <i>Abraxas sylvata</i> : Clouded Magpie	1
Mammals	22	3. <i>Abrostola tripartita</i> : Spectacle	5
Birds	206	4. <i>Abrostola tripartita</i> : Dark Spectacle	3
Reptiles	4	5. <i>Acanthinula aculeata</i> : Prickly Snail	1
Amphibians	5	6. <i>Acanthis cabaret</i> : Lesser Redpoll	1
Fishes	6	7. <i>Acaulon multicum</i> : Rounded Pygmy-moss	318
Molluscs	125	8. <i>Accipiter nisus</i> : Sparrowhawk	2
Arthropods	1118	9. <i>Acentia ephemerella</i> : Water Veneer	2
Crustaceans	29	10. <i>Acer campestre</i> : Field Maple	88
Insects	1054	11. <i>Acer cappadocicum</i> : Cappadocian Maple	1
[SpidersAndAllies]	32	12. <i>Acer davidii</i> : Snakebark Maple	2
[Myriapods]	3	13. <i>Acer mono</i>	3
[Worms]	21	14. <i>Acer negundo</i> : Ashleaf Maple	1
Plants	248	15. <i>Acer palmatum</i> : Smooth Japanese-Maple	4
Algae	0	16. <i>Acer platanoides</i> : Norway Maple	146
Bryophytes	117	17. <i>Acer pseudoplatanus forma variegatum</i> : Variegated Sycamore	1
[Hornworts]	0	18. <i>Acer pseudoplatanus</i> : Sycamore	435
[Gymnosperms and Ginkgo]	0	19. <i>Acer rubrum</i> : Red Maple	2
[Ferns and allies]	0	20. <i>Acer saccharinum</i> : Silver Maple	25
[Clubmosses]	0	21. <i>Acer saccharum</i> : Sugar Maple	1
Angiosperms	120	22. <i>Achroia grisella</i> : Lesser Wax Moth	1
Fungi	198	23. <i>Aclius sulcatus</i>	1
Chromista	1	24. <i>Acleris aspersana</i> : Ginger Button	2
Protozoa	0	25. <i>Acleris cristata</i> : Tufted Button	4
Bacteria	0	26. <i>Acleris forsskalleana</i> : Maple Button	2
		27. <i>Acleris laterana</i> : Dark-triangular Button	1

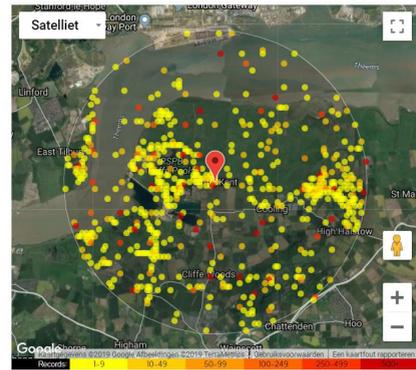


Tips: you can fine-tune the location of the area by dragging the red marker icon.

Showing records for: 195 Church St, Cliffe, Rochester ME3 7QE, Verenigd Koninkrijk

Display records in a 5 km radius [View all records](#) [Download](#)

Group	Species	Species : Common Name	Records
All species	3158	1. <i>Abax parallelepipedus</i>	5
Animals	2851	2. <i>Abdera biflexuosa</i>	1
Mammals	33	3. <i>Abramis brama</i> : Bream	1
Birds	284	4. <i>Abraxas grossulariata</i> : Magpie	2
Reptiles	2	5. <i>Abrostola tripartita</i> : Spectacle	2
Amphibians	5	6. <i>Acalypta parvula</i>	2
Fishes	21	7. <i>Acanthinula aculeata</i> : Prickly Snail	1
Molluscs	97	8. <i>Acanthis cabaret</i> : Lesser Redpoll	21
Arthropods	2404	9. <i>Acanthis flammea</i> : Redpoll	4
Crustaceans	21	10. <i>Acanthisoma haemorrhoidale</i> : Hawthorn Shieldbug	5
Insects	2325	11. <i>Acasis viatica</i> : Yellow-Banded Brindie	1
[SpidersAndAllies]	46	12. <i>Accipiter nisus</i> : Sparrowhawk	485
[Myriapods]	12	13. <i>Achenium humile</i>	1
[Worms]	1	14. <i>Acheta domestica</i> : House Cricket	6
Plants	182	15. <i>Achlya flavicornis</i> : Yellow Horned	1
Algae	5	16. <i>Achroia grisella</i> : Lesser Wax Moth	1
Bryophytes	134	17. <i>Aclius sulcatus</i>	1
[Hornworts]	0	18. <i>Acleris bergmanniana</i> : Yellow Rose Button	1
[Gymnosperms and Ginkgo]	0	19. <i>Acleris forsskalleana</i> : Maple Button	1
[Ferns and allies]	0	20. <i>Acompsa chirella</i> : Ash-coloured Sober	1
[Clubmosses]	0	21. <i>Acrocephalus schoenobaenus</i> : Sedge Warbler	304
Angiosperms	41	22. <i>Acrocephalus scirpaceus</i> : Reed Warbler	575
Fungi	121	23. <i>Acrolocha sulcula</i>	2
Chromista	4	24. <i>Acrioneta aceris</i> : Sycamore	1
Protozoa	0	25. <i>Acrioneta leporea</i> : Miller	1
Bacteria	0	26. <i>Acrioneta psi</i> : Grey Dagger	1
		27. <i>Acrioneta rumicis</i> : Knotgrass	1



Tips: you can fine-tune the location of the area by dragging the red marker icon.

(45) registered species in London and Cliffe [images by NBN Atlas]

as it is.

The selection used for this project is based on taxonomy and their 'function' in the food web. From taxonomical perspective we look at the kingdoms, focusing on 3 of them: Plantae, Fungi and Animalia. Focusing on these because these seem to have the most 'visible' influence from human interventions in space. Furthermore the selection of species is based on function in the food web: producer, herbivore, predator, top predator, decomposer.

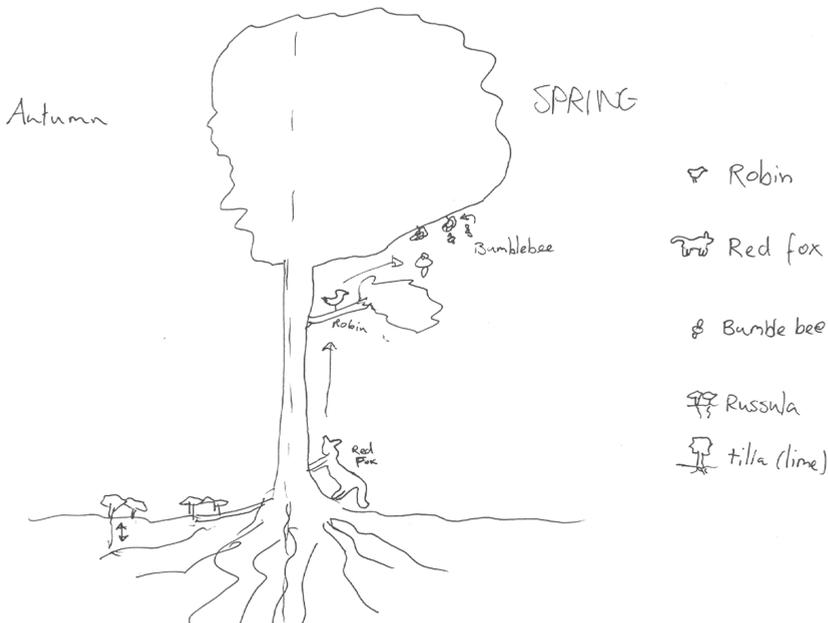
The species chosen are the following 5:

- Tilia Cordata, a lime tree, part of the plant kingdom and a producer
- Bumblebee, an insect of the animal kingdom and a herbivore
- Robin, a bird of the animal kingdom that eats insects among other things.
- Red Fox, a mammal of the animal kingdom

that eats other animals like small birds and might be considered a top predator in the urban environment.

- Russula, a fungi that feeds on the roots of trees like the tilia cordata and is a decomposer.

These species are researched on their spatial needs like food source and nesting/resting sites. For all of these species, these things are completely different. Plants, specifically, have many environmental factors that make up their habitat, e.g. good soil, the right climate etc. The climatic aspects that are important for plants have been shown in the previous chapter, and are combined for plants in this chapter.





(47) centre of London and different worlds of animals, unrelated to the text



(48) *tilia cordata*

Common lime '*Tilia cordata*'

Kingdom: Plantae

Class: Spermatopsida

Order: Malvales

Family: Malvaceae

Average lifespan: 200-300 years (by british hardwood tree nursery. Others say a 350-500 or even a thousand years.)

Spatial needs

Climate: temperate climate. can handle -34 °C, prefers warmer climates

Soil type: loamy, clay or sandy

The *tilia cordata*, also called small leaved lime or littleleaf linden, is a tree that is found in many places in Europe, spreading from the UK to Russia. The tree is usually found in the most fertile soils of forests and is commonly found on wooded limestone cliffs. They can have a long life spanning over more than 1000 years. Its height can reach 30-40m. Limes are hermaphrodite, that means that the flower has both male as female parts and needs to be pollinated by insects. Flourishes in june/july. When pollinated by insects the flowers develop small fruits. The tree has a good value for other species, the leaves are eaten by caterpillars, they attract aphids and the nectar and pollen is eaten by insects. Also its dead wood provide for beetles and in older trees there can be cavities where birds might nest. (Eaton, Caudullo, & de Rigo, n.d.; PFAF Plant Database, n.d.; "Small leaved lime (*Tilia cordata*) - Woodland Trust," n.d.)

The maps on the right show the places where the *tilia* is the most likely to show. the darker the area the more likely the *Tilia* can grow there. The maps are the same, apart from the lower one having also included the acidity and moisture level of the soil. The single maps can be found in the next part of the analysis.



(49) suitable location for *tilia cordata*



(50) suitable location for *tilia cordata* including data of soil pH and moisture

Trees

Trees are everywhere in many different forms and in many different types of locations. It is estimated that there are 3 trillion trees in the world. That means that there are 422 trees per human. In the UK there are 3 billion trees, thus 47 for each person (Bolton, 2015). And there are more than 60,000 known tree species (Beech, Rivers, Oldfield, & Smith, 2017). All these trees have their specific qualities and also their specific needs. These needs can be found in the soil (lithosphere and pedosphere) and in the atmosphere. Through the soil they gain different types of nutrition and from the atmosphere they get energy from the sun. Trees are sometimes referred to as the lungs of the earth, since they take in CO₂ from the atmosphere and generate oxygen.

For humans the trees are seen in many different ways. For example as a resource for building materials, energy or food. But since most of us is not working in one of these industries, we see trees primarily as a scenic

object. We tend to forget the importance of trees in our lives since we are not directly involved with them and only know about its use for us.

For many other species this is completely different. Take for example insects. Based on a tree you can see how many insects are associated with that tree. According to a study by Kennedy & Southwood (1984), there are more than 400 different insect species that are associated with oak (*quercus*) trees. (Alexander, Butler, & Green, 2006)

The upper map on the right show the areas where the *tilia* would be able to freely grow and where it could start to grow without human interference. The spaces marked are the different forests that can be found in the area. Other places where it might start to grow it would have a very high chance of being removed.





(52) bumblebee

Bumblebee “*Bombus spp.*”

Kingdom: Animalia
 Class: Insecta
 Order: Hymenoptera
 Family: Apidae
 Diet: Herbivore
 Lifestyle: Pack
 Average Lifespan: 1 year

Spatial needs

Habitat: Quiet forests and pastures
 Prey: Nectar, Pollen, Honey

Bumblebees are almost entirely dependent on flowers for their food. Therefore their habitat are always flower rich. Nectar is high in sugar and is their source of fuel. The pollen on the other hand provide them with protein and nutrients. The choice of flower depends on the form of the flower, when it allows the bumblebee to use it. Not too narrow and enough pollen and nectar to offer. Bumblebees nest in dry and dark cavities but this can be found in varied places. Some are underground in rodent holes, under sheds and in compost heaps. Nests can also be found in trees and bird boxes. Also, the nests

are found in shaded areas. Bumblebees primarily live from spring to autumn when most of the flowers are flourishing. In autumn the bumblebee queen are fattening and will go in a hibernation. (“Bumblebee nests - Bumblebee Conservation Trust,” n.d.; “Bumblebee predators - Bumblebee Conservation Trust,” n.d.; “Bumblebee predators - Bumblebee Conservation Trust,” n.d.)

- shelter lower chance
- shelter high chance
- ▨ high possibility for food
- ▨ low possibility for food



(53) bee habitat



(54) european robin

European Robin '*Erithacus rubecula*'

Kingdom: European robin

Class: Aves

Order: Passeriformes

Family: Muscicapidae

Diet: insectivore

Lifestyle:

Average lifespan: 1.1 years (when it survives first year, life expectancy grows)

Spatial needs

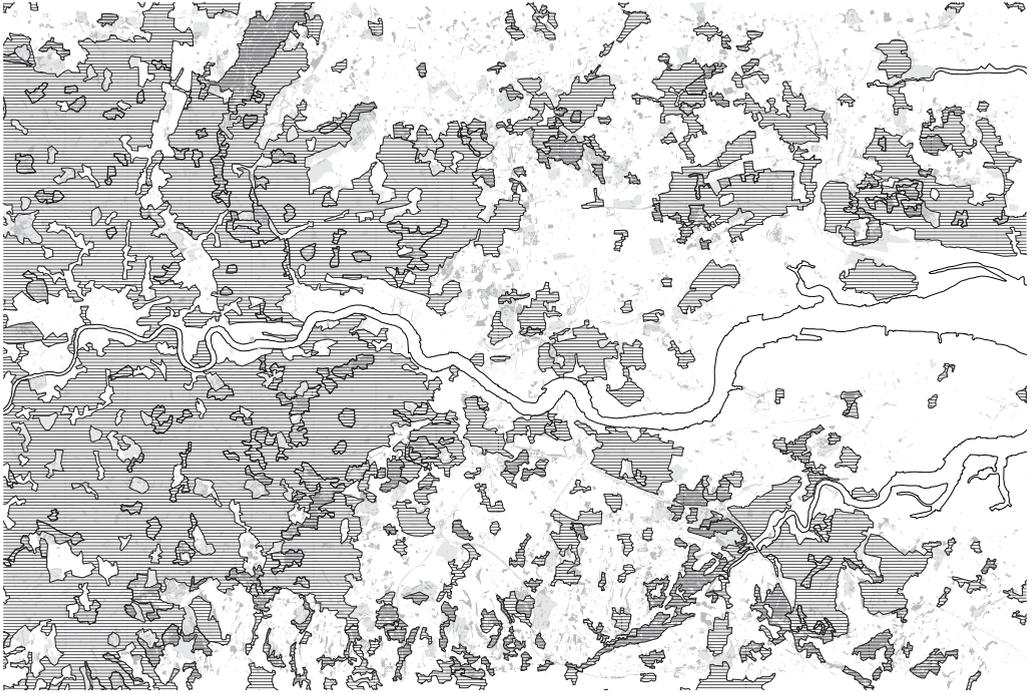
habitat: forests and in winter also suburbs

prey: insects, prefers earthworms

The European robin, known for its red breast, is a small bird that lives across the UK in woodland, hedgerows, parks and gardens. Robin nests can be found in hollows, nooks and crannies, climbing plants, hedgebanks, tree roots, piles of logs and other fully concealed cavities. Tends to follow foraging creatures that overturn earth like foraging wild boars but also gardeners to pick up earthworms. (Hume & Royal Society for the Protection of Birds, 2002; RSPB, 2019)

- shelter lower chance
- shelter high chance
- ▨ high possibility for food
- ▨ low possibility for food

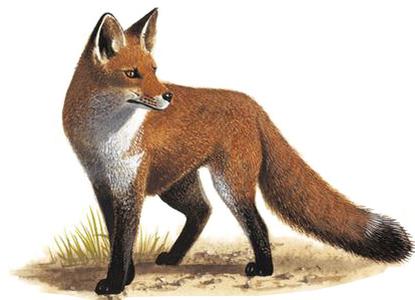
- shelter lower chance
- shelter high chance
- ▨ high possibility for food
- ▨ low possibility for food



(55) suitable robin habitat in winter



(56) suitable habitat robin rest of the year



(57) red fox

Red fox '*Vulpes vulpes*'

Kingdom: Animalia
 Class: Mammalia
 Order: Carnivora
 Family: Canidae
 Diet: Omnivorous
 Lifestyle:
 Average lifespan: 2-5 years

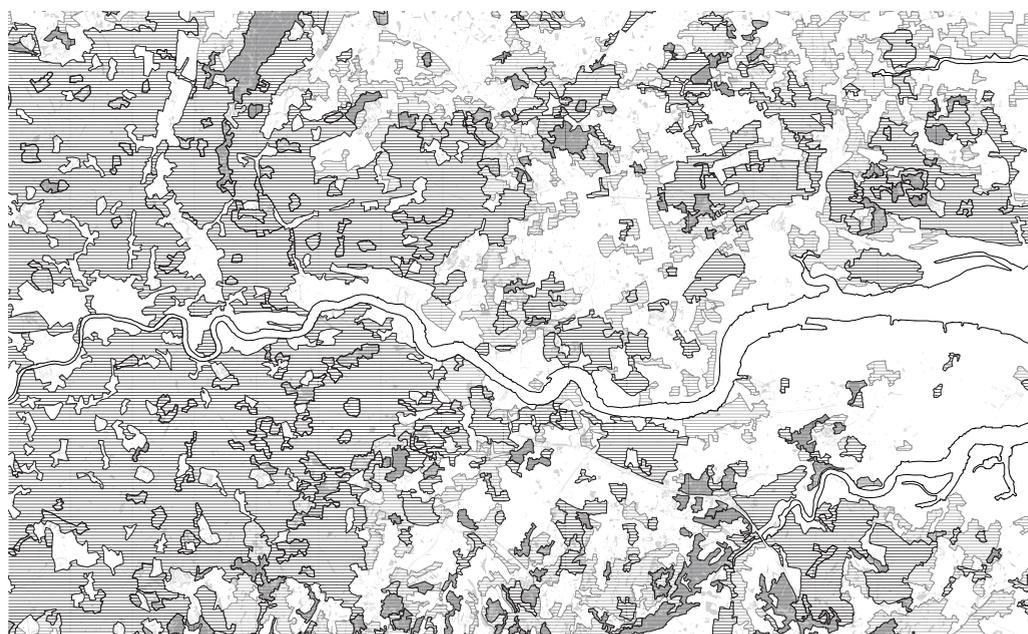
Spatial needs

habitat: grasslands, forests
 prey: rodents, rabbits, birds, fruit but also vegetables, fish, frogs, worms and even pet food

Foxes live in many different habitats including grasslands, mountains, deserts and forests. They also have adapted well to human environments. However, foxes in urban environments tend to be more nocturnal than those living in more quiet areas. The preferred landscape is a mixed landscape made up of patches of forests, grasslands and other land-use. Due to the lack of large predators like wolves, foxes can fearlessly hunt in the human environments. Their diet is very flexible as an omnivore. They feed on rodents, rabbits, birds, fruit and vegetables, fish, frogs

and even worms. In urban communities foxes even feed on garbage and pet food. Foxes breed during the winter from December to February. (Animal Corner, 2019; National Geographic, 2010; The Editors of Encyclopaedia Britannica, 2017)

- shelter lower chance
- shelter high chance
- ▨ high possibility for food
- ▨ low possibility for food





(59) russula

Russula '*Russula spp*'

Kingdom: Fungi
Class: Basidiomycota
Order: Russulales
Family: Russulaceae
Diet: organic matter from trees
Lifestyle: mycorrhizal relationship with tree roots
Average lifespan: unknown

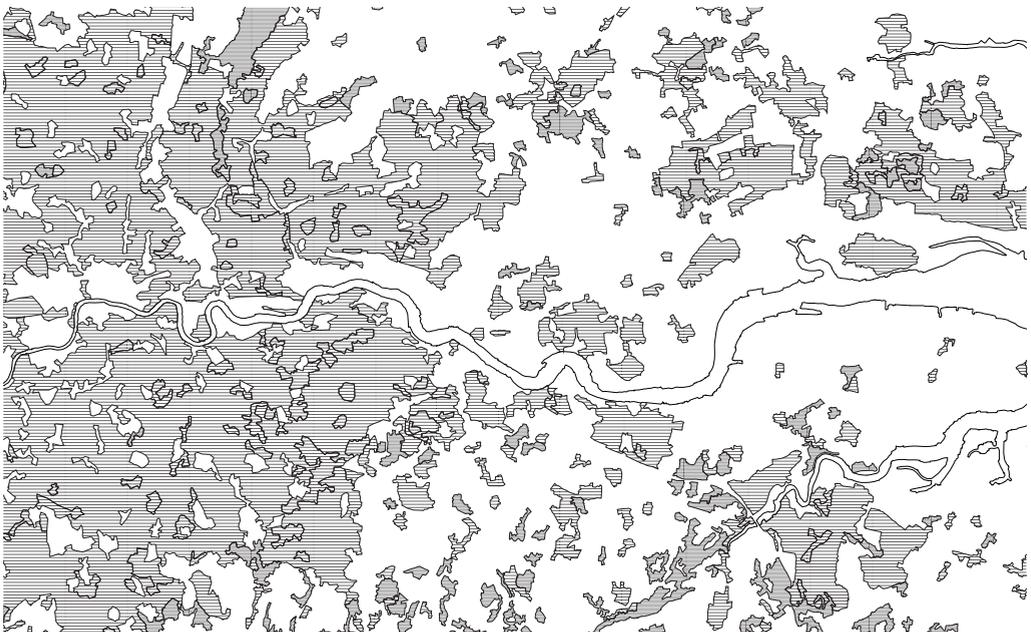
Spatial needs

Climate:

Soil type:

A fairly common fungi genus. Russulas are ectomycorrhizal symbionts with larger plants and trees. This means that it works together with trees, giving the tree nutrients and water from the soil and gaining sugars that the tree gains through photosynthesis in return.

