SUPPORTING GREEN URBAN INITIATIVES IN LOCAL BIODIVERSITY IMPROVEMENT

Master thesis by Jet Luijten

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ABSTRACT

The green pioneers of Rotterdam are actively making the city a greener living environment. Citizens are increasingly involved in their direct living space and this also applies for the public green areas in the city. Similar to several other cities, the municipality of Rotterdam has set-up an infrastructure to support their citizens in green participation. Through this system, citizens can apply to take over a green space or wasteland from the municipality, or they can introduce green elements to the grey streets in which they live. They not only improve the neighbourhood experience, but also contribute in adressing three current climate challenges: climate-adaptation, climate-mitigation and the mitigation of biodiversity decline.

The initial goal of this project is to create a toolkit that supports the green pioneers of Rotterdam in their actions to improve their contribution in adressing their local climate challenges.

I research the green pioneers of Rotterdam, to figure out how they approach their projects, why they are involved, and what they do exactly. Moreover, I investigate their current contribution in adressing the local climate challenges and how this can be improved.

Therefore, I conduct different explorations, including three case studies in which I meet three initiators who are involved in a green initiative in the city. This resulted in the following main insights:

- There is a wide variety between the projects in how the people involved approach the initiative, project forms and the dynamics between the people involved, which all need to be considered in the design.
- One of the main dividers is that the projects are always in a public space and therefore the interaction between the initiatives and neighbours and passers-by should be considered.
- The most promising challenge for green pioneers to improve their contribution in, is the mitigation of biodiversity decline. This challenge is therefore chosen as a focus for this project.
- Most green pioneers want to contribute to biodiversity where they can, but are not always aware when they are able to do so and how.
- Green pioneers can improve the contribution to biodiversity with their green initiative, by adopting an ecological gardening approach instead of a traditional gardening approach.

The goal for the toolkit is specified to stimulate green pioneers who garden in a traditional way, to switch to an ecological way of gardening.

To figure out the required steps to be taken to garden in a more ecological way, I conduct secondary research on the topic. Furthermore, by conducting concept tests and observations during a natural gardening course, I learnt that most people can not be classified as a traditional or ecological gardener, as in reality people show a mix of behaviours. The goal of the design is finalised to:

Supporting green pioneers to adopt more ecologically responsible behaviours.

By analysing the difference between ecological gardening and current behaviours, I arrived at four options in which the design can help improve the contribution of the green pioneers of Rotterdam:

- By providing green pioneers and the citizens they influence inspiration on possible actions and their ecological effect
- By stimulating green pioneers to make decisions with a focus on the effects on animals and plants.
- By broadening the perspective of green pioneers and the citizens they influence by including unfamiliar/ unattractive animal- and plant species.
- By encouraging an interplay-experience between the actions of green pioneers and the input of natural processes.

These four solution spaces lead to the development of a toolkit concept. The toolkit provides inspiration and support to help the green pioneers of Rotterdam to optimize the ‘natural site’ that they created in the city. The toolkit can be incorporated in any approach, initiative type and group structure. It consists of the following items:

1. Introduction booklet
2. Box of inspiration seeds
3. Design workbook
4. Activity calendar
5. Inventory shed
6. Maintenance notebook
7. Exploration signs
8. Safari application

The concept is evaluated on its effect and feasibility through evaluation sessions, which resulted in final recommendations for further development of the toolkit. A suggestion is made to combine the desired features of the initial concept into the following three items:

1. Inspiration calendar
2. Inventory shed
7. Exploration signs

GLOSSARY

Blue

Containing water. As in *blue schoolyards* or *blue roofs*.

Green

Containing or referring to vegetation. As in *green schoolyards, green roofs, green facades, green areas* or *green initiatives*.

Green urban initiatives

A citizen initiative in which green space or wasteland is taken over, or in which green elements are added to the urban environment.

Green pioneers / Green guardians

The terms green pioneer and green guardian are interchangeably used in this project to refer to the people who are actively involved in green urban initiatives.

Neighbours

The people who live nearby a green initiative and are therefore indirectly involved.

Passers-by

People who do not live nearby a green initiative but walk through or past it and are therefore indirectly involved.

Target group

The people whom are supposed to benefit from this project and the product in which it will result.