■ shelter lower chance
■ shelter high chance
▨ high possibility for food
▨ low possibility for food



(60) suitable habitat for russula

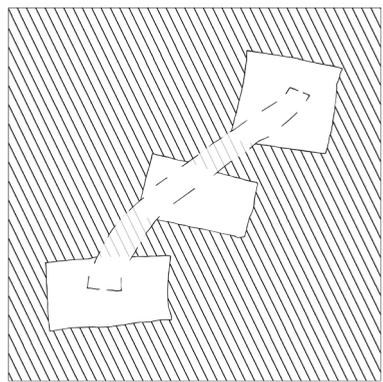
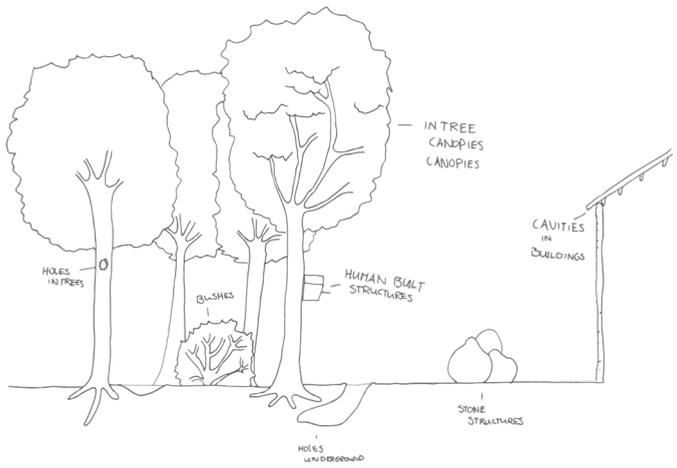
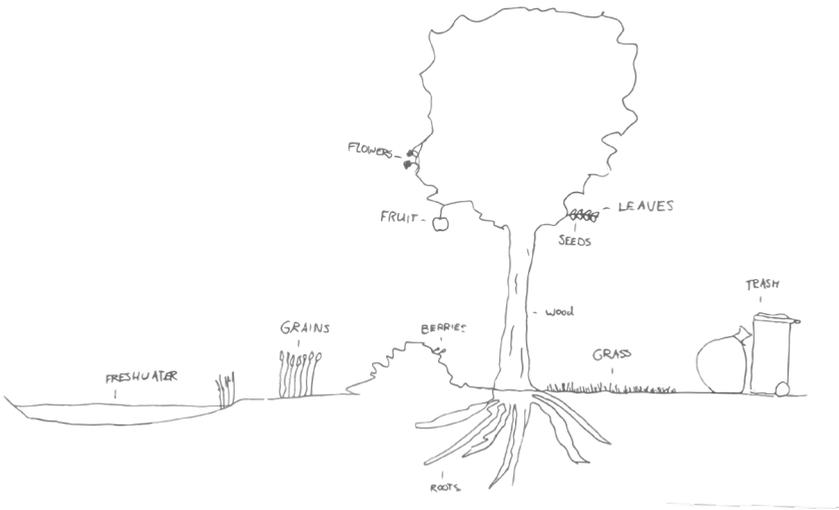
Analysis - Textures

These brief analyses of species show a brief research of the location seen through the eyes of another species, where they would live and where they would work to get food. Of course, the real use by species is still different, but this primarily shows their possibility where to find what they need. However, when continuing this way, it will become incredibly time consuming in order to map out all the species. This method would therefore be wise to use for species that have to be conserved or if an important species, say a keystone species, should be conserved. But in order to provide for a larger group of species it would be wiser to use a different method.

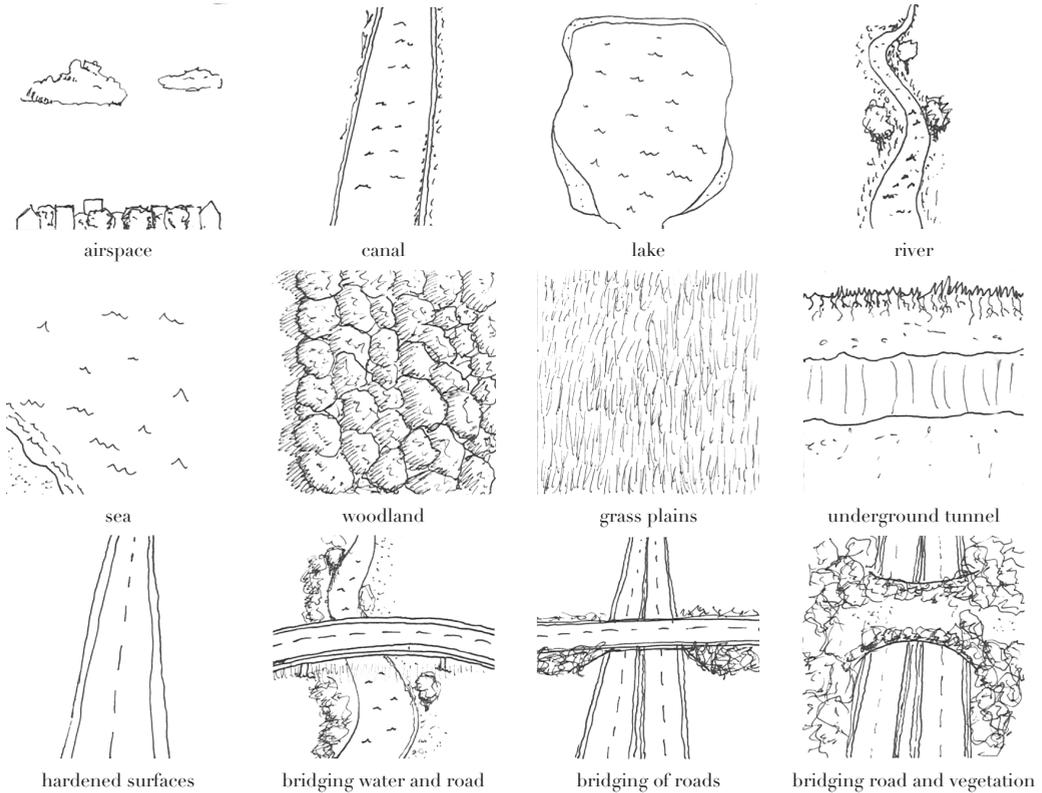
This method is the texture method that will be tested in the next part is focused more on the textures. The textures themselves are aimed at showing the basic needs for species. The needs that we have to look for the needs that are mainly directed by land cover. These are food, water, shelter and infrastructure. The textures of climate have been introduced in the previous chapter and will not be part of this chapter since these conditions are less

relevant since they are not as easily manipulated on space and are primarily affected by secondary effects as we have seen in the chapter on effects. However, that does not mean that pollutants that alter a state of conditions and have a negative influence on biodiversity should be limited.

The texture analysis starts with an overview of different textures and their affordance separated from space. The Thames Estuary is reviewed based on these textures which forms the rest of the chapter.



(61) From top to bottom: food sources, places of shelter, connecting habitats



Infrastructure textures

Infrastructures can be found on the largest scales and are ways of moving from one place to another. The infrastructures form spaces of movement through areas to be able to move from one place to another. They can be made of different materials but generally are covering a larger region. Airspace can be found nearly everywhere and is a reason why birds can move easily through spaces. Water species are more constrained by their structure in terrestrial environments, but in the oceans they have incredible freedom to move. Humans have been able to create new waterways in order to move their own ships and this also benefitted some of the

water species that are now able to live in them. Furthermore, there are several types of vegetated infrastructures. Specifically the ones that offer shelter like woodland and fields with lower vegetation types. Humans have also been able to create efficient hardened surfaces or roads that makes vehicles easily movable.

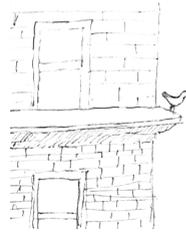
Sometimes different types of infrastructures cross each through a means of bridges.



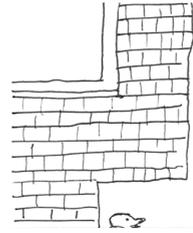
house



apartment block



building ledge



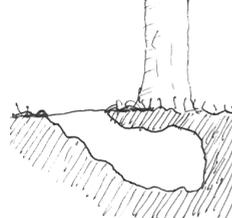
cavity of building



burrow



cave



underground hole



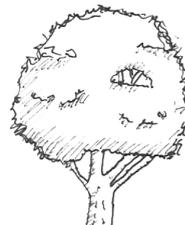
tree root cavity



nest



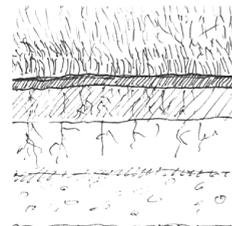
cavity in tree trunk



canopy



bush



soil



shallow water

Shelter textures

Shelter can be found in many different places. What the shelters in many cases have in common is the fact that they are found within cavities. Sometimes existing and sometimes built.

Humans have been very resourceful in building their own shelters, that even create a very suitable climate allowing them to live through winters without having to migrate. These structures are on their turn used by other species as well. For example by birds that use the ledges as a place to rest or in some cases a cavity in or under the building. Humans are not the only species that construct their own shelters. Many birds build

their own nests whilst other species create caves in the ground. Vegetation is another important source for shelter, especially trees create many different affordances to species within the cavities and canopies.



branch



grass



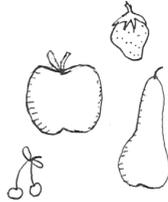
flowers



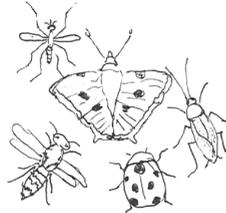
fungi



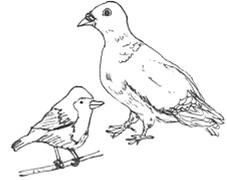
seeds



fruit



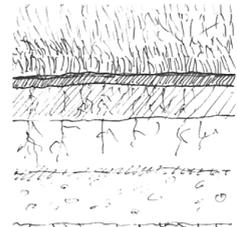
insects



birds



rodents



soil

Food textures

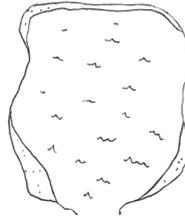
The basis of a large consumption of the food is found in plants. Different species can eat different things of a plant. Some species eat leaves, some flowers or parts of flowers like nectar, whilst others eat the fruits or seeds that a plant drops. Next to these herbivores there are the species that eat other animals like insectivores and carnivores. Finally there are the species that feed upon dead materials of plants or animals and their excrements. These species are known as the decomposers and usually recycle the dead materials into nutrients for the soil.



precipitation



river



lake



drops



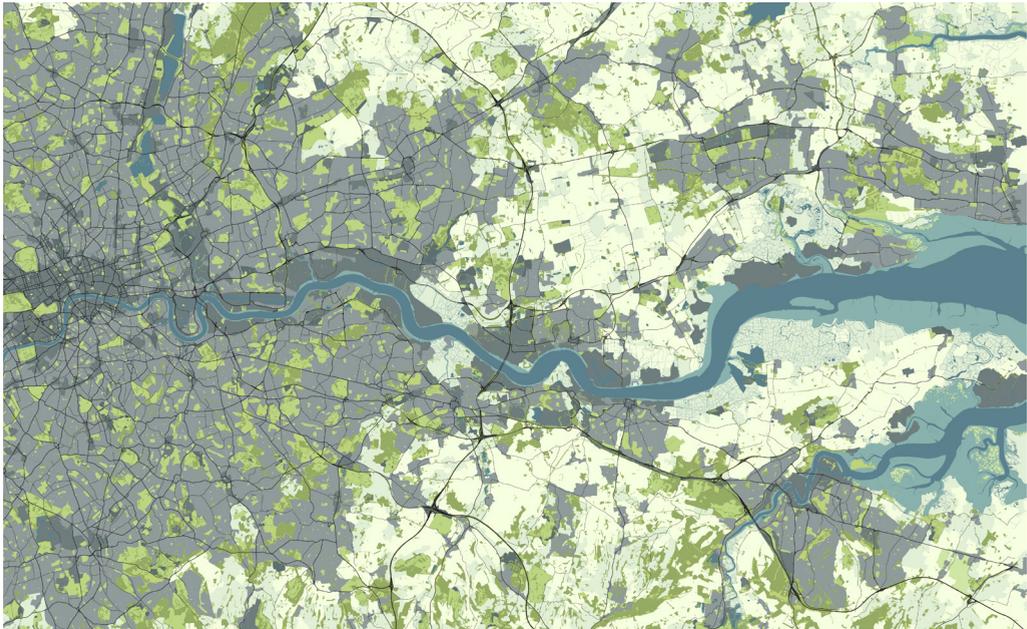
leaves



grass

Water textures

Water can be found primarily in the different water bodies or from precipitation. Smaller animals retrieve water from small drops that lie on other structures like leaves and grass.



(104) textures Thames Estuary

- water
- foreshore
- urban continuous
- urban discontinuous
- forest
- other green
- pastures
- cropland

On a macro level we can find several main types of textures in the area of the Thames Estuary. These can be seen in the map on the other page. The most prominent types of textures are discontinuous urban and agriculture primarily in the form of non-irrigated arable land. The last type of texture is of course a very big limiter since this type of texture is focussed on creating lands that only allow one type of plant annually. Discontinuous urban is found in highly urban areas of London but it is also found in the industrial areas along the Thames. Even though these areas are different, they are the same in the sense that a large part of is filled with impenetrable surface. The river Thames consists of two types of textures (seen from the surface) the part where there is constantly water and a foreshore that changes from water to land during the tidal movement. Forests and other green areas are islands in

between the more cultivated areas.

By abstracting the elements it becomes clear that the most urbanized areas are in the west of the Thames Estuary where Located. The eastern part is mostly dominated by types of agriculture. Woodland is the third type, however more dispersed than the other textures. The same holds true for public green in the area. Most of the industrial activities are found along the Thames because of the proximity of port infrastructure.

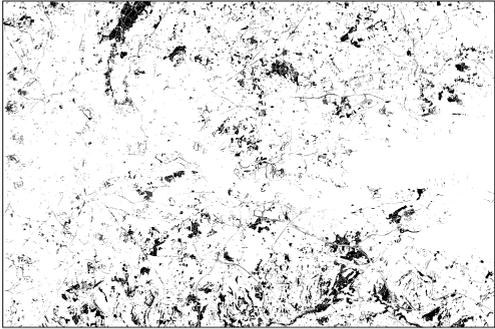




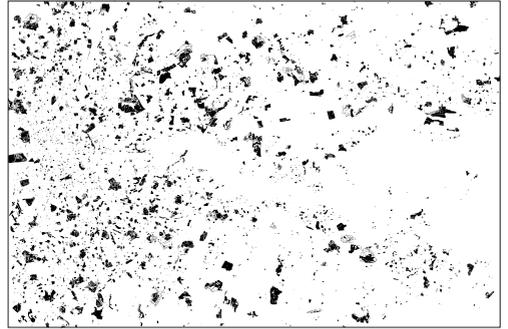
(105) arable land



(106) pastures



(107) woodland



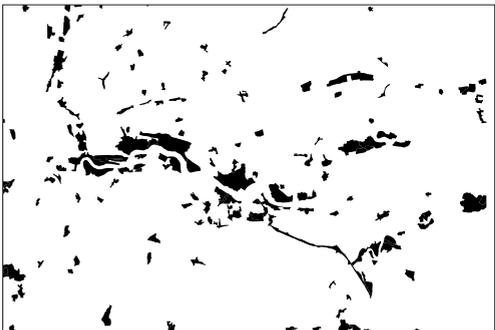
(108) public green



(109) industry and urban continuous



(110) suburban



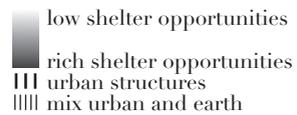
(111) industry



(112) water



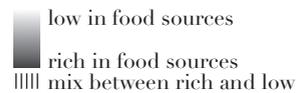
(113) shelter textures mapped



When looking to possible places of shelter for species we see that woodland offers most opportunities to other species. Because of the mix of trees shrubs and places in earth there are many possibilities for species to seek shelter. Lowest possibilities are found in the cropland areas where due to the heavy maintenance and fertilization there is not a lot of different types of cavities possible for species. The highly urban spaces primarily have shelter for species that are able to live in loud environments and which can live in small cavities of the built structures. The suburban areas are a mix between built structures and penetrable surfaces and different kinds of plants found in gardens and along the streets.



(114) food textures mapped



Also when looking to food sources the forest areas are scoring high due to the richness of plants and especially trees bringing many food types. Next to woodlands, the (fresh) water sources are becoming very important to many of the larger species like birds and mammals. The suburbs have a mix of food sources depending on how people design their gardens and how streets are designed. Pastures, however planted, are more beneficial to other species than croplands, due to less heavy maintenance and use of pesticides. Croplands could be seen as some of the least food rich areas, primarily due to the monocultural approach and the heavy use of pesticides.

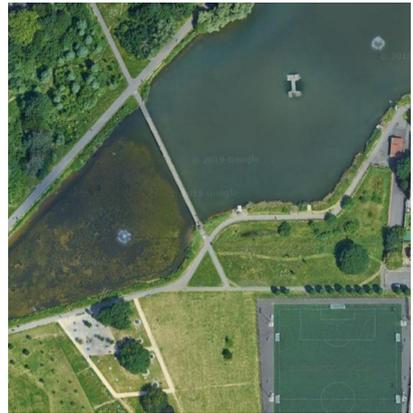
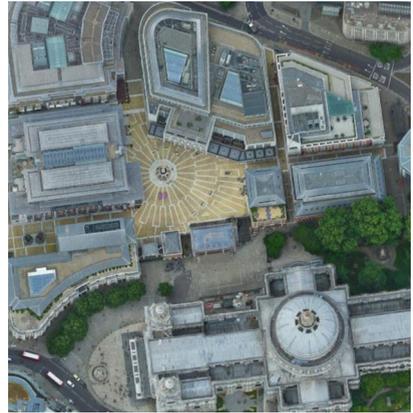


(115) infrastructure textures mapped

Reviewing the area from a large perspective don't show good infrastructures for species that need quietness and shelter. Only a few clear structures can be found, with the river lea (the north western arrow) being the only real connected corridors. All others are broken up by heavier types of land use like road structures and built structures. However, the base of the structures seem to be there and with some strategic connections there can be more possibilities for species to move between habitats.



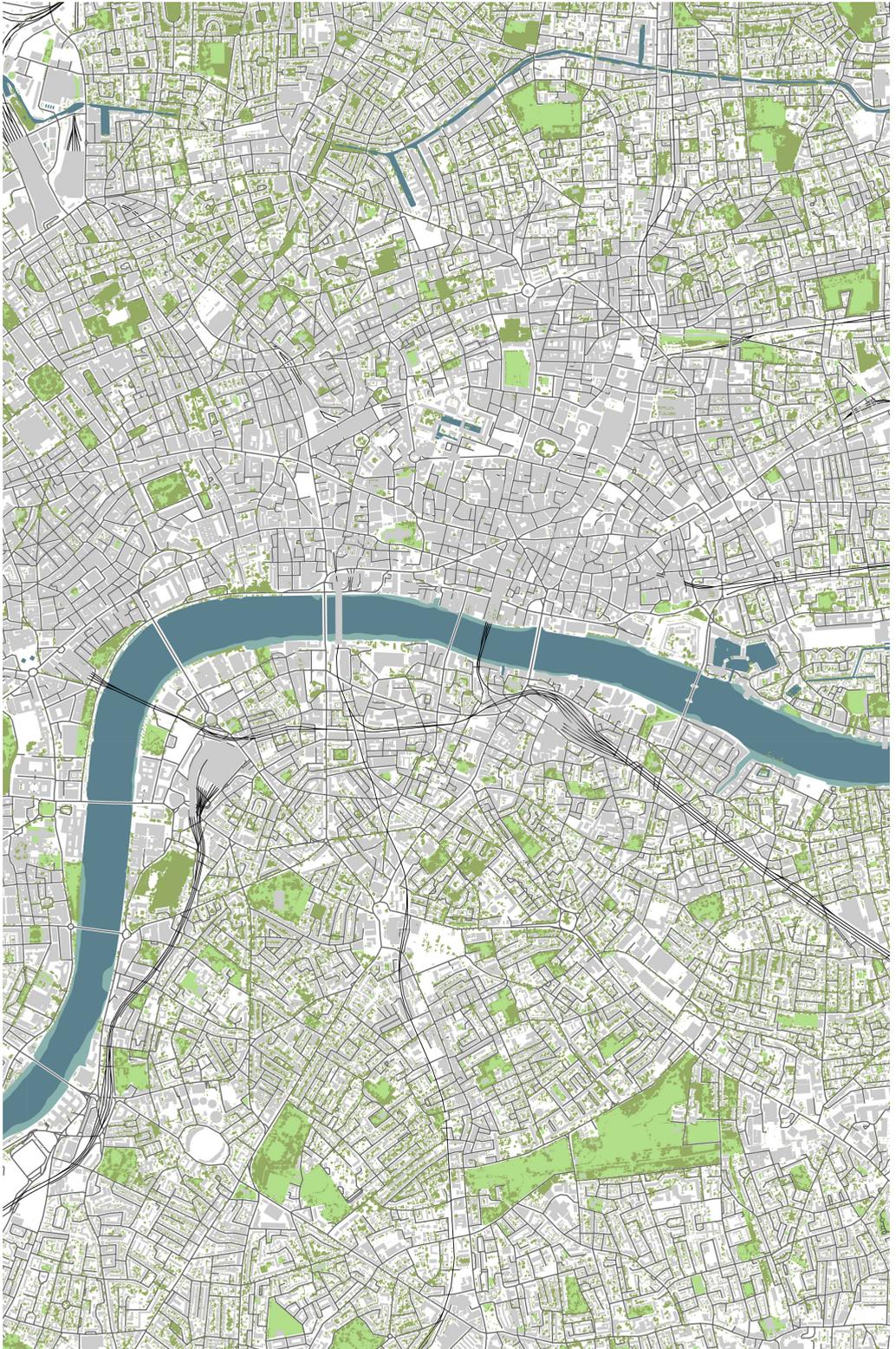
(116) water textures mapped



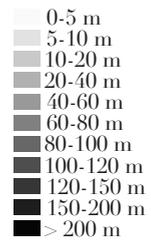
(117) snapshots of aerial of London

The area chosen in London is one of the most urbanized parts in the area. The most dominating type of textures that can be found are buildings and road structures which are mainly impenetrable surfaces. In between the built parts there are occasionally islands of green found.

- water
- foreshore
- buildings
- road structure
- woodland
- other green

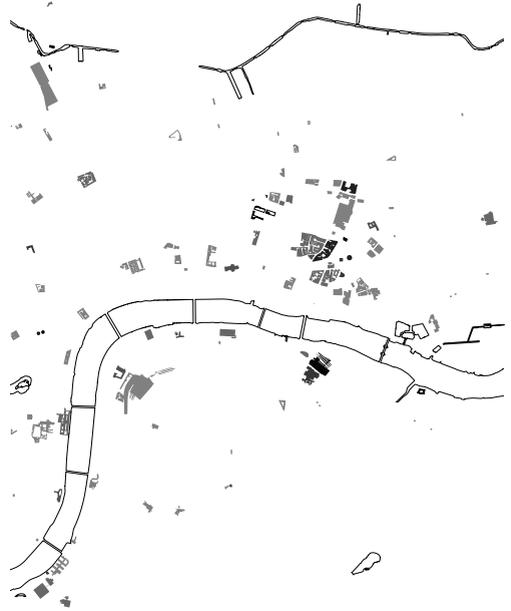
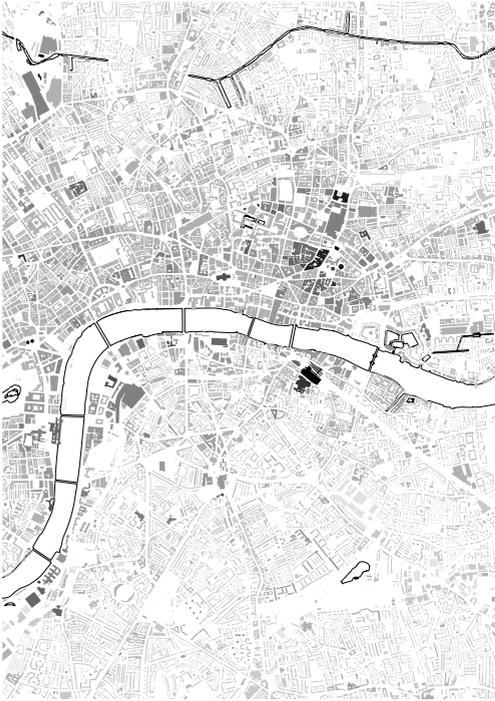


The buildings in this area vary much in height from each other. Some buildings have a peak height of more than 200m. The higher buildings are primarily found along the Thames and especially on the north side of the Thames. The average height of the buildings seems also to be higher on the northern side for the lower buildings.

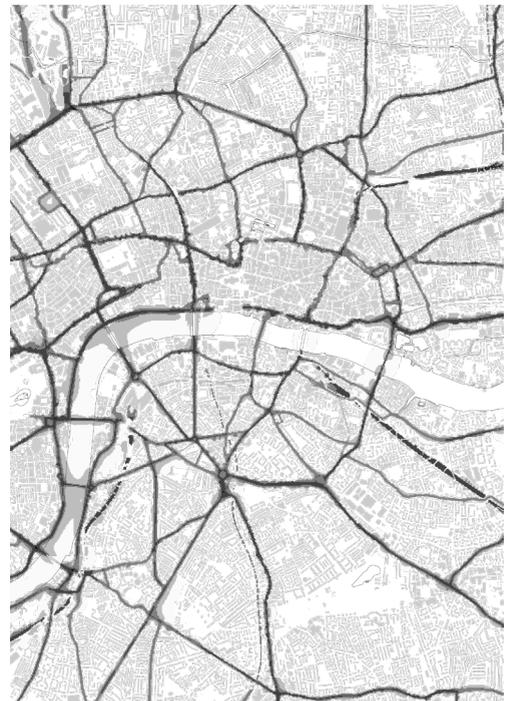
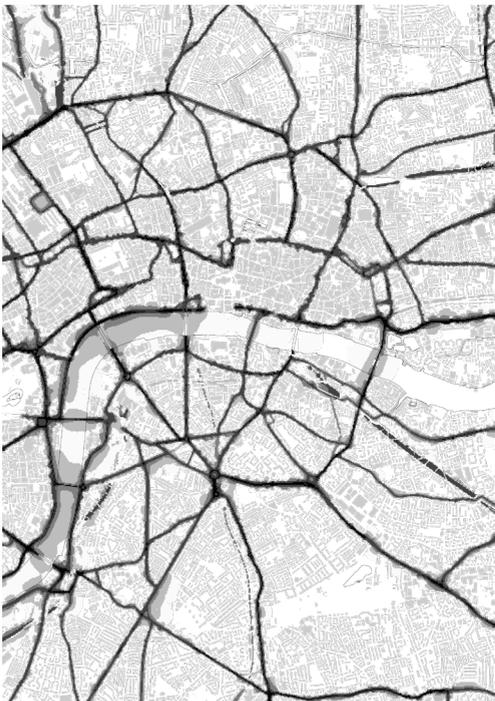


For London there is also data on the noise of vehicles. There it is possible to see which main roads produce the most noise. On the western side of the area it is very clear that along the road structure along the Thames produces a volume that spreads itself over the whole width of the Thames in some places.

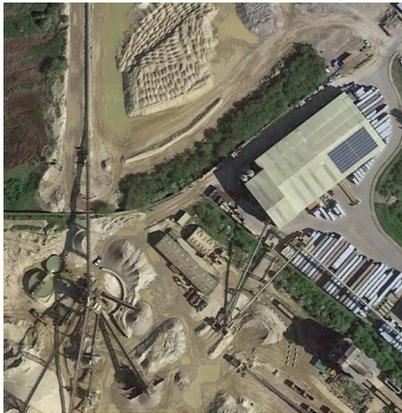




(119) building height and all buildings above 60 m



(120) noise day and night



(121) snapshots of aerial of Cliffe

The area of Cliffe is as agricultural as London is urban. Here the urban textures form islands in the agricultural landscape. On the North side there are primarily pastures, whilst cropland form a belt on the south side.

- water
- foreshore
- urban continuous
- urban discontinuous
- buildings
- road structure
- woodland
- other green
- pastures
- cropland

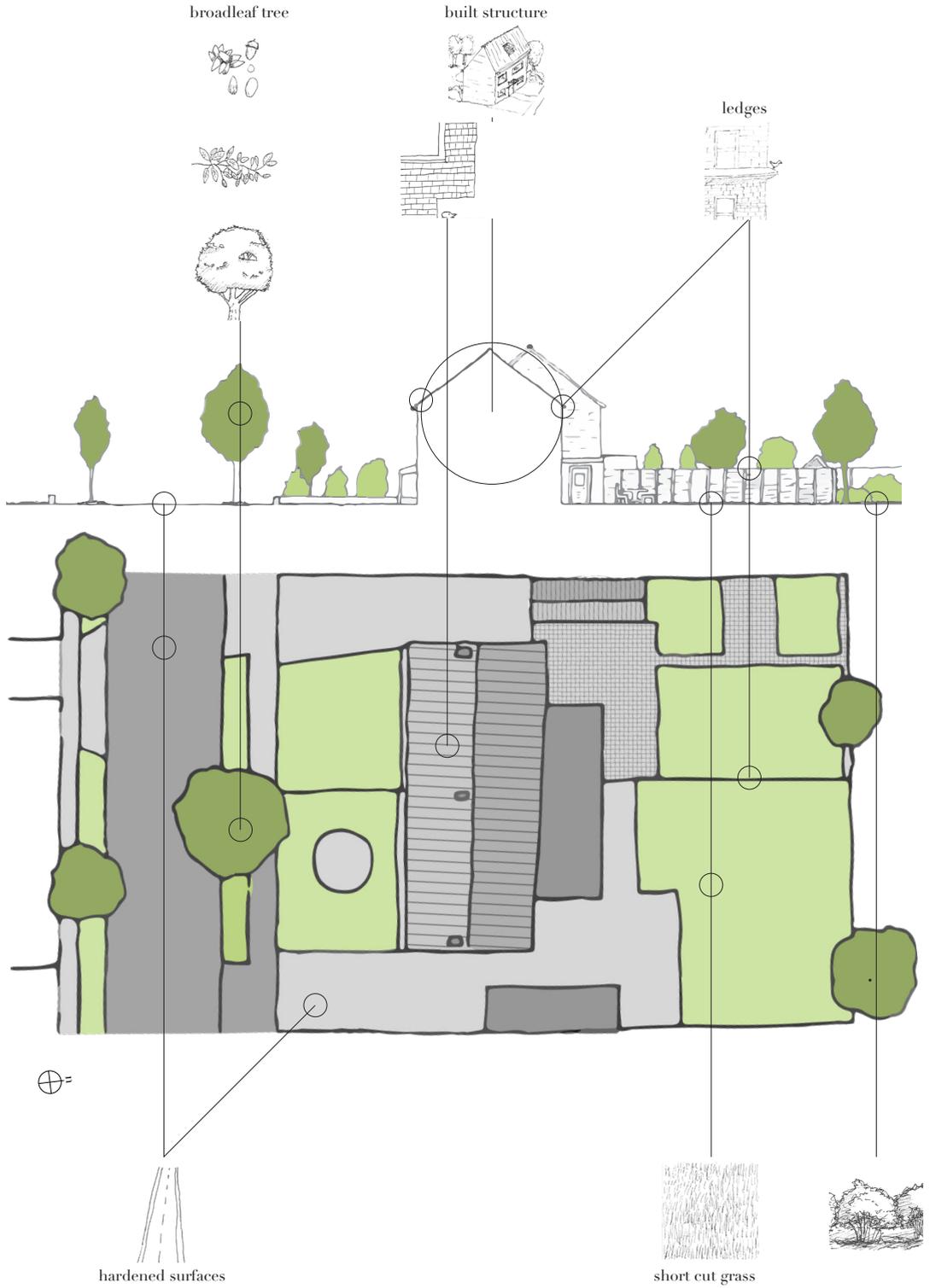




(123) textures suburb Cliffe

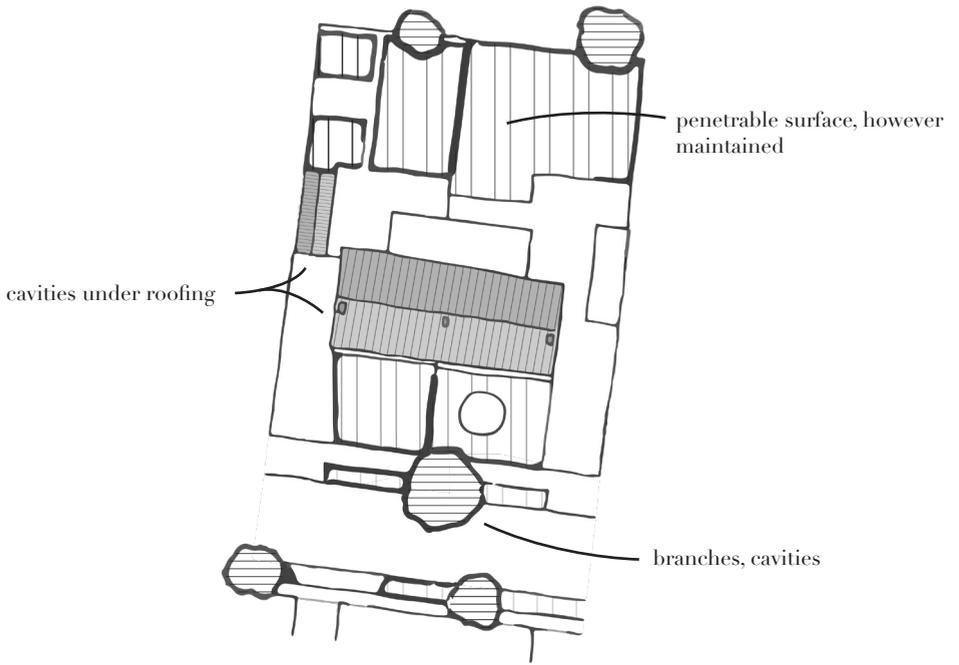
- paved
- asphalt road
- building
- fences
- trees
- bushes and hedges
- grass

When zooming in to the neighborhood of a suburb in Cliffe it becomes more clear of what textures this type is built up. Bordered by a road structure made of impenetrable materials like concrete and asphalt the suburbs form seemingly green islands with different sets of textures. The impenetrable borders are enriched by a row of trees and patches of grass underneath. The islands are clearly fenced with one large built structure (a house) standing in between fences and being split by one. These fences are made from low stone walls at the front side and wood at the gardenside. Furthermore the plots are filled with smaller structures next to the house or at the end of the garden. Every garden forms a different set of textures depending on the style that the gardener chose. In many cases the gardens are filled with lawns. However, some choose for a complete fill with impenetrable surfaces made from tiles, others choose to plant trees, bushes hedgerows or other plants.

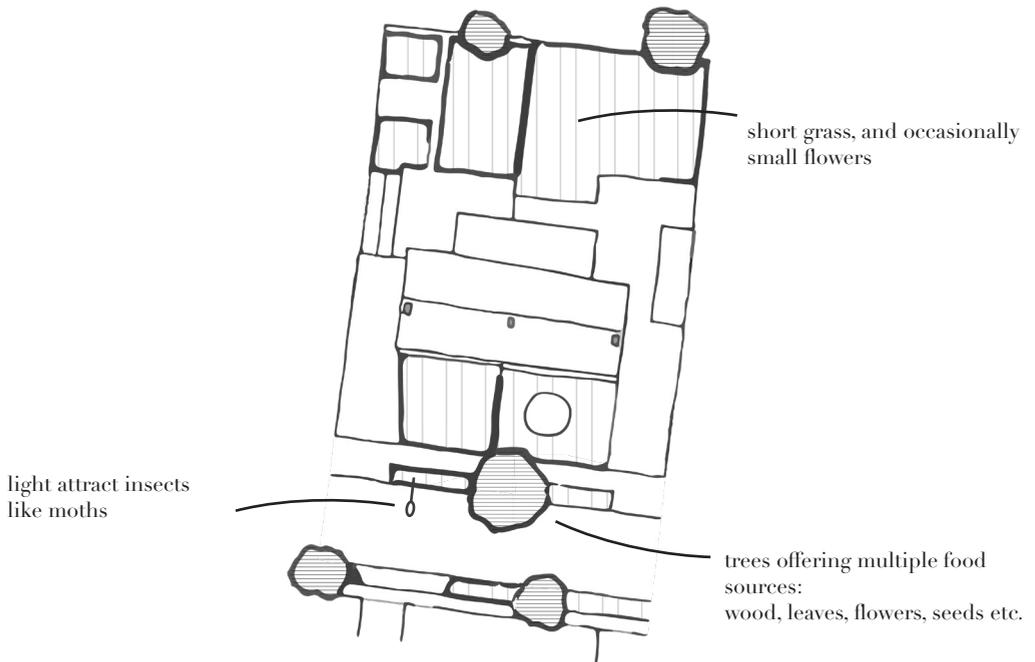


Shelter can be found in different form within this suburban texture. First and foremost there are many trees that offer several different kinds of shelter. Next to these, the lawns offer very limited shelter to underground species and of course the grass itself. Another possible shelter are the buildings. Within the structure of the roof or the walls there are cavities where some bird species or bats might find shelter. Also rooftops are a good place for lichens since they are not touched for a long time.

Food sources can primarily be found within the trees and on the lawns. However, there is more potential in the lawns but this potential is limited due to the heavy maintenance of the grass. Furthermore, the human activity might feed some species by offering bird food, or placing pet food outside. Finally the artificial light sources form a food source for spiders and bats. This because the light attracts many insects when turned on at night. Spiders often create webs near light sources.



(125) potential places for shelter



(126) potential places for food

Analysis - Limitations

The following maps provide an overview of the earlier findings but focus on the limiting effects in stead. Therefore the most problematic areas are highlighted.