Toolkit

An accessible collection of materials which can be used in order to achieve a certain goal

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CHAPTER 1
INTRODUCTION

This chapter starts with a brief explanation of the intention and context of this project in section 1.1 ‘Intention of the project’. Followed by section 1.2 ‘Project Context’ with a more elaborate explanation of the contex to provide a better understanding of the origin and relevance of this project.

Figure 1 - Context

INTENTION OF THE PROJECT 1.1

More and more citizens are getting involved in the implementation and management of their direct living environment, including the public green areas. Neighbours are taking action to change the appearance of their neighbourhood by taking control of the green spaces and wasteland themselves, or they add green elements to the existing, mostly grey, paved streets they live in. We could call them green pioneers; citizens who create green oases in the grey urban desert. Their actions results not only in a pleasant transformation of the neighbourhood's appearance, their contributions are valuable in the battle against climate-related challenges that cities are currently facing.

Current climate challenges include the adaptation to climate change induced phenomena (like heat stress and flood risks), the mitigation of climate change itself, and the mitigation of the current biodiversity-decline. Researchers and governments acknowledge that increasing green areas in the urban context can contribute to these challenges. By adding and managing green areas in the urban environment, green pioneers inherently make a contribution in this regard, with or without their knowing.

The potential of these initiatives to address these climate challenges is what will be explored in this project: How can we help green pioneers to realise this potential?

Taking a first step in making this broad project more manageable, Rotterdam is chosen as a playground, as this is a city that is experienced in citizen participation in the public green areas. How exactly does the municipality of Rotterdam support their green pioneers? What do the green pioneers of Rotterdam exactly do and what is their motivation? And how can they be supported in addressing local climate challenges?

PROJECT CONTEXT 1.2

Before we dive deeper into the green pioneers of Rotterdam, it is valuable to first understand the climate-challenges that they adress. What are they? And what is the role of green areas in these challenges?

Climate related problems at city level

Global warming causes an increase of warm and dry periods, alternated with extreme downpours. Especially cities, with their abundance of pavement and buildings that prevent water from draining and keeps heat contained, are facing the challenge of creating resilience to climate change. An interlinked problem with the global warming is the decline of biodiversity, in which the expansion of the urban environment has a significant share.

Global warming and the city

Higher global temperatures cause an increase of extreme downpours, in which a large amount of waterrains down from the sky in a short period of time. The majority of urban surfaces is paved or built-up. Paved surfaces prevent water from infiltrating the ground underneath the pavement. Because the built environment requires a solid foundation, most of the ground in the city is compressed, which prevents water from infiltrating in the ground as well. This results in less storage of water in the ground. Water stays on the surface and is drained to the sewerage system. Sewerage systems can be overloaded during extreme downpours. The end-result is an increase of flood-risks. (Dirven-van Breemen et al., 2011) (Deltares, 2012)

Another effect of global warming is an increase of longer periods of drought. Given the decrease of water storage in urban soil, the groundwater level can become extremely low during these droughts. This is problematic in Dutch cities as many houses are built on wooden structures underground. The wooden foundations are dependent on higher groundwater levels and will get exposed to other elements and decay when water levels are low. (Deltares, 2012)

The rise of global temperatures is also measurable in cities. The density of human activity in urban areas increases urban temperatures. Heat is trapped between buildings and absorbed by brick, concrete, and asphalt during the day. At night, the heat is emitted to the cooler atmosphere

in the city. The decrease of water storage in the ground means that there is less water to evaporate during periods of drought. This prevents urban environments from cooling down. (Deltares, 2012) The combination of these processes increases the average temperatures of urban environments significantly compared to surrounding areas in warm periods. This phenomenon is referred to as the Heat Island Effect. (Kuypers et al., 2008) (Aram et al., 2019)

Biodiversity and the city

Biodiversity is declining on a global scale. Biodiversity indicates the total variety of all living organisms. Not only the number of species is important. The genetic variation within species and in living communities and ecosystems is of importance as well. (Jones-Walters et al., n.d.) People are completely dependant on healthy and vibrant ecosystems, as they provide humankind the basis for all our needs. To describe and emphasize everything nature has to offer to humans, they are appointed the term: ecosystem services. Ecosystem services are devided into four categories: cultural services (recreation), product services (drinking water, food and raw materials), regulatory services (pollination and regulation of climate, soil, water and air systems), and supporting services, that support the beforementioned services (the cycle of nutrients and biodiversity). (Van Oostenbrugge et al., 2010) As biodiversity has declined over the last several decades, the offer of ecosystem services has been declining, while demand is increasing. (de Knegt et al., 2014)

The loss of species is mainly caused by a loss of habitat. (WWF, 2020) A reasons for this is the increase of urbanisation. (Kowarik, 2011) Urban structures form a specific habitat that are only habitable for a niche of animal and plant species. The compressed ground in urban areas do not allow for a rich soil life, most plants do not grow on the paved environment, and therefore most insects and other animals are dependant on the green fragments, scattered over the urban area. (Hiemstra et al., 2018)

In addition, climate change contributes to the biodiversity decline within urban ecosystems. The decrease of water storage in the urban ground in combination with longer periods of drought result in more desiccation and higher mortality rates of locally growing plants. This in turn hampers the survival of local insects, birds and other animals.

Urban vegetation as solution

Not surprisingly, as stones and concrete are the main cause of climate-related problems, the value of vegetation in the urban area is increasingly acknowledged. The European Commission called on European cities to develop Urban Green Plans in 2021 to bring nature back to cities (European Commission & Directorate-General for Environment, 2021) . Green areas can contribute to solving these problems through climate mitigation, climate adaptation and by increasing biodiversity.

Urban vegetation and climate mitigation and adaptation

Green areas help cities adapt to climate change and its effects in multiple ways. during heavy rainfall, they allow rainwater to infiltrate the ground and thereby act as a buffer. These buffers in turn act as a water reserve for periods of drought. There are particular green area designs, invented with the main purpose to tackle local flood risks and drought effects, such as *wadis* and drainage systems. (Dirven-van Breemen et al., 2011)

Groundwater, can evaporate through the plants that root there. This reduces local environmental temperatures and therefore reduces the Heat Island Effect. Plants provide shade, and therefore they intercept sunlight before it is stored in the petrified surroundings. *Green roofs* and *green facades* also insulate buildings and therefore keep indoor temperatures lower. (Kuypers et al., 2008) (Aram et al., 2019)

Adaption to higher temperatures simultaneously decreases energy demand to cool down buildings. By doing so and by sequestrating and storing carbon, green areas help mitigate climate change as well. (Naturvation, 2020)

Urban vegetation and biodiversity

Green areas provide an inviting living and foraging environments for soil life, plants, pollinators, other insects, birds and other small animals. Street greens such as trees, hedges, flowerpots and flower- or plant beds can act as *habitat corridors*, which are green areas that connects habitats for species to allow them to relocate and exchange genes. (Dirven-van Breemen et al., 2011) (Boeschoten, H., 2021)

Rotterdam and urban vegetation

Now we have background knowledge on the value of green in the city in combatting climate challenges, let us zoom in on Rotterdam. How does its municipality support the addition of green and what actions are taken by the citizens?

In recent years, the municipality of Rotterdam has been working on the realisation of more than 20 additional hectares of green space. They did this by working together with developers and companies, and by adding more green to the areas that are in possession of the municipality itself. Green space was added in public areas, on roofs, through green or blue schoolyards, street green, and green space around shops and companies. (Gemeente Rotterdam, 2022)

Furthermore, they provide an infrastructure for citizens to participate in the greening of the city. By for instance introducing a so called ‘zelfbeheer’-policy (loosely translated to ‘self-management’), in which the municipality provides subsidy and information to citizens who are interested in taking on the management of areas originally maintained by the municipality, or in adding green elements to the street or neighbourhood (Zelfbeheer, n.d.). *Opzoomermee* is an organisation that works as an intermediary between the municipality and its citizens by implementing the policies and granting subsidizing the citizens. They also provide information and tips on how to set up an initiative (Opzoomermee, n.d.).

Two examples of organised actions from the citizens are Het Hefpark (Hefpark, n.d.) and Het Essenburgpark (Essenburgpark, n.d.).