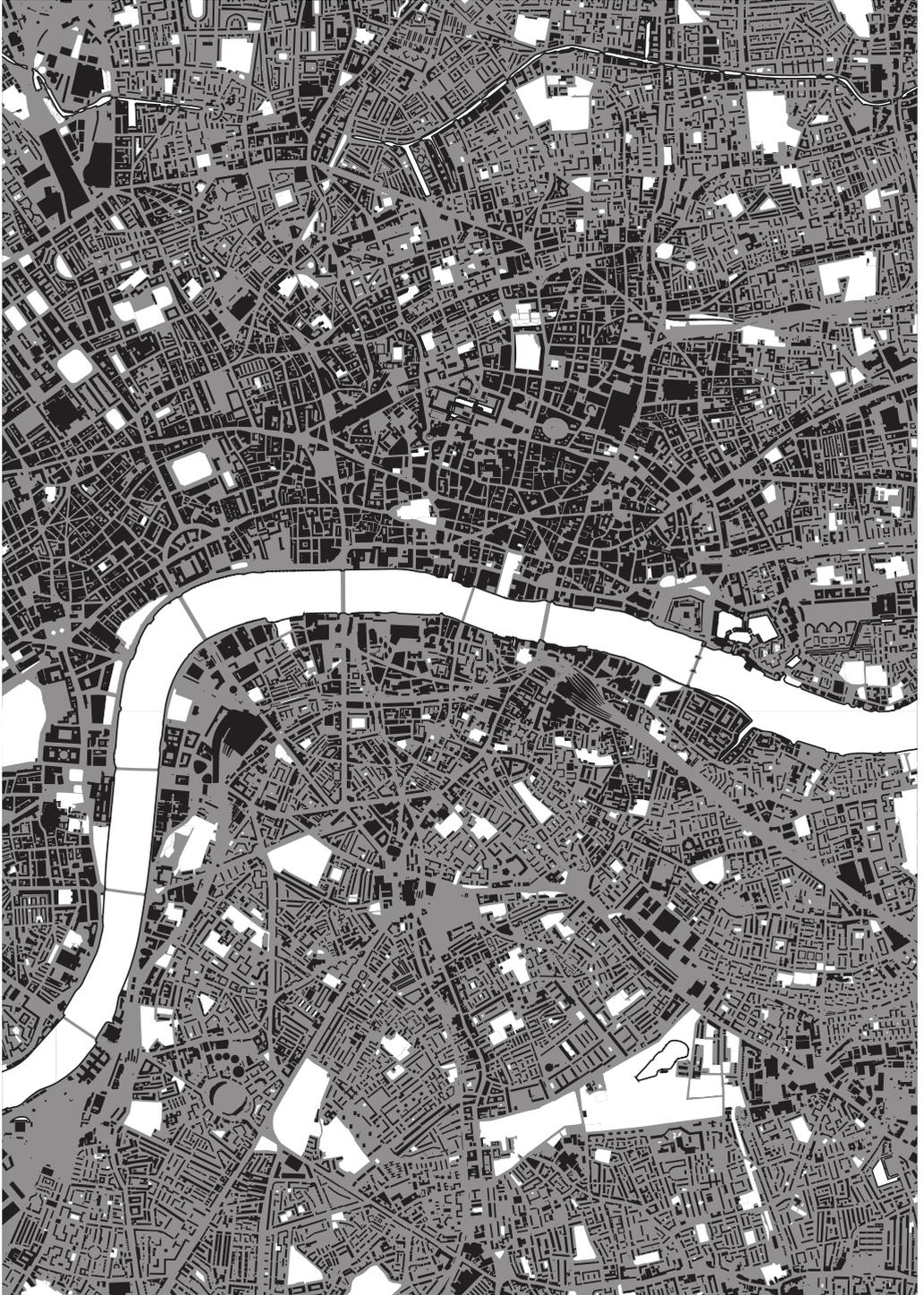
Nearly all textures can be improved in order to create a higher biodiversity. The agricultural areas are heavily maintained and especially the croplands are primarily monocultural with large patches full of the same annual plant. The urban areas have large parts of impenetrable surfaces and have many dispersed patches of green that are not connected with each other. This also happens within the suburban texture however here the penetrable surface is sometimes bigger than the impenetrable. Other limitors are the river barriers that stop the movement of water on the land. therefore many of the lands are disconnected from the river and less of the rich foreshore textures are to be found. Finally the road structure, and especially the heavily used structures are a barrier for species movement and are in the form of impenetrable surfaces.

- ≡ monoculture
- ≡≡ planting maintained
- paved surface
- river barriers
- road structure



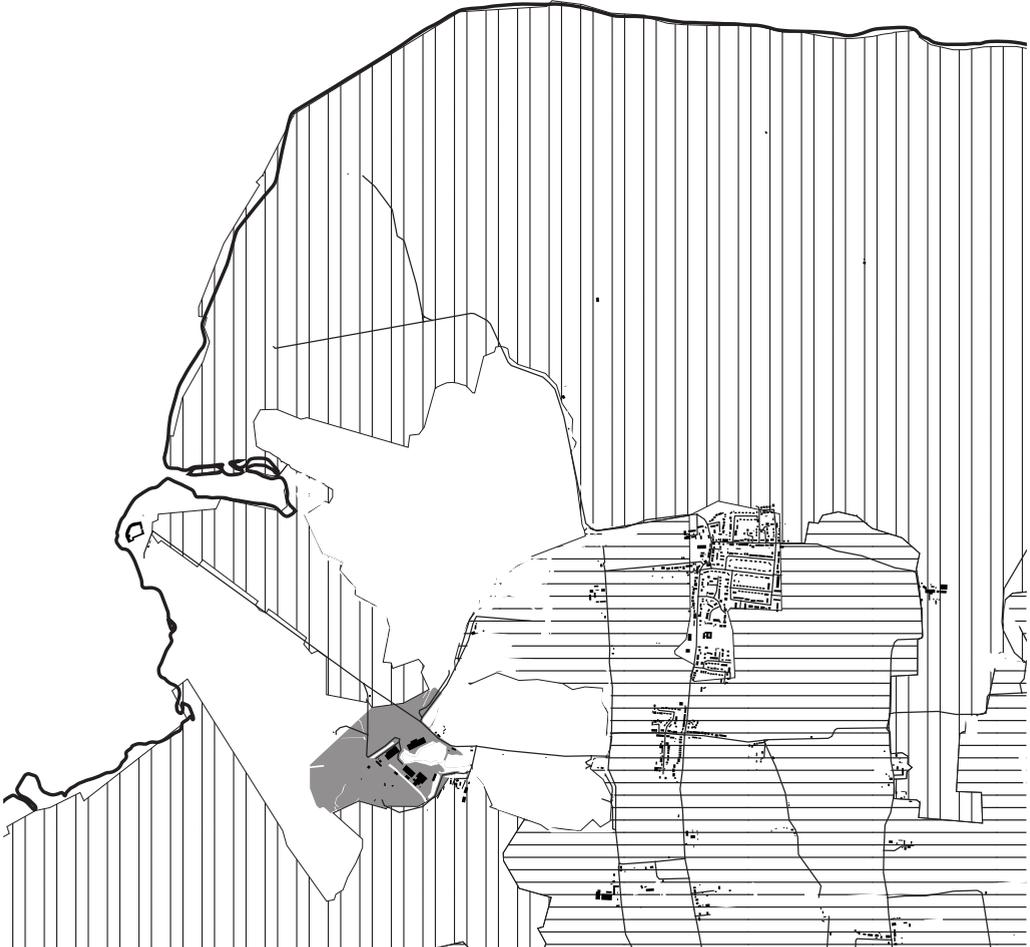
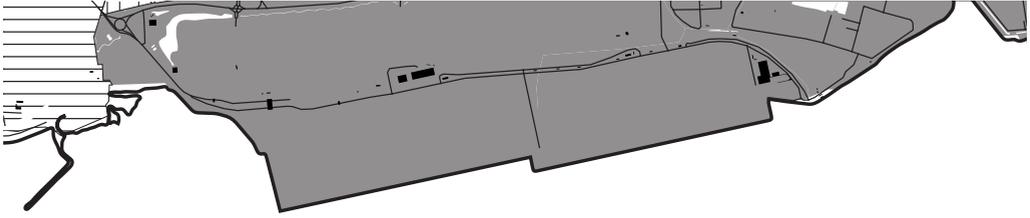
The area of London is filled with permeable surfaces that directly limit plants from growing. there are only a few islands where it is possible. However, these are limited due to maintenance.

- ≡ monoculture
- ≡≡ planting maintained
- paved surface
- river barriers
- road structure



The biggest limiters in the area of Cliffe are the heavy maintenance of the agricultural fields. By maintaining a monoculture there is not much space for other plants to grow.

- ≡ monoculture
- ≡≡ planting maintained
- paved surface
- river barriers
- road structure



(129) limit map Cliffe

Design for Coexistence

Chapter overview

In order to show how this process can take shape this chapter focusses on a vision for the Thames Estuary where coexistence between species is improved. This vision is a manifestation for coexistence. It is guided by a phasing concerning three consecutive steps: initiation, restoration and transformation. These are accompanied with specific design solutions on different scales and with different priorities.

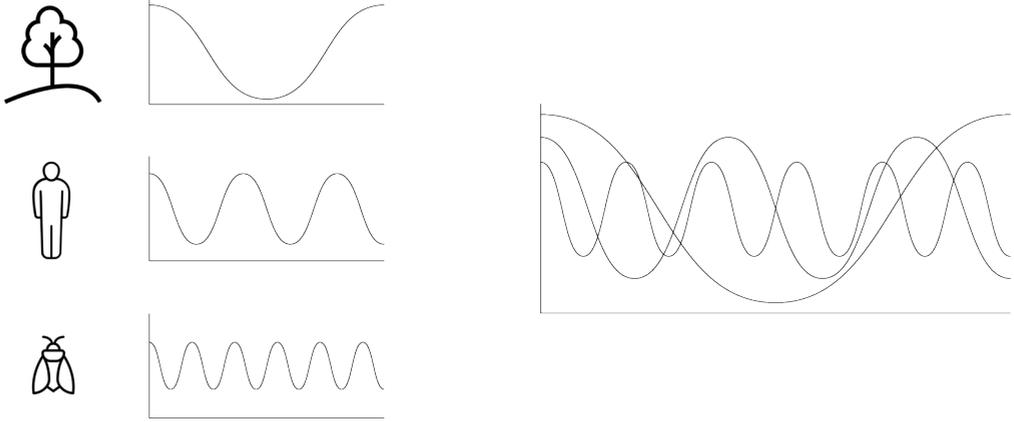
Co-design with species

Designing for coexistence means to design not just for species but with them as well. Only by allowing other species to create their own environments a true form of coexistence will form. In the maintained society as we currently live in, only a few nonhuman species have limited chances to exist. Designing for coexistence is a design that is more about allowing and accepting the unforeseen that a complete direction over

space as we have been used to.

The foundation of the territorial ecosystems can be found in the soil, the place where plants grow. Plants and their growth and coming of age are an incredibly important part of a resilient ecosystem since these can create many affordances for species of the kingdoms of animals and fungi. Creating places where humans limit plant life heavily is creating place without life and deteriorating the soils. On the soils that we inhabit we have stopped ecological succession from happening and we therefore live in places largely dominated by impenetrable surfaces, grasses and annual plants.

Designing for coexistence at this moment in time will therefore be focussed on resetting the limits that we have put on our soils. Hence, we are able to re-establish the coexistence between species. In this world of coexistence soils and the plants that root in them therefore become the great ecosystem engineers of a new era, an era of a strong



(130) lifespans species



(131) ecological succession

coexistence between species.

Design Principles

In the approach chapter we have already introduced the design principles of diversifying textures, letting them grow and connecting the rich texture sets. These form the foundation of the vision that is created for the Thames Estuary. In addition, the analysis of the previous chapter shows us

where we can find both the rich and poor areas. These areas become important for changing the landscape of the Thames. For one the rich areas are the areas that greatly benefit one another when connected, whilst the poor areas have to be enriched and diversified.

The era of coexistence

The new era of coexistence is an era



(132) vision

of diversity, diversity of species and of ecosystems. It is also an era of connectivity. Connectivity on large scales that makes species able to move between areas with different climates and on smaller scales where species can move between food, water and shelter sources.

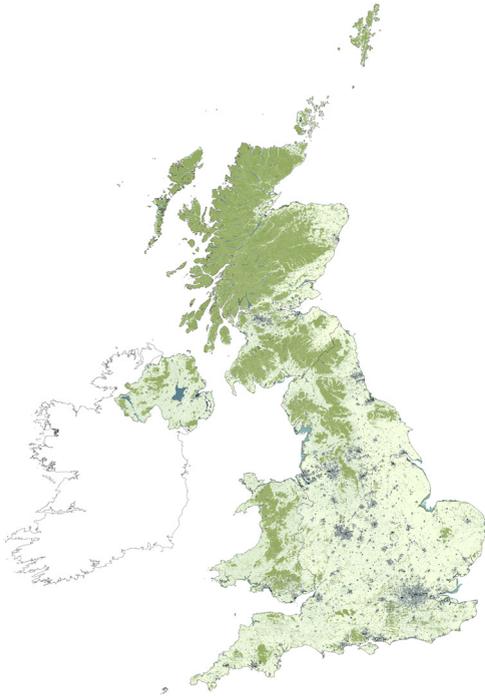
The current agricultural textures with their heavy maintenance, the monocultural and also heavily maintained suburban textures that form the largest part of the Thames Estuary will be turned into places of diversity where many different kinds of species will be able to live. Furthermore, the current forests will be connected with one another to form a network that makes it possible for species that seek a sheltered infrastructure to move between places. This takes place within the Thames but will also be part of a countrywide infrastructure similar to that of the human highway. On this green highway the different rich areas of the country are connected to one another and made accessible for many species. Moreover, other potential rich areas will be restored and made part of this new infrastructure. The most important

of these areas are the rivers and their tributaries that especially in cities have been heavily limited.

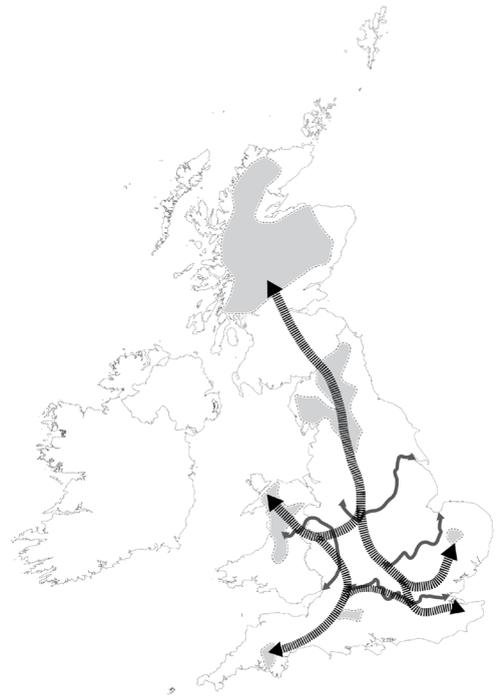
Human life changes as our human environments change. The changes in agriculture result in a different and more diverse diet. Furthermore, we live in diverse neighbourhoods with places of both high and low density and many places to encounter other humans as well as other species. The new urban landscape is a dynamic landscape that constantly changes, where many species prosper, grow old, and pass away to create new life again.

Phasing

In order to get to the era of coexistence, different strategic phases have been set out. They are as follows: Initiation, where it all starts. Restoration where structures are strategically restored. Finally, transformation, where larger whole systems are being transformed to become more diverse.



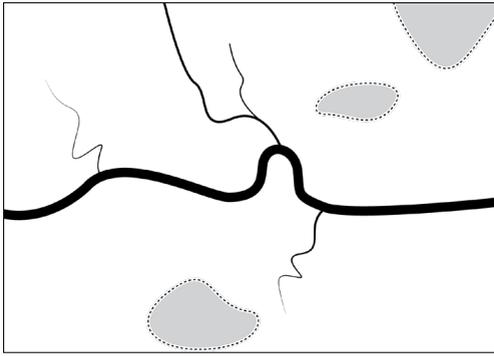
(133) UK land cover



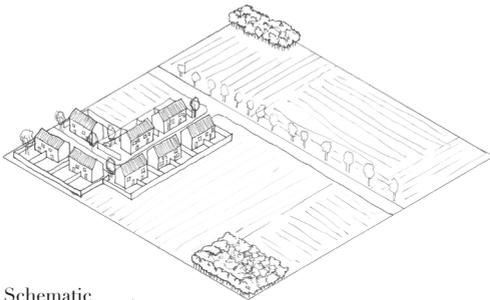
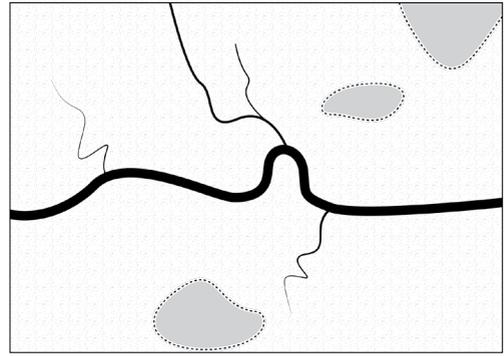
(134) UK infrastructure vision



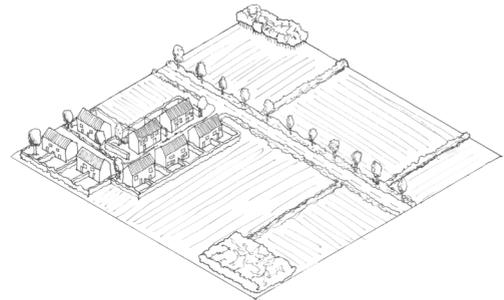
(135) national infrastructure projected on the territory of the Thames



Changes on large scale

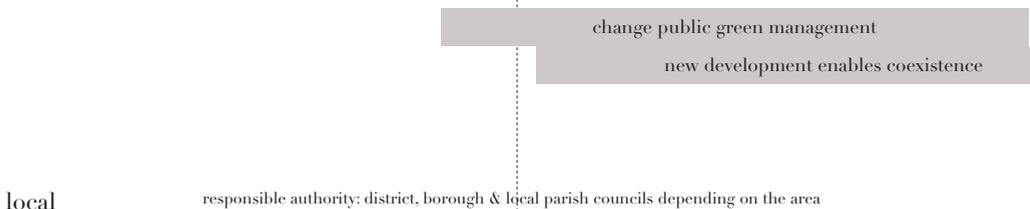
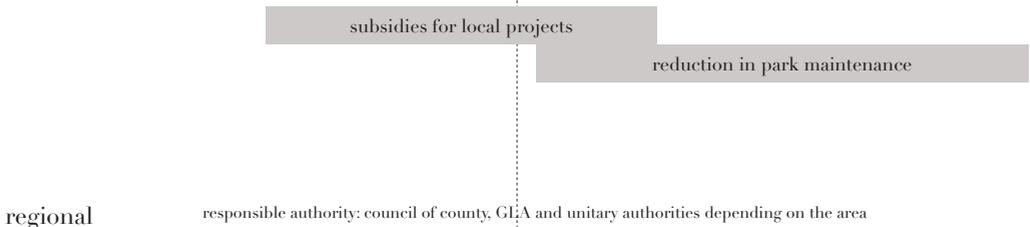


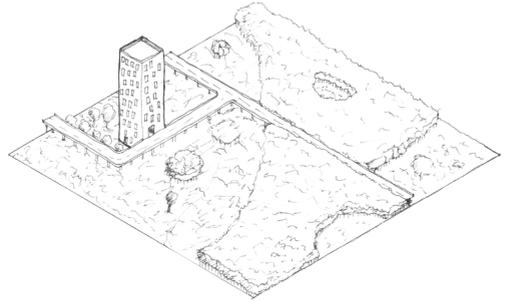
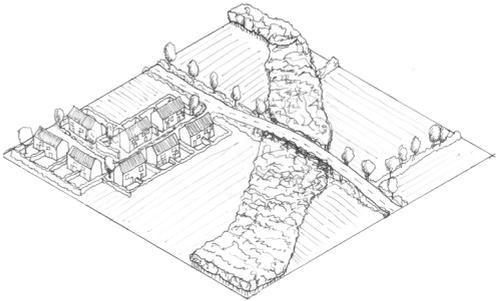
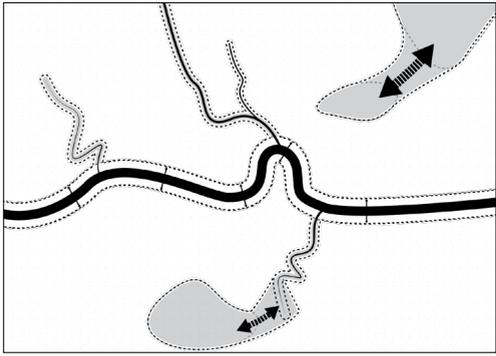
Schematic