Figure 2 - Het Hefpark

Figure 3 - Het Essenburgpark

To support biodiversity in the city, according to Harry Boeschoten, green should be designed as an infrastructure for plants and animals. They require to be able to get from green area to green area the same way cars need to be able to move from one parking place to another. (Boeschoten, H., 2021) Even the addition of green through small initiatives contributes to this infrastructure.

Besides these bigger initiatives, there are many smal initiatives in which little elements of green are added where possible, through for instance *planters (bloempotten of -bakken), facade gardens (voorgeveltuintjes)* and *tree bases (boomspiegels)*.

Figure 4 - Green additions to an otherwise grey street.

Figure 5 - A tree base planted by citizens.

Small or big, all initiatives together add a significant amount of green, and contribute to the green infrastructure in the urban area, and thus to climate-challenges. (Lahr et al., 2014) (Aram et al., 2019)

However, the level of contribution is dependent on the interpretation of that green area. There are certain actions that the creators can take that have more value in this regard than others. Some examples to illustrate this:

- Harry Boeschoten mentions the importance of using flora that fits the local context, versus flowers that appeal to people. The Hortensia Annabelle, for instance, looks appealing but have little value to butterflies and bees as the plant does not provide any nectar. (Boeschoten, H., 2021)

- Food forests are designed in a layered structure to allow for many insects, reptiles, amphibians and mammals to thrive. They make use of the organic waste that comes from the vegetation as a surface layer to support the microscopic soil life. *Blooming arcs* (bloeibogen) are introducced, to ensure that there is nectar for the insects throughout the year. The rich vegetation of a food forest allows for a variety of predators to live together in harmony, keeping pests in balance. (Buiter, 2017; Buiter & Derksen, 2017)

- Tiny forests are areas of vegetation in which a planting strategy is used in order to stimulate a quick devolopment of a matured forest. A natural climax-vegetation is simulated, to accelerate the achievement of a high biodiverse and balanced ecosystem. A high variety of tree species is used (more then 25 different species) which are densely populated (on an area as big as a tennis field). The high variety of tree species ensures the support of a wide variety of insects and other animals, while also making the forest more resilient to diseases and plagues (Tiny Forest, n.d.).

- The inclusion of beforementioned *wadis* and drainage systems improve the water absorption of a design. (Dirven-van Breemen et al., 2011).

The municipality of Rotterdam mentions the aim to realise more ecological qualitative green (Gemeente Rotterdam, 2022), but they do not yet provide a solid structure that helps the citizens to contribute in this. The quality of their green is therefore dependent on the creators' interpretation. The main research question of this project is:

How can the actions of green pioneers be optimized as to realize their potential contribution in addressing local climate challenges.

Summary

The pressing problems around biodiversity and climate change at city-level are increasingly prominent.

Urban vegetation has the potential to mitigate these problems.

People in various levels of society value adding green to the city. Including citizens, who take action by adding green to their direct living environment where possible.

As citizen initiatives are very promising ways to add vegetation to a crammed urban area, the citizens who are involved in them are in a unique position to contribute to the mitigation of beforementioned climate related problems.

However, if this potential is utilised is dependant on the interpretation, the actions the creators take. An opportunity lies in:

Optimizing the actions of green pioneers in order to improve their contribution in addressing the local climate challenges.

CHAPTER 2
PROJECT SET-UP (INTERSECTION)

Now that the context and the intention of the project are clear, the exact aim of the proejct will be further defined and specified in section 1.1 'Project Aim'. Furthermore, a description of the approach that is used to get from the initial aim to a final design during the whole of the project, is provided in section 1.2 'Project approach'.

PROJECT AIM 2.1

Initial Design Goal

To start the process of research and design, first, the opportunity as described in the previous chapter is translated into a design goal. This is a statement that clearly communicates what the final design should offer people, whilst keeping open what the design will be exactly (Boeijen et al., 2013). To make the statement as clear as possible, three subjects are included:

For whom will the design be created?
The green pioneers of the city, so the citizens who are involved in green neighbourhood initiatives in Rotterdam.

What effect should the design evoke?
Stimulate the green pioneers to unlock their potential and improve their contribution to the local climate challenges.

How should the design reach this effect?
The answer to this question will lay in the final design, but based on the context information, we can already state in the design goal that it will need to somehow intervene in the actions they take within their initiative.