Phase 0 - current state

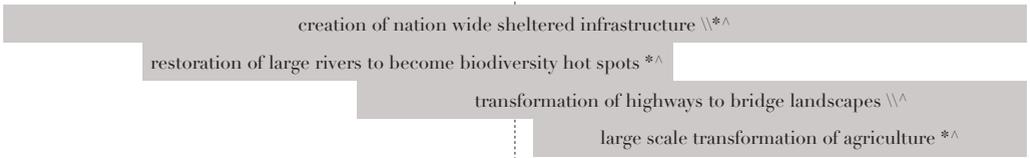
Phase 1 - Initiation



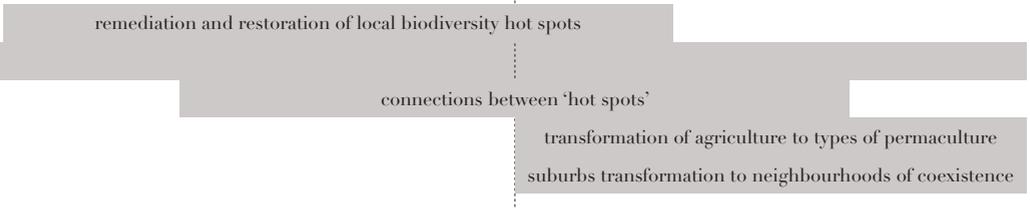
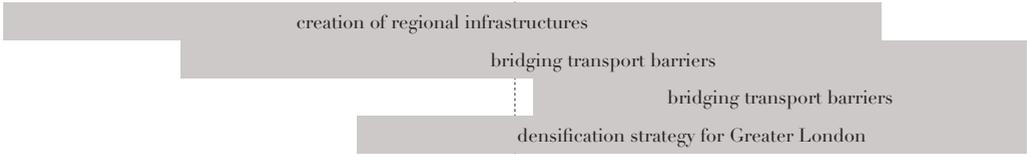


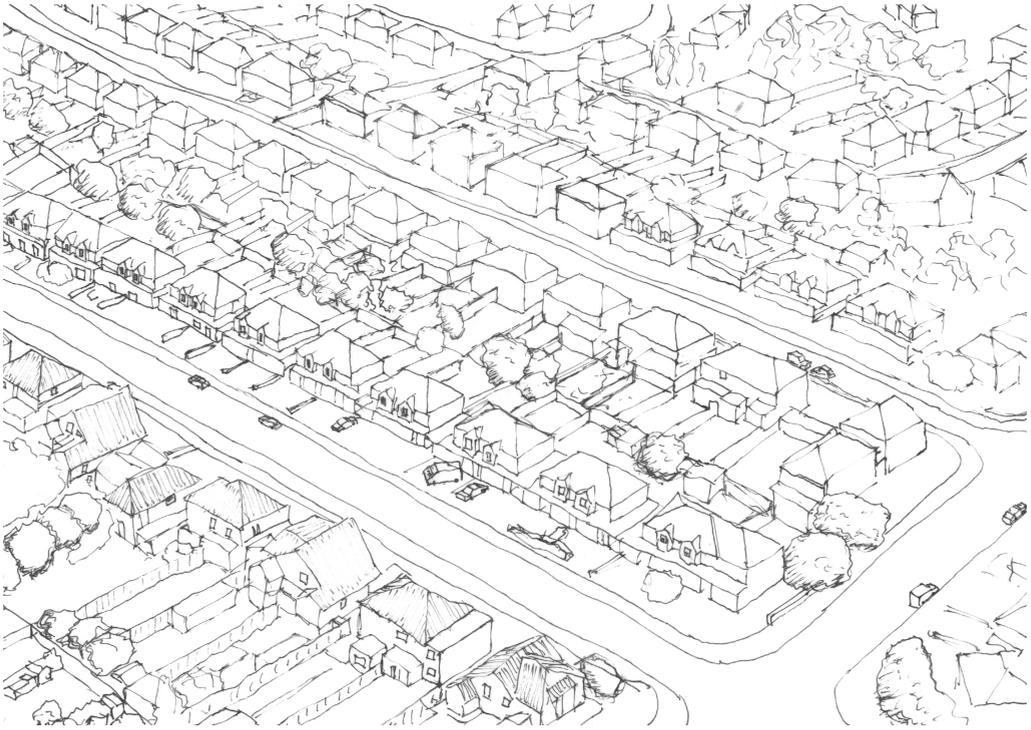
Phase 2 - Restoration

Phase 3 - Transformation



* = Dept. Environment, Food and Rural Affairs ^ = Dept. for Business, Energy and Industrial Strategy \ = Dept for Transport



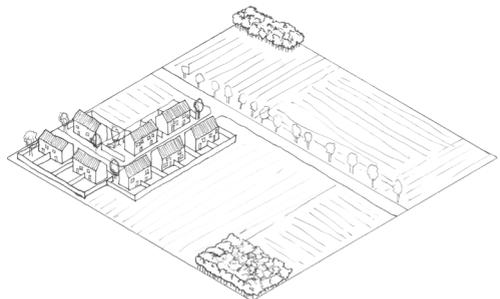


(137) current state of a suburban neighbourhood southeast of London

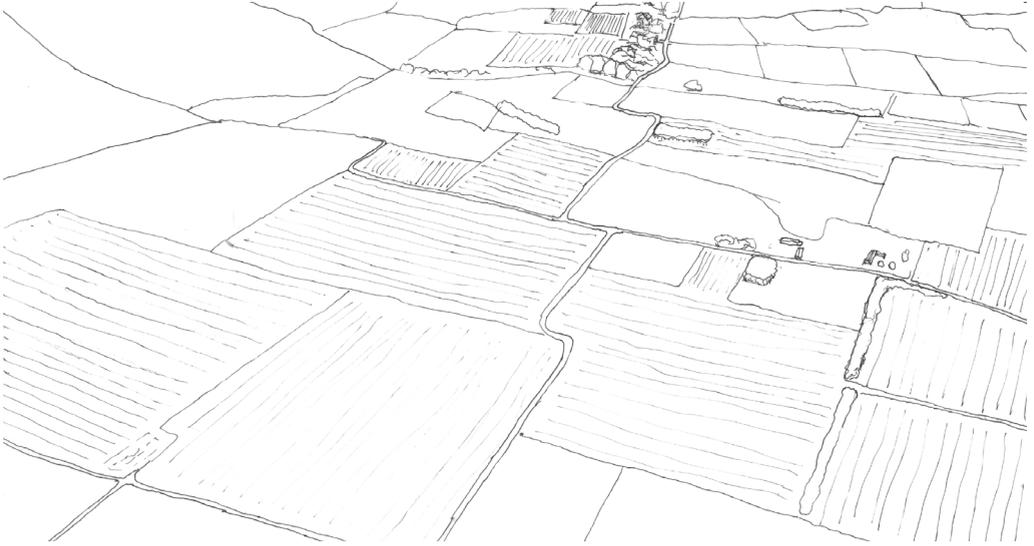
Phase 0 - current state

The current state has been described analysed in many of the previous chapters. We now know many of the problems concerning biodiversity that human environments create. The focus in the phasing will be on the entire Thames and its implications in a suburb southeast of London and an agricultural area near the town of Cliffe. These two examples demonstrate the systemic change on its specific textures.

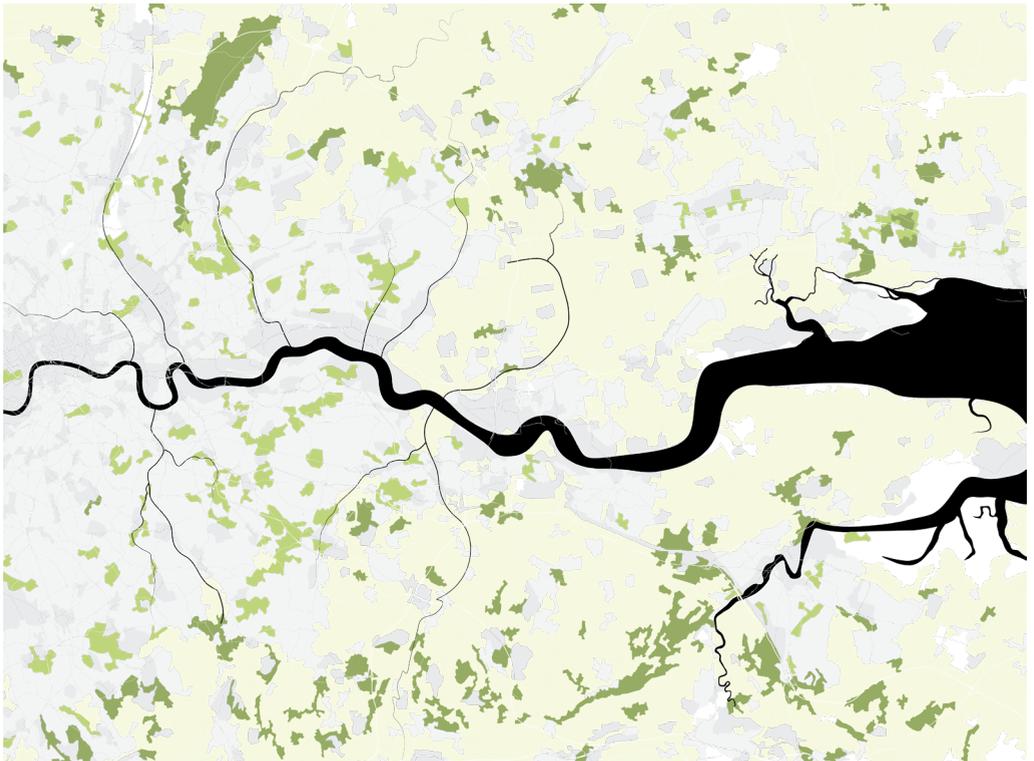
Phase 0 is a state of a dispersed network of forests. A large amount of heavily maintained agricultural and urban areas and a state of barriers. Barriers both terrestrial and hydrological.



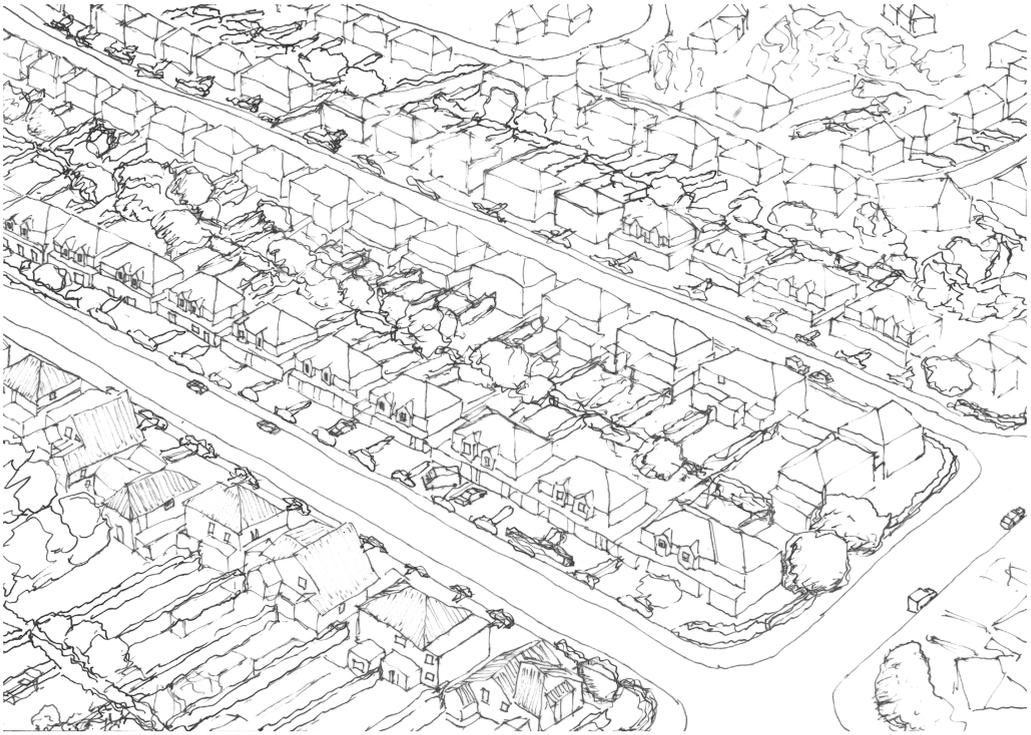
(138) scheme phase 0



(139) current state of agriculture near Cliffe



(140) current state of the Thames and its (possibly) rich areas highlighted



(141) phase 1 state of a suburban neighbourhood southeast of London

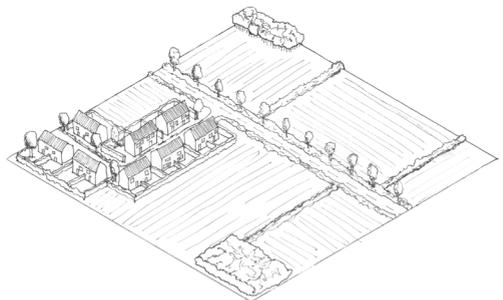
Phase 1 - Initiation

During the initiation phase easy steps that take less effort are being performed. Similar to acupuncture, unused places are defined and can be left unmaintained for longer periods of time. Allowing plants to grow and offer more affordances to other species. Areas that are specifically of interest are the borders between owners of land, these usually are fenced and can be easily turned around into small but rich places that offer shelter, food and infrastructures to some species.

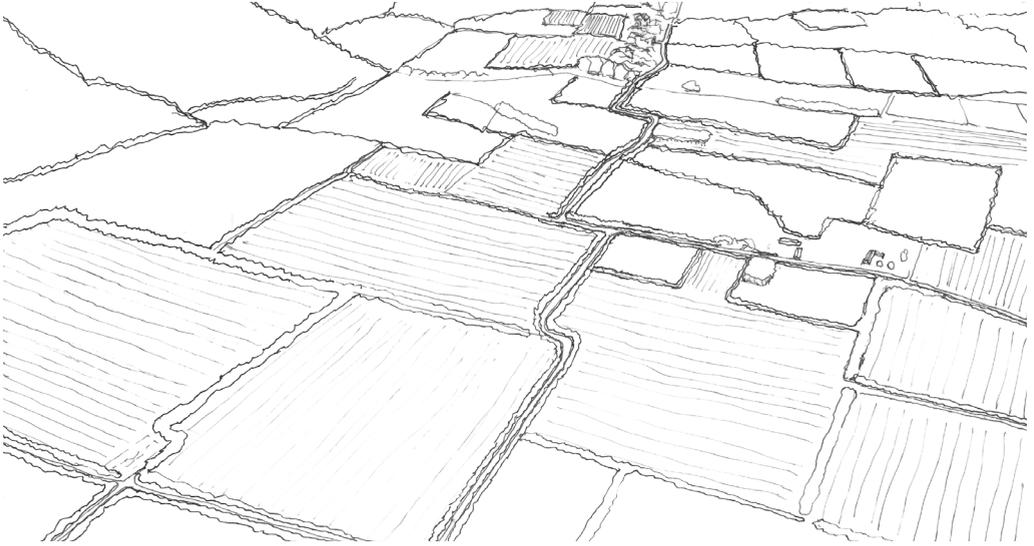
It is also this phase that reduction of pollution should commence. Policies by the central government can stop pollutions from industries and agriculture and can create benefits for both our own lives and that of other species.

Furthermore, subsidies can help local initiatives to start and also create an impact with little effort.

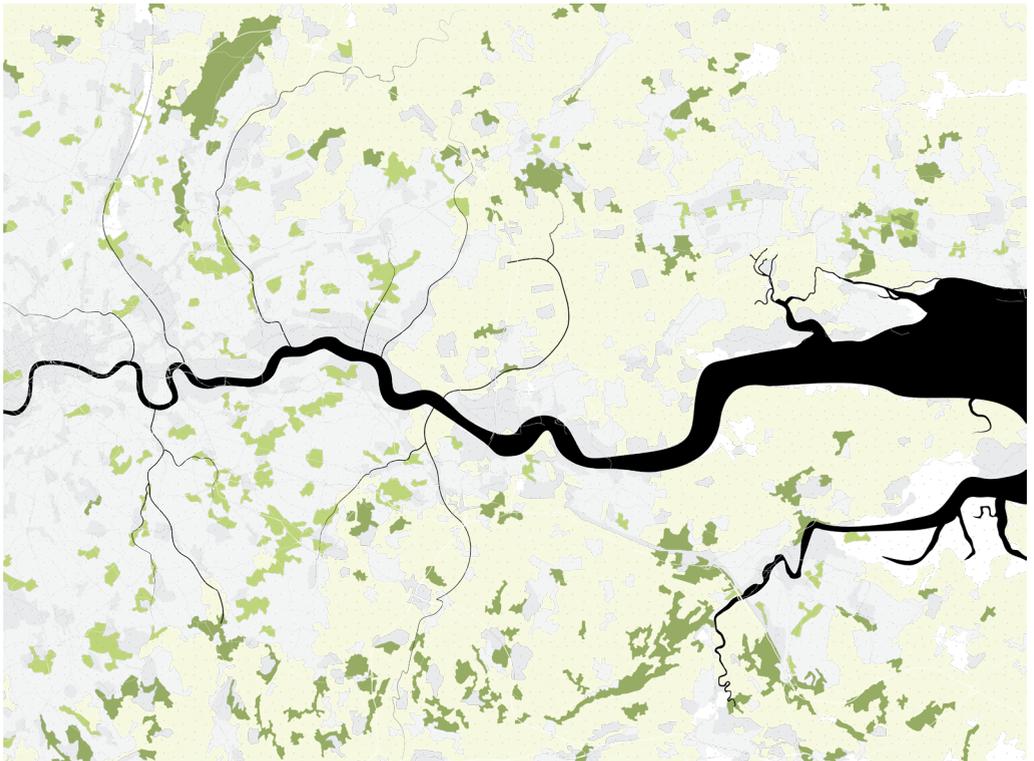
New developments should by default have been designed for a certain amount of coexistence. And have a vision of enabling other species rather than limiting them.



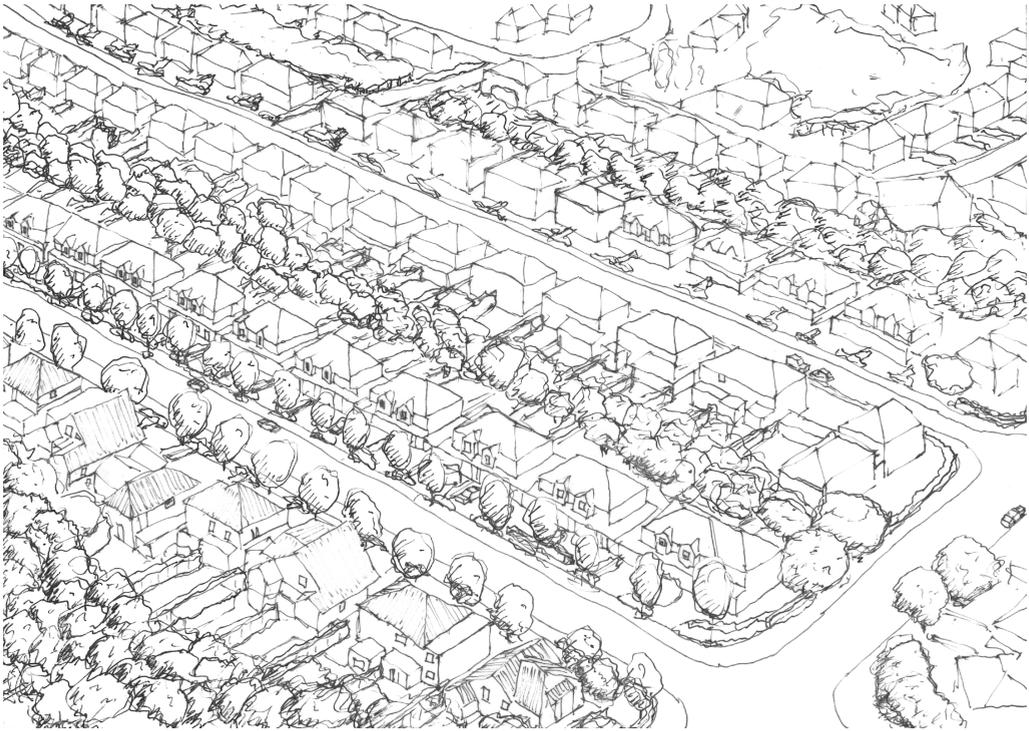
(142) scheme phase 1



(143) reduction of border maintenance



(144) acupuncture texture change that cost the least effort

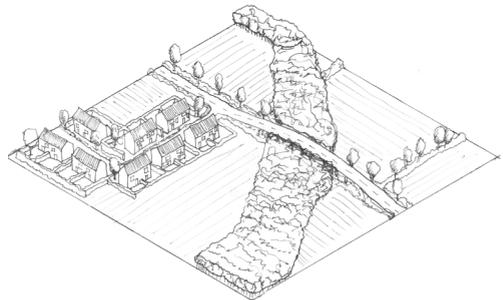


(145) phase 2 state of a suburban neighbourhood southeast of London

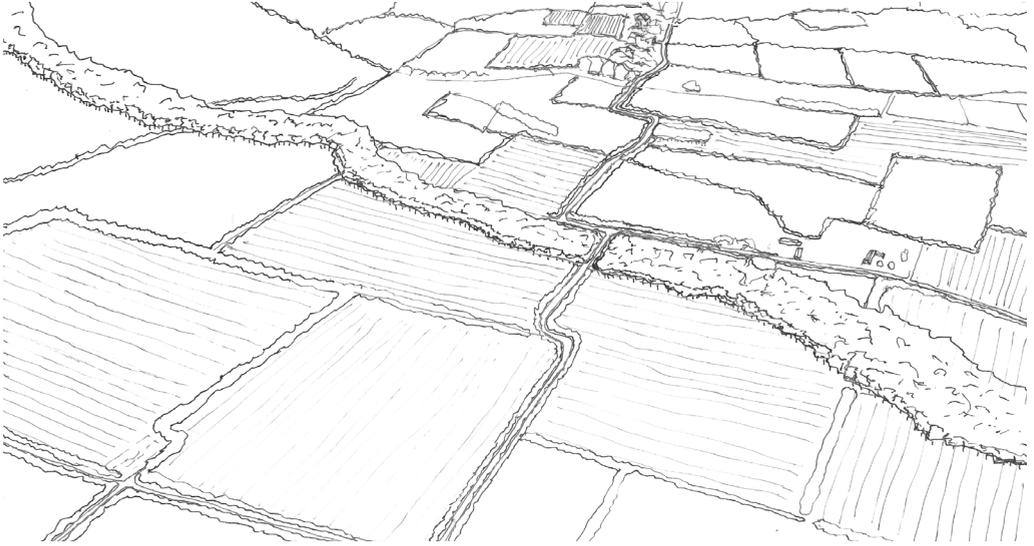
Phase 2 - Restoration

During the restoration phase, the first big changes in landscape start to unfold. Networks are being restored in places making it possible for many species to move. This occurs on specific locations, connecting the already rich textures with one another and by focussing on the possibly biodiverse areas like rivers and creeks where land meets water.

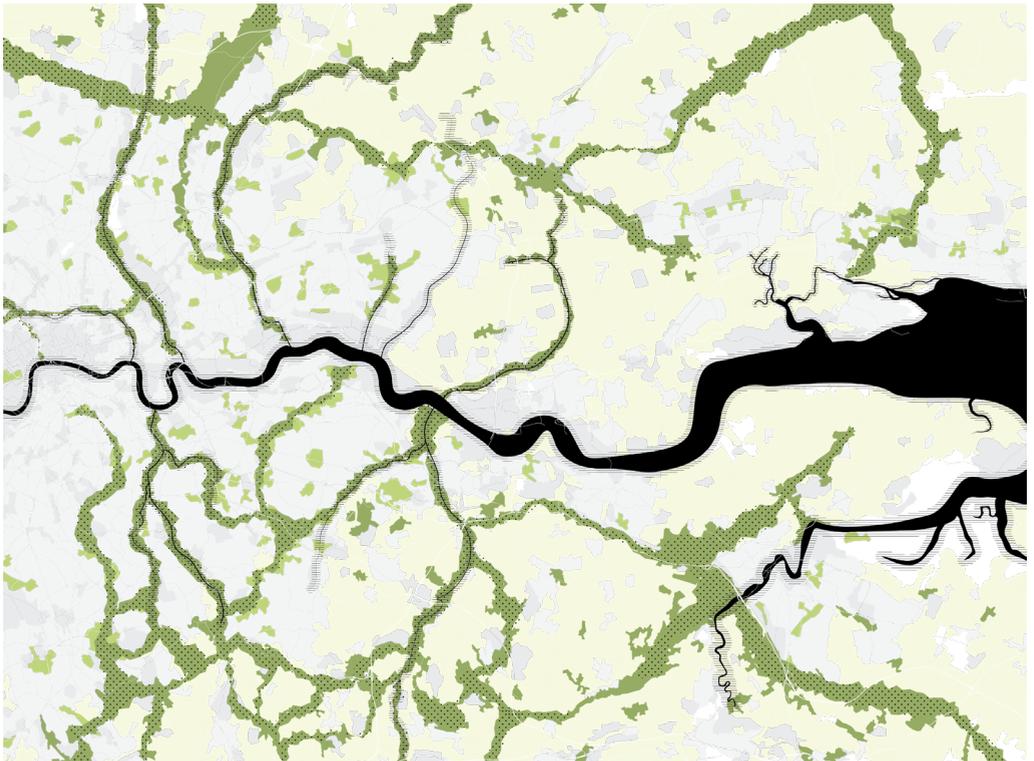
Within this phase, the crucial step is to overcome barriers by resetting or bridging them, making new networks possible.



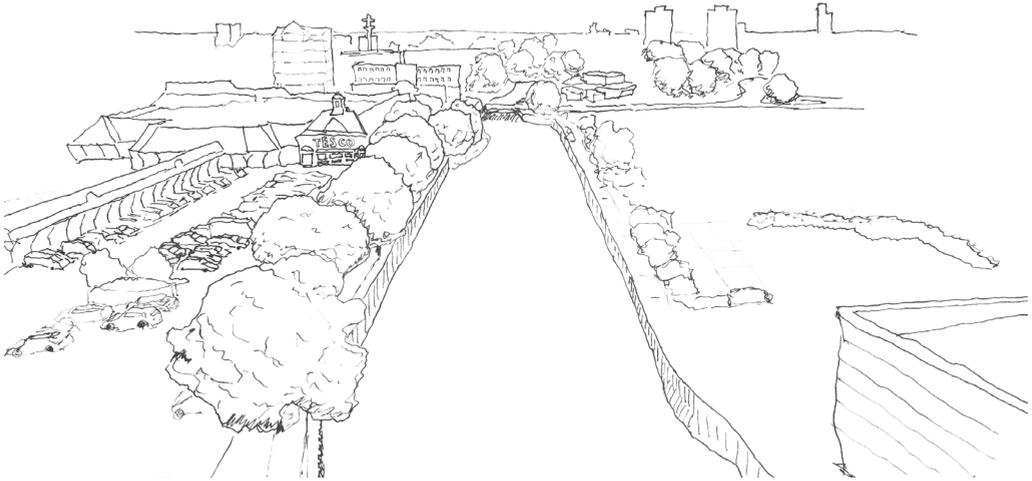
(146) scheme phase 2



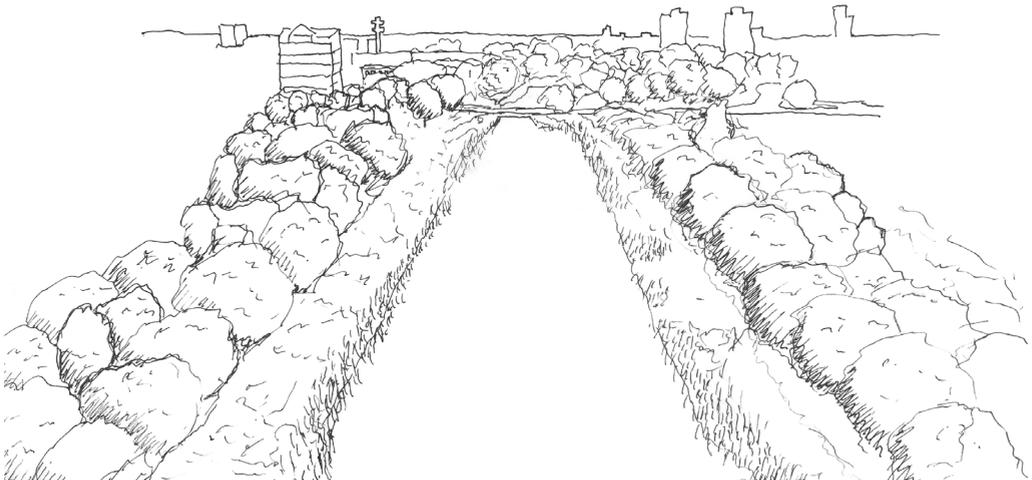
(147) a new corridor through the agricultural landscape



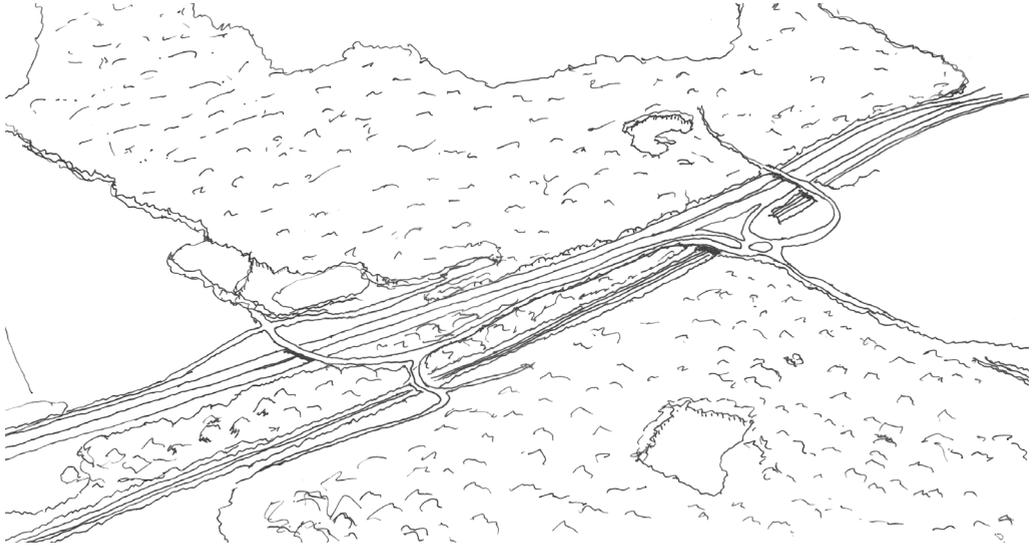
(148) restored rivers and connected woodland



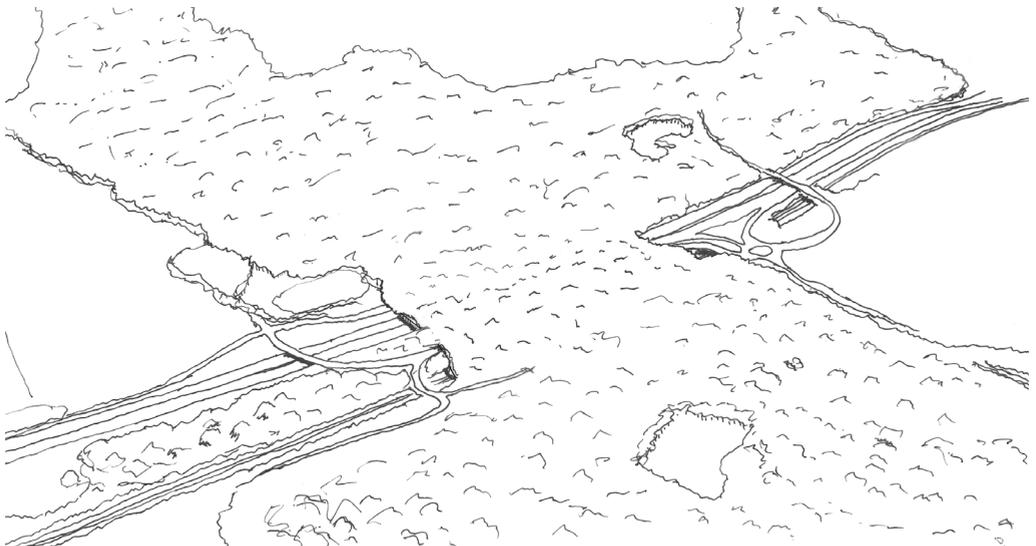
(149) current state of the river Roding



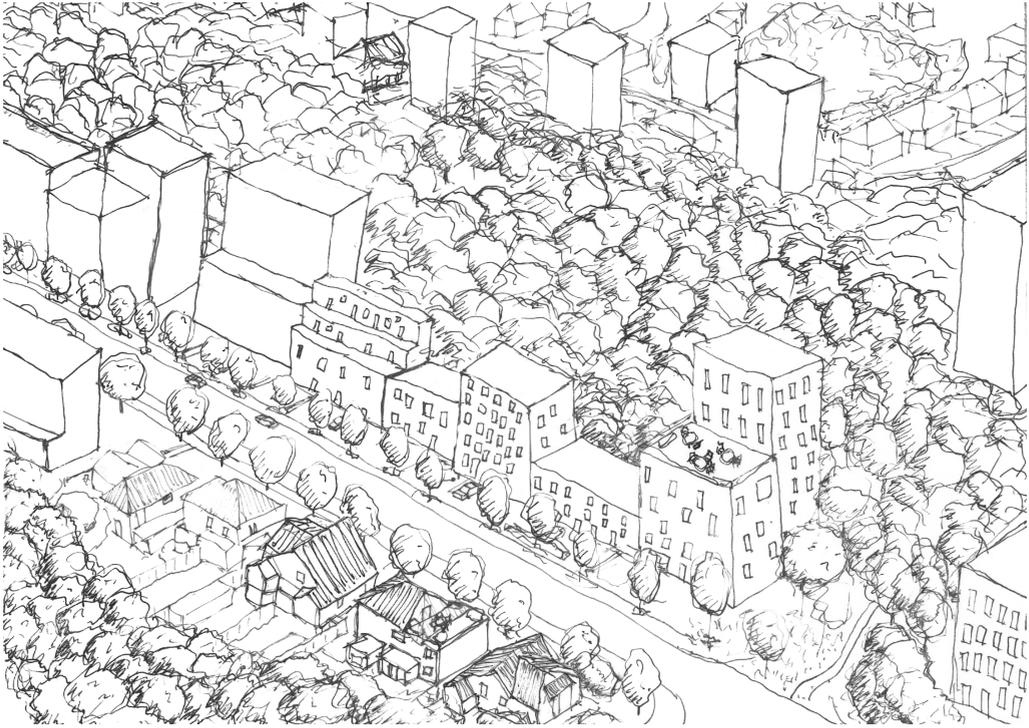
(150) a restored river Roding, making more space for other species and the river itself



(151) infrastructure crossing woodland between Gravesend and Rochester



(152) restored connection between woodland by bridging the highways

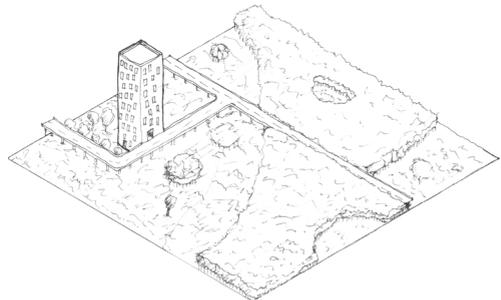


(145) phase 3 state of a suburban neighbourhood southeast of London

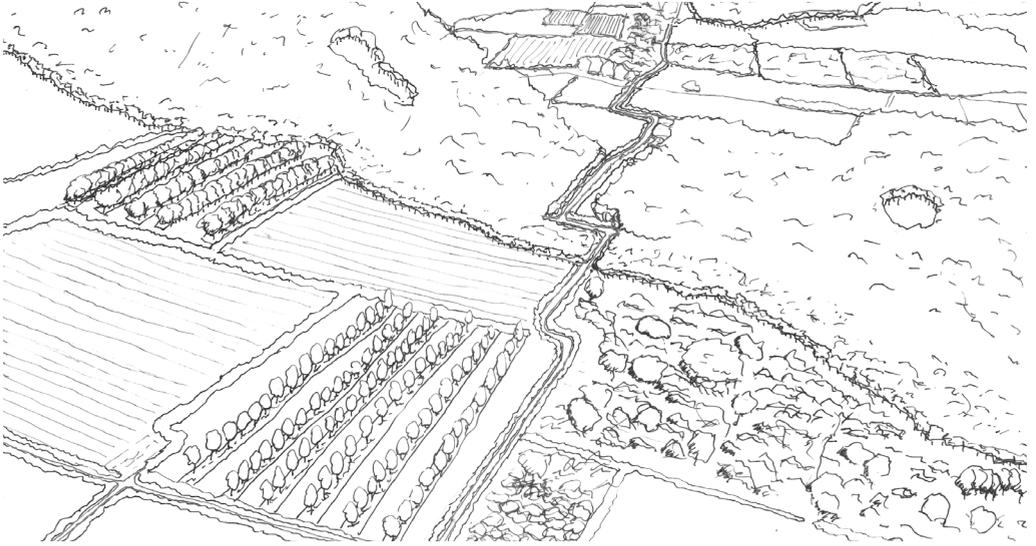
Phase 3 - Transformation

The newly laid networks form the basis of the transformation phase where large parts of both the suburban and agricultural environments are being transformed. The suburban area becomes a diverse area where many species can coexist alongside humans giving both a many different types of vegetation as well as built structures, in both high and low density.

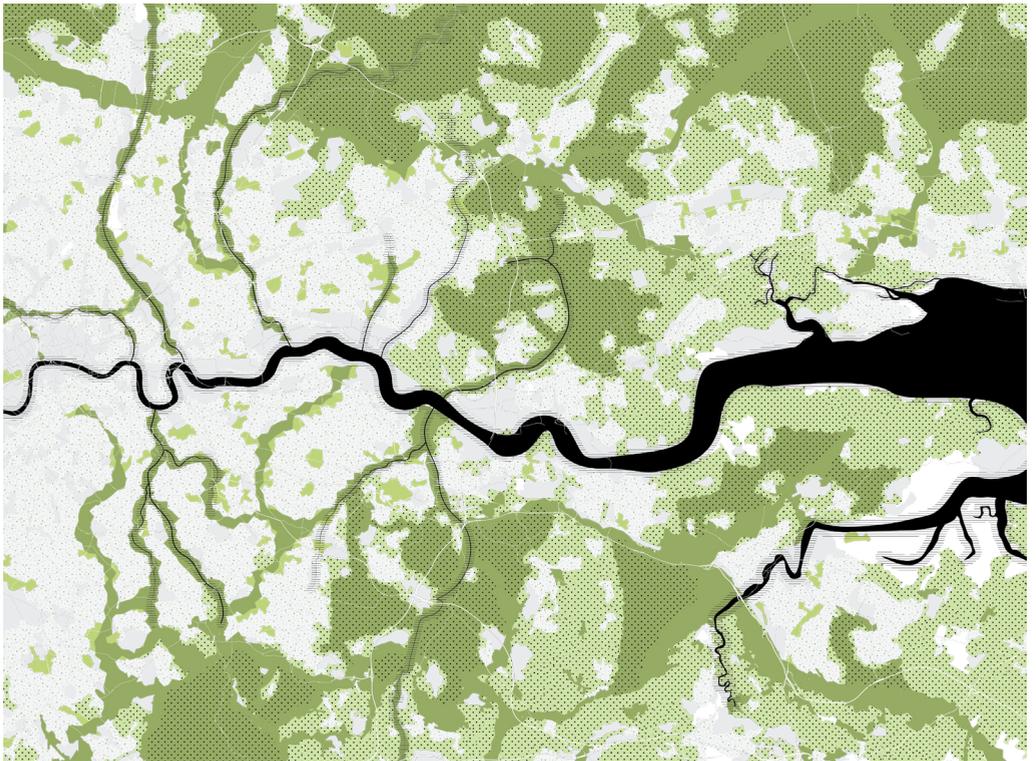
Agriculture changes drastically as well. New forms of agriculture are being adopted to create new ecological niches in the area. Some farmers adopt agroforestry, whilst others create food forests that become a part of the woodland infrastructure. Making it friendly for both humans and other species.