To support the citizens who are actively involved in green neighbourhood initiatives in their actions to make a larger contribution to the climate challenges in their local context.

Figure 6 - Initial Design Goal

Knowledge gaps

From the examples described in the context, we know that green pioneers could be adding green elements or areas to their neighbourhood, or that they could be transforming an existing green area. They presumably start up a project together with their neighbours or join an existing initiative. And their projects can be at the starting phase or further developed. But many things are still unknown; who are these green pioneers exactly? What do they do exactly? How do they do it? And why? To be able to come to a fitting design, these are questions that need to be answered during this project.

The contribution to climate challenges need to be specified to the citizen initiatives; In which challenges can they contribute?

We know very little about their current actions, or what do they currently contribute to the climate challenges. We have seen some examples of which actions would improve the contribution of a green area, but what else is possible?

Project Scope
Some boundaries of the project are defined:

The green pioneers that will be focussed on are green self-management projects in Rotterdam.

The climate challenges that will have the focus in this project are the ones that are known to be influenced by green areas in the city. These are:

- The mitigation of climate change
- The mitigation of the effect of climate change on the local urban context (climate adaptation)
- The mitigation of the local biodiversity-decline.

PROJECT APPROACH 2.2

This project consists of three distinct phases: A research phase, an ideation phase and an evaluation phase. The process is visualised in figure 7, and further explained below.

Research

As pointed out briefly in the previous paragraph, to be able to design a concept that would stimulate the people of green urban initiatives to unlock their potential and improve their contribution to the local climate challenges, many questions about these people and their possible contribution need to be answered. These questions will be answered during a phase of research, consisting of two parts with a different focus;

Understanding the initiatives

The first step is to get a better view on who the green pioneers of Rotterdam are, the motivations they have and the actions they take. Secondly, an idea needs to be formed on which climate-challenges these citizens specifically can contribute in and how this contribution can be improved. The research consists of various explorations on these different topics. Insights from these explorations were used to formulate requirements for the final concept. The explorations also resulted in a focus point within the design goal regarding the contribution improvement, that allowed for a specification of the initial design goal.

Understanding the contribution improvement

The found contribution improvement is further explored in a second exploration phase, to find out what it entails and what it means to make this improvement for the green pioneers. Insights on how the target group could be stimulated to make this improvement were used to formulate four solution spaces, which are assets that can be used in one concept to achieve the intended effect from the design goal. New requirements that evolved from the research were added to the list of requirements.

Ideation

The new insights and solution spaces allow for a definitive specification of the design goal, which, together with the solution spaces and the list of requirements, form the basis of the ideation phase. In this phase, multiple design activities are executed, which result in a concept of a toolkit.

Evaluation

In the final phase, the concept of the toolkit is evaluated on feasibility and on if the intended effect is achieved. This results in a list of recommendations.

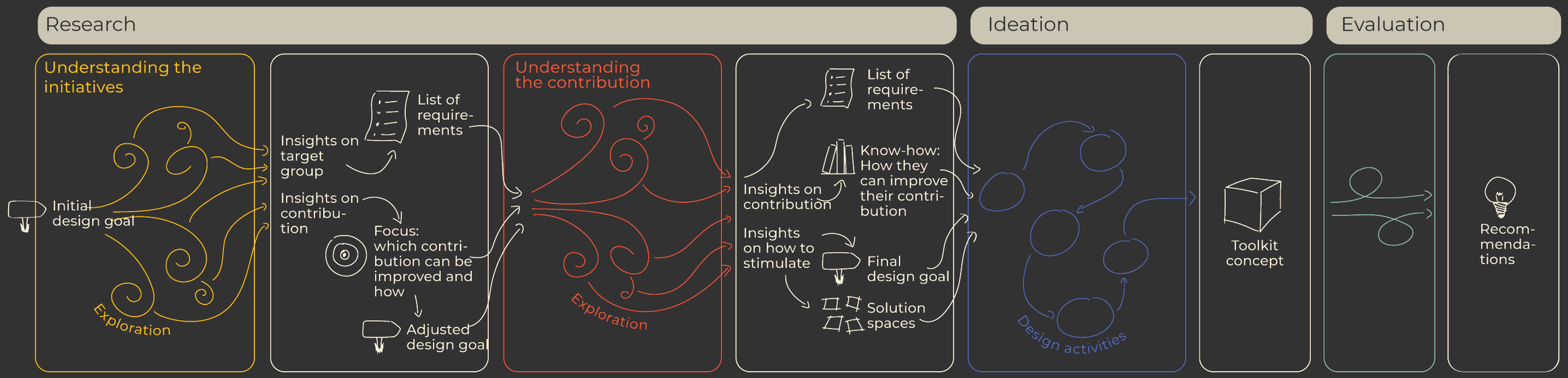


Figure 7 - project approach

Report structure

Figure 8 shows the build-up of this report. Chapter 3, 5, 7 and 9 separately cover the activities and results of each of the phases. The chapters 2, 4, 6 and 8 present the intersections in the course of the process, that contain design decisions, requirements and goal-adaptations that shaped the process.

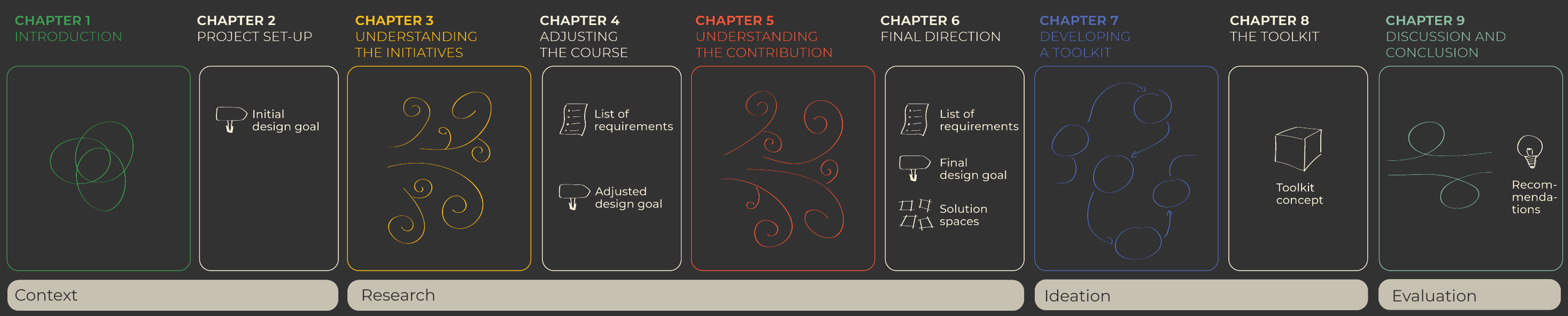


Figure 8 - Structure of the report

CHAPTER 3
UNDERSTANDING THE INITIATIVES

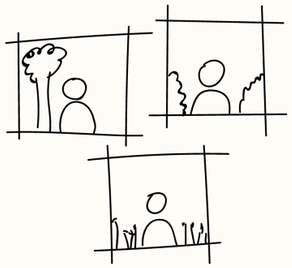
This chapter describes the explorations that were conducted to get a better understanding of the following topics: 1) the target group, 2) their intentions and 3) their possible contribution. The chapter opens with an overview of the exploration activities that were used in section 3.1 'Methods'. The results of the explorations are divided over the three, each described in a separate section. The insights from the explorations are summarized in section 3.5 'Summary'.

METHODS

Below follows an overview and explanations of the different research activities that were conducted to get to know the green pioneers, their intentions and their possible contribution.

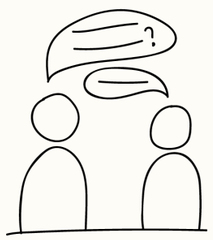
3.1

Some activities lead to insights on multiple topics. Each section of this chapter will display a box in which is shown which of the methods lead to insights on the topic of discussion in that section.



Case studies

To get a better image of who green pioneers are, their approach and their motivations, I found it relevant to get some first-hand insights from green pioneers themselves. Therefore, I conducted case studies on three green self-maintenance projects in Rotterdam. These contained interviews with the initiators, combined with guided tours of the green area they created, or creative methods on their experience. For a full explanation of the approach and the acquired data and transcripts, see Appendix B.