(146) scheme phase 3



(147) introduction of permaculture types



(148) enriching and diversifying textures

Conclusion

The main question asked in this research is: How can spatial design be implemented in order to improve the coexistence between species in the human environment? Underlying this question is the problem statement that due to land use and other human practices on the planet, the biodiversity is dropping rapidly. This problem should be taken seriously, because this makes our ecosystems unstable which threatens our lives, but above all we should start caring about the other (approximately) 8,7 million species. To answer the main question, a different ontological viewpoint is introduced. This viewpoint puts humans and other lifeforms on the same level. Through this ontological viewpoint it is possible to dive not only in the perspective of other things, it is also possible to see the immense networks that arise from the relations between all the species and the networks of networks. This would only be possible by changing the glasses through which we view the world, because otherwise we would only view the world around us as a resource that we can use and therefore has meaning to

this. The world is much more than this. Even though other species would probably have a similar 'zuhandenheit' view as we do, by taking their perspective, we already see that their worlds are different from ours.

This has also brought up ethical questions, especially since we humans have the power to alter our environments in such a way that it gives us incredible freedom to move and fulfils all our needs. However, when viewing this from many of the other perspectives, this ability to create will change to a destructive one, destroying habitats that used to be filled with life. Ethics always has been a useful tool to offer answers on how to do good to others and how we can live a good life. If other species would be introduced in our ethics, what kind of moral status would we give them and on what basis? It is shown that there are not really valid arguments not to give moral status to other species since the basis of these arguments were just a form of prejudice of one species over another merely on the basis of a biological category, in other words a form of speciesism, which is similar

to sexism or racism. However, the question of what moral obligations we then should have towards other species is a question that is much harder to answer. Designing space is practicing ethics, since all the things you do might have positive and negative effects to others. Especially in the large scale fields of planning, urban design and landscape architecture, this is an important aspect. Enhancing awareness on ones actions and the effects on others is therefore crucially important.

The third subquestion elaborates on the effects of the urban habitat on other habitats and shows that human land use is the main limiter of the lives of other species. Especially impenetrable surfaces and the maintenance of monocultural landscapes limits the possibilities of other species to live in those spaces. On top of this, the activities that occur on these type of land use result in an even larger impact on other species. Different kinds of pollution that for example results in acidification, alter the conditions of the atmosphere and the soil, making it impossible for other species to live. However, not all actions that people do have a negative influence on other species. In highly urban environments, humans have been able to create new sets of habitats that offer new niches to species, and it is also expected that new niches will still be arriving in these environments. Several species have done an incredible job adapting to urban environments. These species are now able to find their basic needs in the urban environments. This also clearly shows that most actions have both a positive and a negative influence on other species. Even in very harsh conditions some species are able to thrive. This is not an argument to continue the way we plan and design our environments, it primarily shows the ambiguity of the problem. If we do want to live in healthy ecosystems we do need places with high biodiversity and therefore we need to tackle problematic types of land use that create more harm than good.

In the second part of the research, a new approach to spatial design is explored. The initial hypothesis proposed a method of mapping the stakeholders (species) of a

specific area and their needs. Soon however, this method, although informative, would not be an efficient method for a complete ecosystem. The texture approach looks more promising for designing for coexistence. Rather than working from the perspectives of specific species, this approach is focused on the affordances that textures offer in more general needs of species. These basic needs are shelter, food, climate and infrastructure. Maps are made showing whether areas offer these specific aspects or whether areas have a negative impact on these aspects. By analysing textures and creating limit maps, it becomes easier to find problems in areas that can be turned around to create higher potential for an increased biodiversity.

Designing then means to alter these textures so that that more affordances would pop up that create new possibilities for a wider range of species. Important to note is that textures not only appear in space but also in time since everything changes in time. The first design task is to reset the limitation that the current design has put on the space in forms of limiting land use and heavy maintenance on this land use. To overcome these limitations we can use the following design principles that make it possible to design the different textures:

1. enrich and diversify textures to increase the amount of affordances an area can offer
2. let it grow or in other words co-design with other species. Not only do we limit textures from occurring by performing continuous maintenance, also plants that find themselves in the right conditions perform much better.
3. connect rich textures, this makes it possible for species to move between one area where they will find their needs to another.

Spatial design is there to create infrastructures for species, both human and nonhuman. These infrastructures are frameworks in which inhabitants have the possibility to fill space, similar to an architect who designs spaces that users can decorate on their turn. By doing this designers codesign with other species to create environments of coexistence.

Reflection

Developing a new approach and the relation between research and design

Research and design go hand in hand; without proper research a good design will not exist. Important for the research part of the project is asking the right question. ‘Who are you designing for?’, ‘What is the problem that needs a design solution?’, ‘How is this problem to be solved?’ etc. This project used extensive literature research and reflecting on this research in order to come up with solutions for the design. Instead of fully focussing on spatial design, this project focusses mostly on the approach towards design because of the main question that was asked. Developing this approach has been a peculiar iterative process in which different methods of analysis and design are explored. Exploring the right variables has been key. The spatial design itself reflects on the development of this new approach.

During the year, different approaches have been tested in order to find out whether they were suitable for designing for coexistence

between species. This resulted in the design approach that is focused on textures and the relations they have with the species and how the textures bring affordances to species. By focusing on these neutral aspects, the design approach can be universally applied.

In context of the studio

Most projects within the studio of Transitional Territories have been focused on maritime, riverine or delta areas. Even though this project was set along the Thames Estuary, the location could have been set in any place. Still, the project fitted rightly so in the studio, since the studio’s main focus is transitional territories and the project researched the worlds of other species, resulting in an investigation of different worlds in a transitional territory. Increasing awareness on the different worlds of other species uncovers a large amount of new spatial relations and narratives that are open for additional research and design.

In the societal context

We live in desperate times and our future on this planet is increasingly becoming more uncertain. Part of this is the huge decline in biodiversity which triggers many problems for society and the planet as a whole. A recent report from the UN again brought to light how big this problem is for our societies and for life as it is now on the planet as a whole. This research has shown that this problem is mainly produced by our society itself. By our ways of using land and our increasing need for resources have put ourselves in the position we are in right now. In order to reflect on these problems we therefore have to be critical towards our very own actions, activities and systems that make up our societies, because as this research has shown, every action has an effect that not only affects us but also the lives of many other species that we coexist with. The developed approach is a way to reflect on the current landscape but also on the design of new landscapes, whether they are urban or not.

Furthermore, this project has been trying to bring together different academic fields with each other. Now that many academics become more and more specialized into very specific topics, it is a good that there are fields that try to reconnect the academic islands with each other in the dispersed landscape of the academic world. The research topic of urbanism is located at an intersection of different systems and fields. In this project, design has been combined with politics, sociology, psychology, ecology and other environmental studies. Strangely, ecology seems to be rather neglected in urban design. This seems especially strange due to the impacts our designs can have on the ecology of a place. Our typical viewpoints on what nature is and what ecology is might cause this. This thesis tried to bridge the gap between biology and spatial design and can therefore be a starting point to better communicate and understand biologists, as well as to incorporate other species in spatial design. This research therefore recommends universities and schools of spatial design to start incorporating courses in the standard curriculum that touch some of the core concepts of ecology and how designs can

affect the ecology of a place.

More on ethics

In my project, I have already reflected on the ethics in designing for other species. Therefore, this part will reflect on ethics in design.

Peter Paul Verbeek states: “the design of technology is – in fact – doing ethics, by other means”. This is especially true for spatial designers like urbanists or landscape architects. The choices designers make can have a large impact on the lives of other human beings and on other species and therefore have many moral implications that need critical reflection. Ethical awareness and the ability to think critically therefore are key elements of designers.

Further research recommendation

This project is far from complete and there are still many further questions that can be asked. A few important topics of further research are elaborated upon below.

The method is highly speculative, in order for it to be assessed it should be tested in real life. It would also be interesting to see if this method could also work for other case areas.

The system changes as for example the change of agriculture still face many implications that should be further researched. For agriculture specifically, a system change towards alternative forms of agriculture changes many things. Questions that could be asked are how space can efficiently be used and what humans will be eating.

Another thing that is neglected so far are the actual encounters between humans and other species in the built environment. Some of these species might be threatening to humans and other species, whilst others might not get socially accepted by humans. Further research on possible encounters and the new social challenges arising is needed.

The design created from the developed

method is only just one exploration. Many other iterations are possible that can still be investigated. Also, specific design solutions in smaller more detailed scales still can be explored further.

With existing methods, it still remains difficult to draw the worlds of other species. Research into new drawing techniques might come up with new solutions for making these worlds visible to humans.

The project is also very political, however it is still hard to fully understand what other species really want and need as humans can not communicate with them. Their representation in spatial design thus still remains highly speculative.



(149) structure along the Thames

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Chapter 3: Theory

Coexistence

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Chapter 5: Context

Chapter 6: Analysis

Species

Textures

Limitations

Chapter 7: Design

Chapter 8: Conclusion

Chapter 9: Reflection

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Appendix

The appendix consists of the following parts:

1. Climatic maps
2. Process
3. Symposium entry

Climatic maps

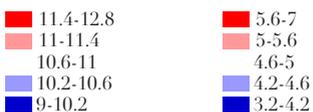
mean temp (°C) spring and summer



sunshine (hours) spring and summer

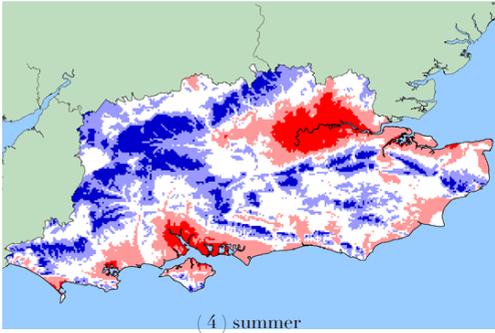


mean temp (°C) autumn and winter

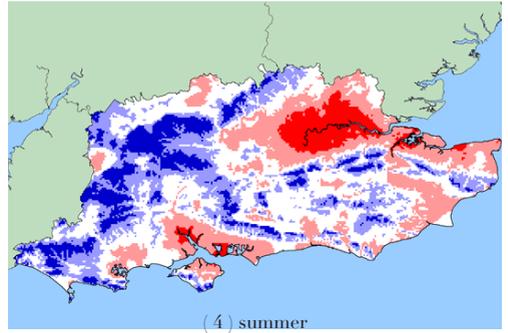


sunshine (hours) autumn and winter

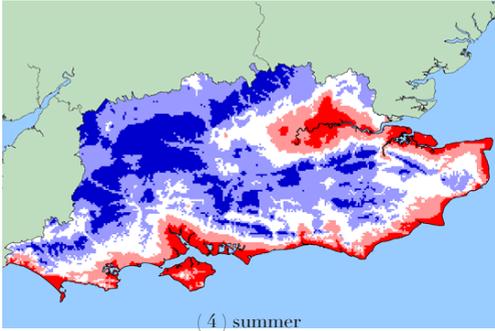




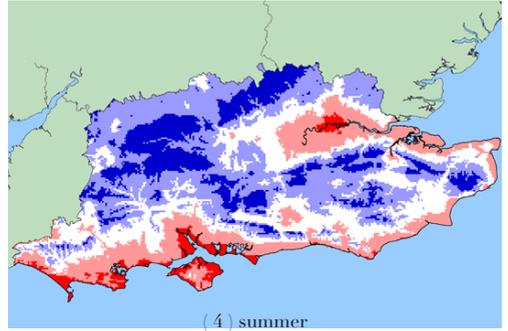
(4) summer



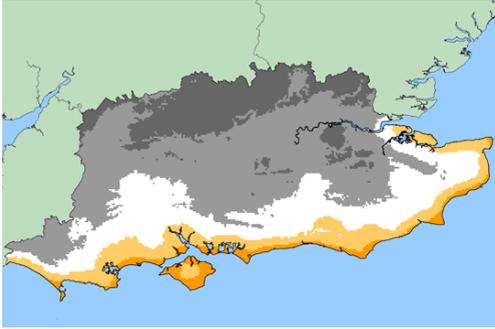
(4) summer



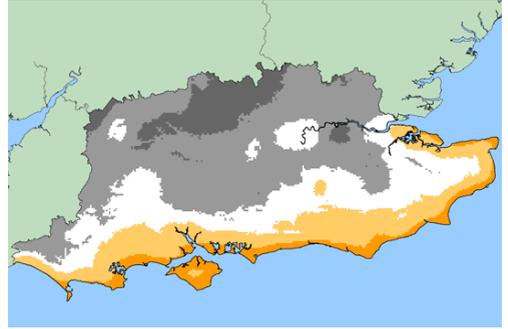
(4) summer



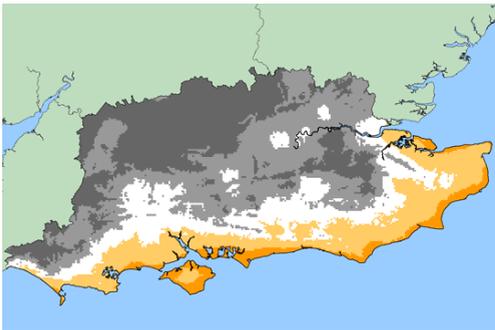
(4) summer



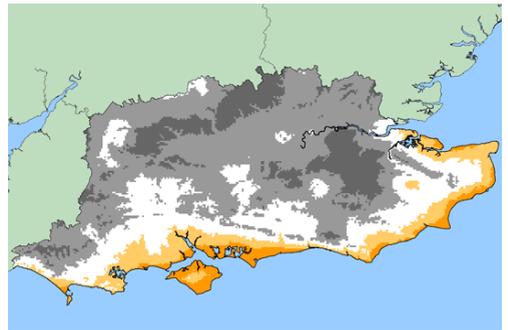
(4) sunshine spring



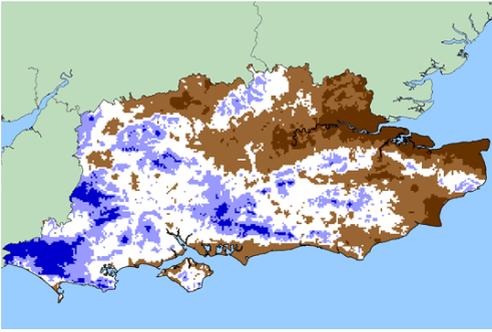
(4) sunshine summer



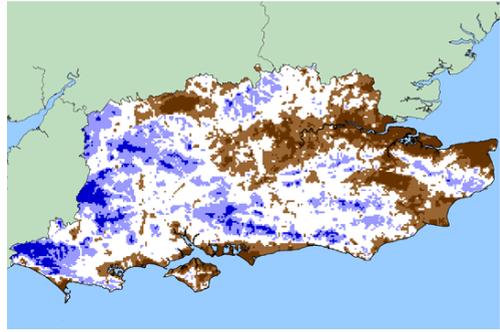
(4) summer



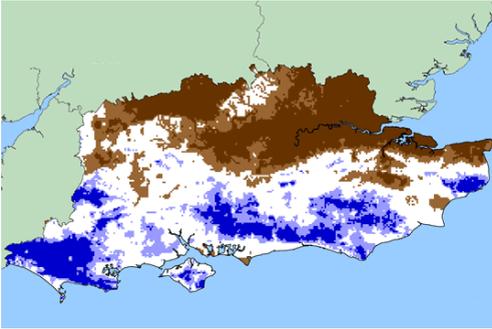
(4) summer



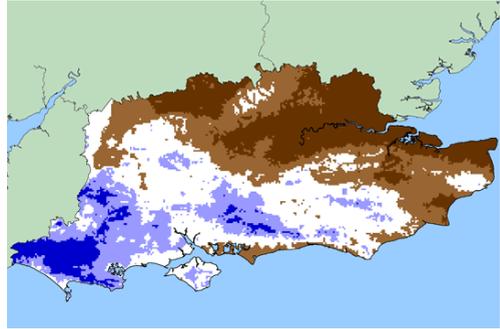
(4) precipitation spring



(4) precipitation summer



(4) precipitation autumn



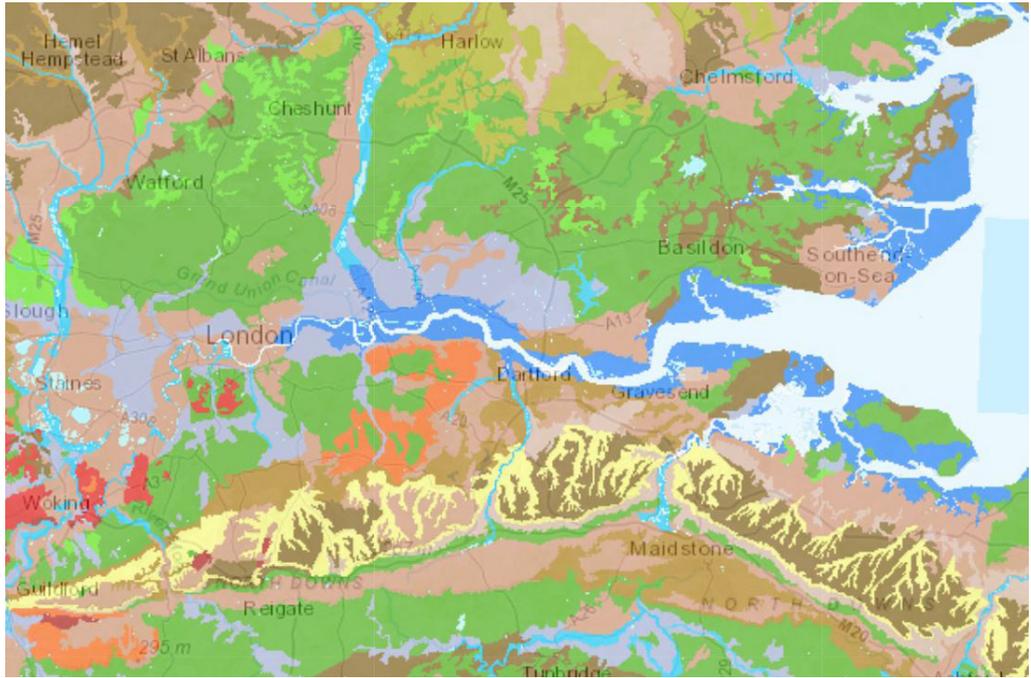
(4) precipitation winter

precipitation (mm) spring and summer



precipitation (mm) autumn and winter





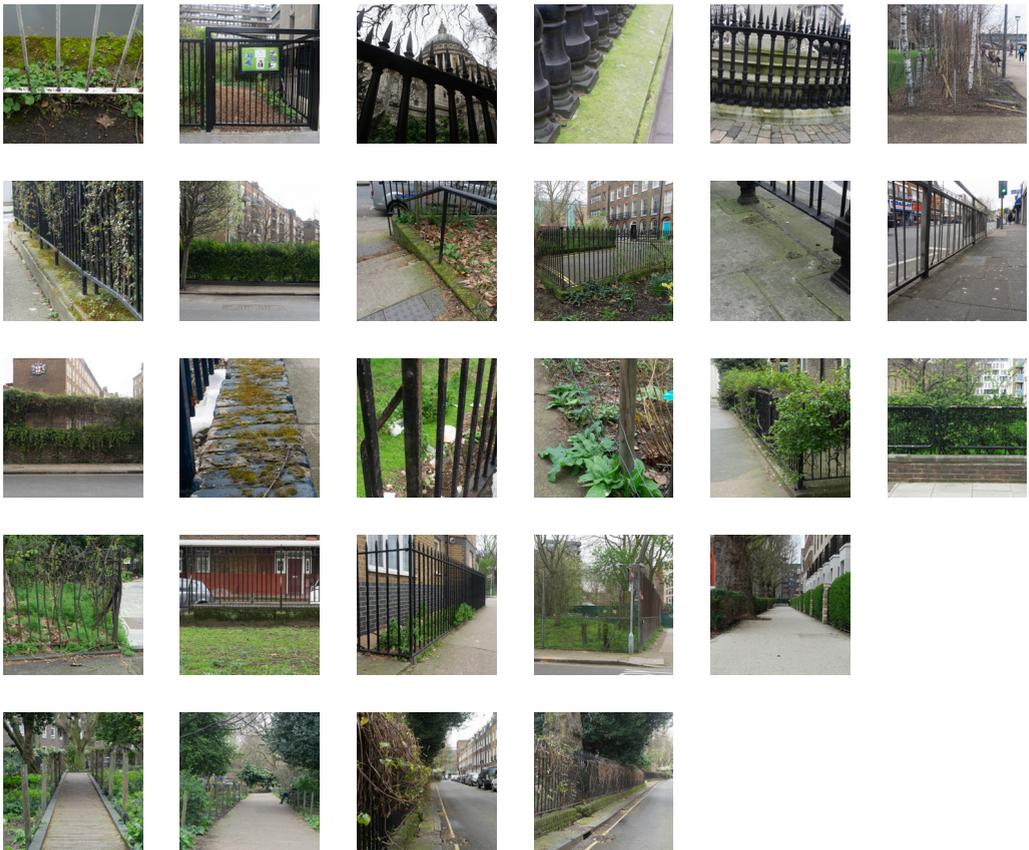
(4) soilscapes

- | | | | |
|---|---|---|--|
|  | Blanket bog peat soils |  | Loamy soils with naturally high groundwater |
|  | Fen peat soils |  | Naturally wet very acid sandy and loamy soils |
|  | Freely draining acid loamy soils over rock |  | Raised bog peat soils |
|  | Freely draining floodplain soils |  | Restored soils mostly from quarry and opencast spoil |
|  | Freely draining lime-rich loamy soils |  | Saltmarsh soils |
|  | Freely draining sandy Breckland soils |  | Sand dune soils |
|  | Freely draining slightly acid but base-rich soils |  | Shallow lime-rich soils over chalk or limestone |
|  | Freely draining slightly acid loamy soils |  | Shallow very acid peaty soils over rock |
|  | Freely draining slightly acid sandy soils |  | Slightly acid loamy and clayey soils with impeded drainage |
|  | Freely draining very acid sandy and loamy soils |  | Slowly permeable seasonally wet acid loamy and clayey soils |
|  | Lime-rich loamy and clayey soils with impeded drainage |  | Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils |
|  | Loamy and clayey floodplain soils with naturally high groundwater |  | Slowly permeable wet very acid upland soils with a peaty surface |
|  | Loamy and clayey soils of coastal flats with naturally high groundwater |  | Very acid loamy upland soils with a wet peaty surface |
|  | Loamy and sandy soils with naturally high groundwater and a peaty surface | | |

Process

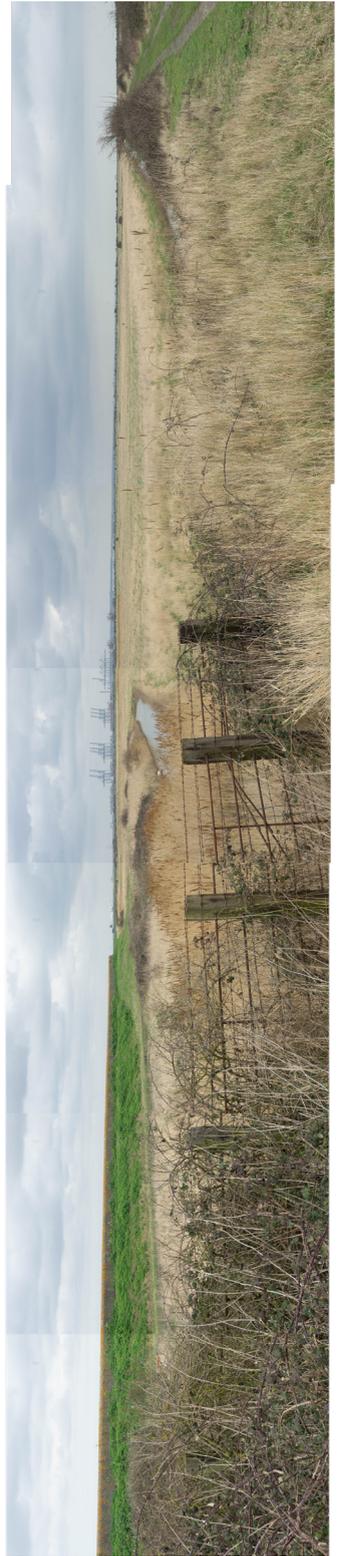


(4) pole elements





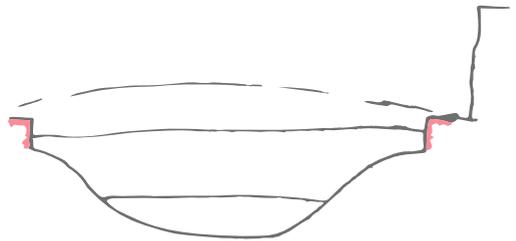
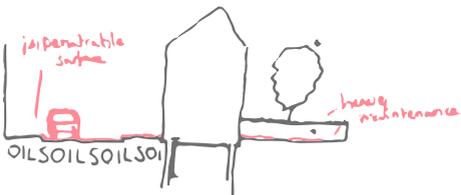






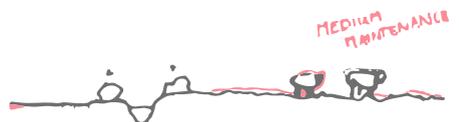
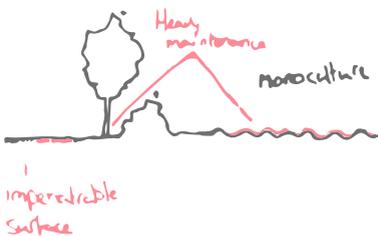
ROAD / HOUSE / GARDEN

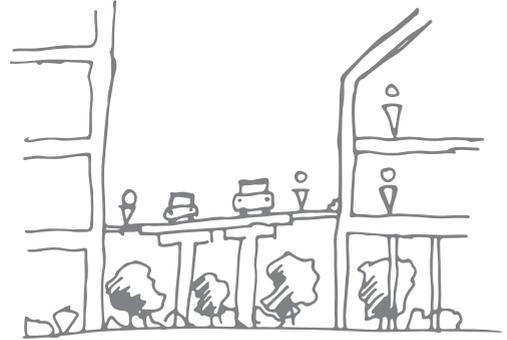
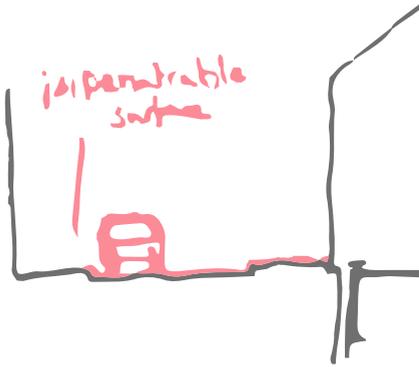
Rural / suburb



Agriculture

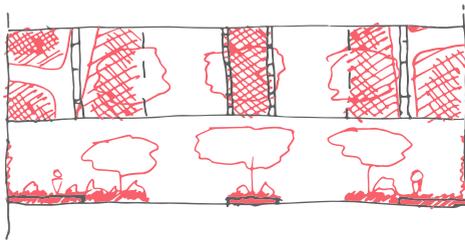
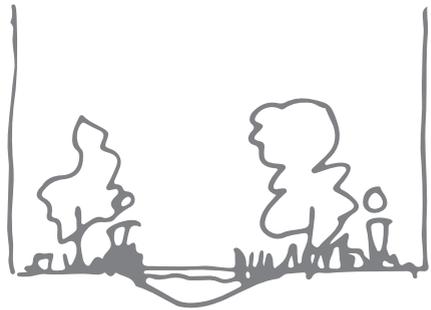
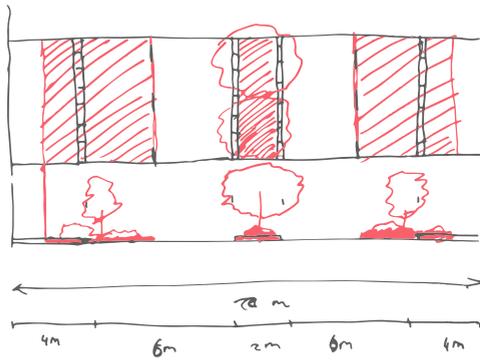
CROP LANDSCAPE





Streetscape

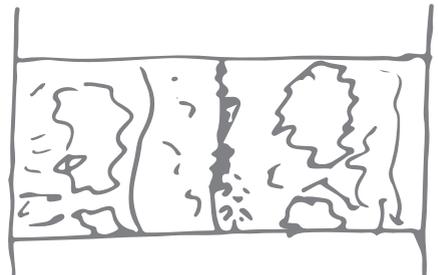
SEPARATED

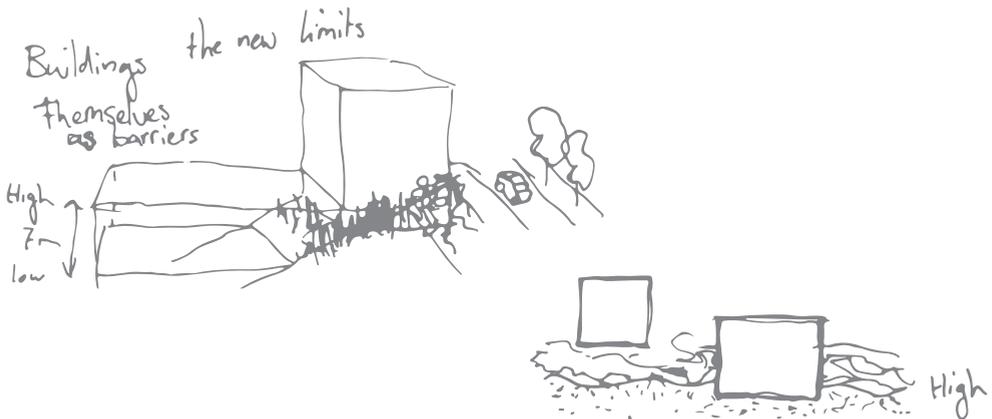
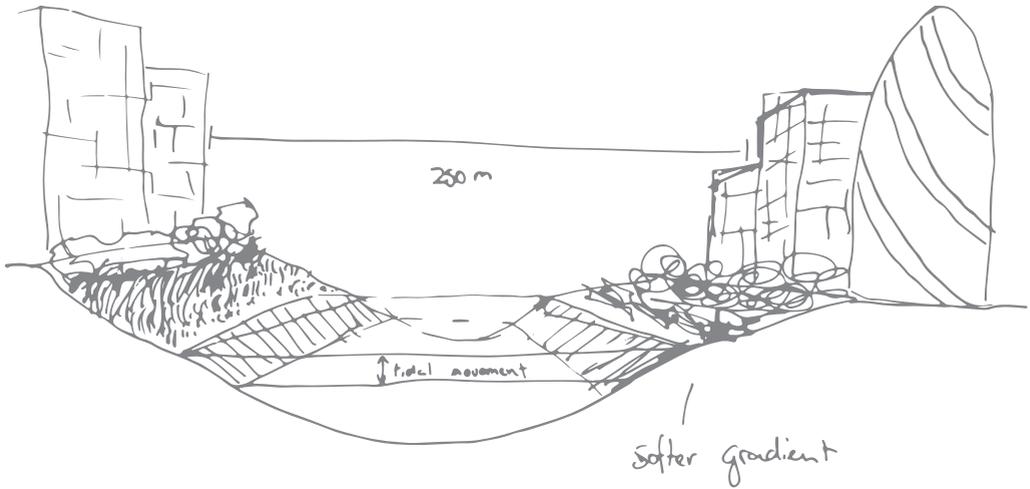
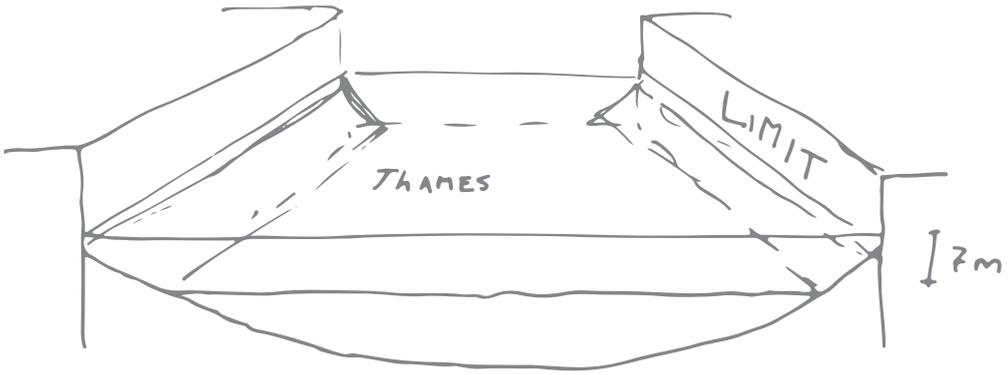


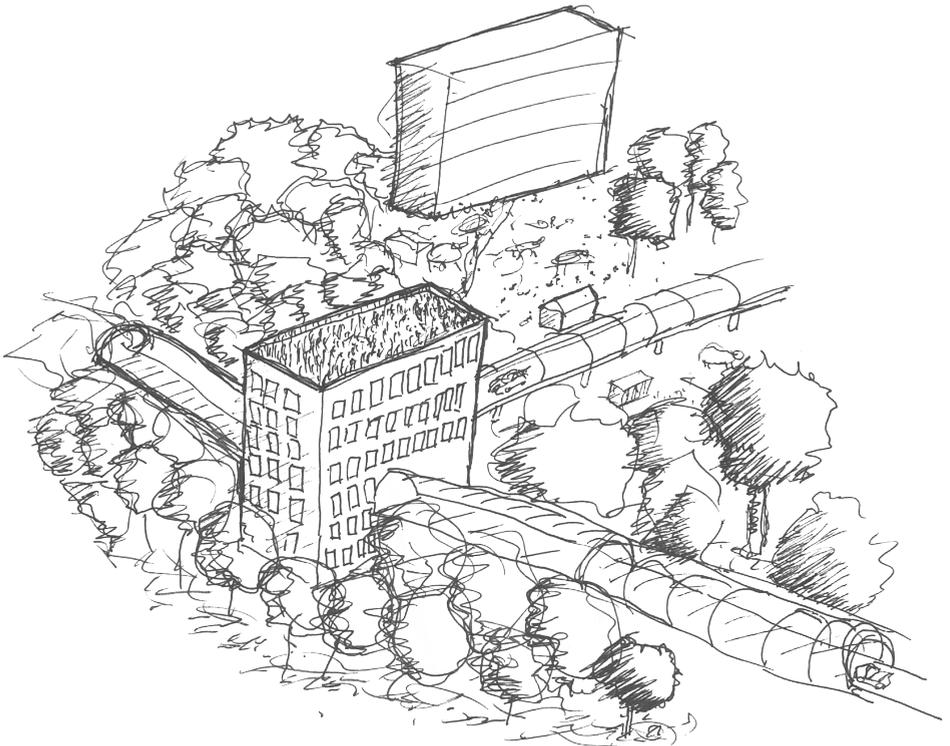
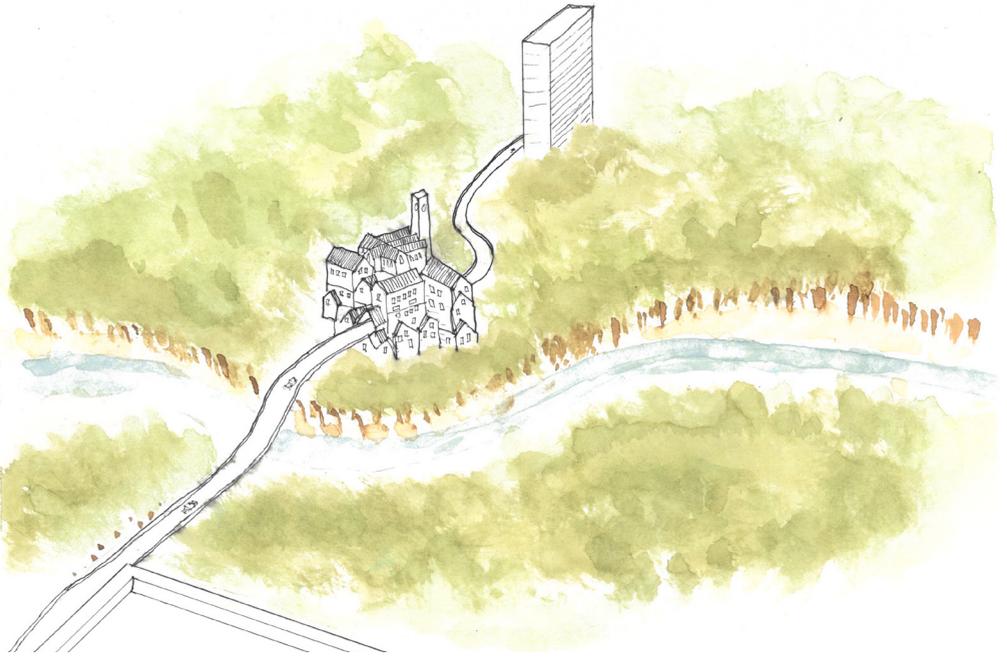
add gradients of maintenance

- relatively maintained
- Hardly maintained

20 mph zones



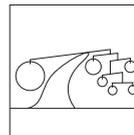




Symposium

Minister of Human and Non-human
affairs

Jan Gerk de Boer
Thames Estuary
The United Kingdom



North Sea Parliament
Berlagezalen
Julianalaan 134
2628 BL Delft
Netherlands

Dear Fellow Ambassadors of the North Sea,

We, the humans, have a good life on this planet. Especially in the area of the North Sea we have been accustomed to incredible amounts of wealth for many centuries. But our presence and our usage come at a cost as well. Our usage of resources has an incredible impact on the ecosystems. Biodiversity has dropped in nearly all the locations that we influence. Furthermore, many species alter their way of life completely because of our influences in order to be able to live. Researchers already warn us that we are now in one of the biggest extinction events that our planet has undergone. We, the humans, are a virus on earth.

But why do we humans have so much trouble in coexisting together with all the nonhumans in the world?

This question asks us to revise the way in which we construct our human environments. Whatever we build, design or plan has an impact. Not just in our own environment, but also in the environments of the nonhumans. In order to find out what effects our constructions have on nonhumans we need to change to the perspectives of the nonhumans. This project aims to explore the effects that our human environment has on nonhumans. With the knowledge from this exploration we will be able to alter our designs so that they will allow for a better coexistence between humans and nonhumans. Resulting in the following question: What kinds of interventions can be done in order to establish a better coexistence of nonhumans and humans?

On a regional level, it means analyzing land use: How does our current land use have an impact on nonhumans and how can it be improved to allow a higher biodiversity? Furthermore, on an urban scale it means research into the current urban fabric. How does the physical urban environment influence the ecological processes?

This project is all about relations. Relations between humans and nonhumans. We, the humans, have already broken many relations, let's not break more.

Yours sincerely,

Handwritten signature of Jan Gerk de Boer.

Jan Gerk de Boer