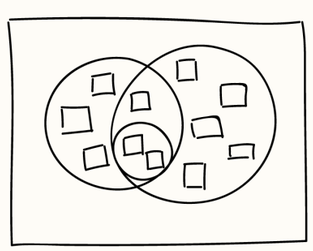


Expert interviews

As the case studies resulted in in-depth knowledge, but only on a select amount of people, other methods were used to get more general knowledge. I chose to conduct semi-structured interviews with people that have worked with green pioneers, because they would have observed different motivations and had formed a perspective on their attitude towards climate-related challenges. For summaries of the interviews and descriptions of the interviewees, see Appendix C.

Secondary research

Literature and online resources were consulted to get a more concrete view on the boundaries of the initiatives in Rotterdam and the variety of projects that are happening/can happen in Rotterdam. It also allowed for gathering more general knowledge on the motivations of green pioneers and their relationship to climate-related challenges as stated by literature.



Action analysis

To get a more concrete idea of the contribution that can be made by citizen initiatives specifically, I explored resources that presented possible actions that could be taken in the urban environment. Actions were selected that could be taken within self-maintenance initiatives and they were analysed on the type of climate-challenge they relate to. See Appendix D for a description of the resources and found actions.

Methods that lead to insights in this section

WHO ARE THE GREEN PIONEERS OF ROTTERDAM? 3.2

In this section, green initiatives are explored and researched from different angles, to find answers to the unknowns. Like what kind of initiatives are there? How does the support structure of Rotterdam exactly work? What does the process of setting up an initiative look like? And who are involved and what are the dynamics between them? All of these questions are summarized through the following research questions.

1.1 What do green citizen initiatives entail?

1.2 Who are involved and what are the dynamics between them?

1.3 What is their approach?

Supportive structure of the municipality

To get a clearer view on how the municipality of Rotterdam currently supports their citizens in participating in greening the city, the website of the municipality is explored. This gives an idea of the information and inspiration that citizens who want to make Rotterdam greener will have access to as provided by the municipality, and the rules that apply to them.

Below follows an overview of the kind of initiatives that count as self-maintenance as presented by the website of the municipality.

Facade gardens (geveltuinen) are described as a strip of plants in front of the house, as an alternative for front gardens. The website provides a video with a step-by-step instruction on how to make one and online flyers with lists of plants that can be used. There are a few rules that apply to the creation of façade gardens; a minimum width of 1,8m of pavement should remain, and a maximum of 1,5 of pavement tiles is allowed to be removed to create the strip. (Geveltuinen, n.d.)

Figure 9 - Facade garden

Then there is the adoption of a **tree base** (boomspiegel). A tree base is the surface around the stem of a tree, which is remained unpaved in order for rain to reach the roots of the tree. The main restriction in planting these is that the tree roots are not to be damaged, fencing the area is therefore not allowed and using deep-rooting plants should be avoided. The website gives some options for suitable plants to chose, and some tips for maintenance. (Boomspiegel Beplanten, n.d.)

"Fertilize the tree base occasionally with natural fertilizer. Remove dead flowers from the branches. This promotes growth. You should not use chemical pesticides. Nor does the municipality.

Do not rigorously clean up dead plant parts in the fall. Beneficial insects, such as ladybugs that feed on aphids, hibernate in dead plant parts." – (Boomspiegel Beplanten, n.d.).

Figure 13 - Tree base

Another option is the adoption of **planters** (plantenschalen). The management of planters that are already on the street can be taken over by citizens, or they can request the municipality to place a planter, and then be planted and maintained to their own wishes.

Figure 10 - Planters provided by the municipality

Undeveloped land (braakliggende grond) and **courtyard gardens** (binnentuinen) are allowed to be taken over by citizens. These kind of larger pieces of land could be used to create **city parks** (stadsparkjes) or **allotments** (moestuintjes).

Figure 11 - City park

Figure 12 - Allotments

Other elements that were found in examples of existing initiatives on the websites [bron], were **green roofs** (groene daken), **flowerpots** (bloempotten), **pocket parks** (groenvakken) and **roadsides** (bermen).

Figure 14 - Green roofs

Figure 15 - Flower pots

Figure 16 - Pocket parks

Figure 17 - Roadsites

Process of applying

According to the website, in most cases citizens need to ask for approval from the municipality before they are allowed to take-up a green initiative. Figure 18 illustrates the process an initiator will go through.

The approval can be requested via a website. The information that is needed for this is the address of the location, the number of the people who are involved, which can be one to five people, the names and the addresses of the people who are involved and a description of the initiative itself.

The neighbourhood director (wijkregiseur) will then get into contact with the initiator to discuss the initiative. Neighbourhood directors are municipal employees who are responsible for the public area of one or multiple neighbourhoods.

For façade gardens and tree bases, there is no approval needed. For tree bases, the initiator just has to report this through the same route as when applying for approval, so the maintenance of the tree base can get transferred from the landscape contractor (hovenier) who is in charge of maintaining the green spaces in that area, to the initiator.

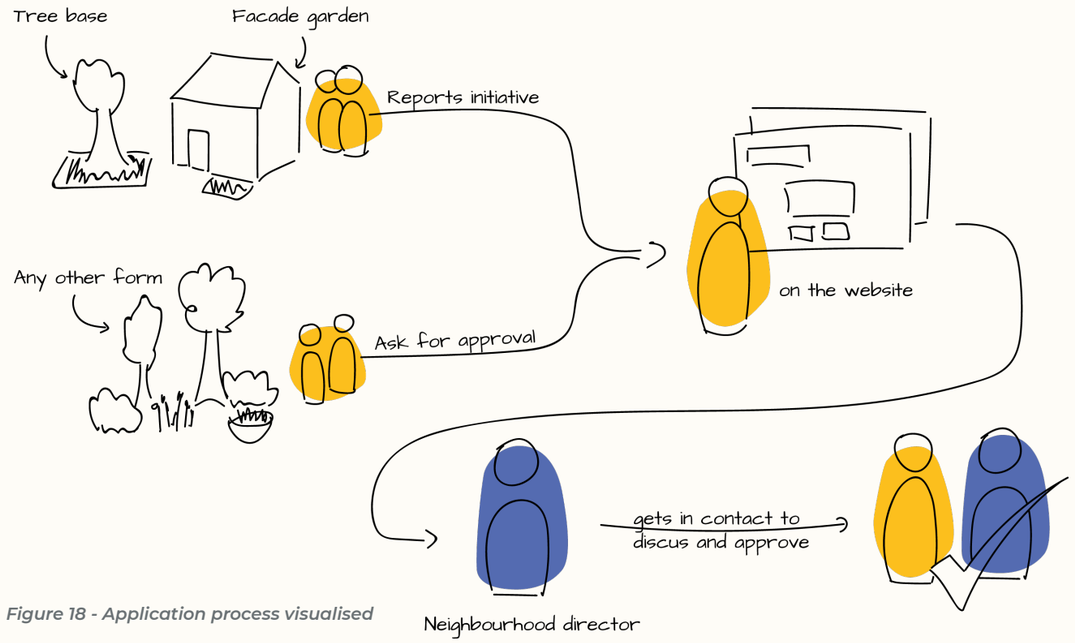


Figure 18 - Application process visualised

Because registration sometimes takes some time, initiators can request a sign that shows the contractor that this piece of land is maintained by citizens.

Figure 19 - Selfmaintenance sign

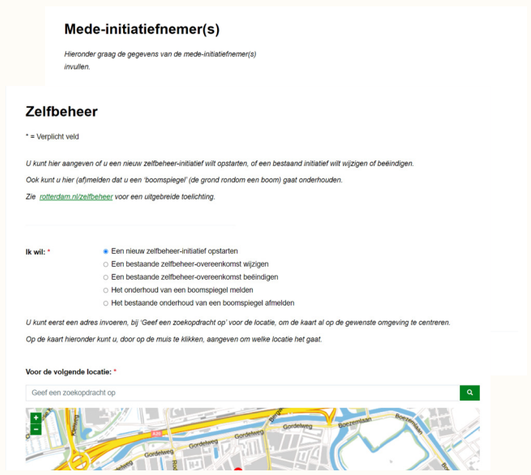


Figure 20 - Online application form for approval or to report an initiative

Subsidies of less then 10.000 euros can be requested through Opzoomermee, a foundation that is concerned with the implementation of the policies of the municipality. A form must be filled in with an explanation of the initiative and the vision behind it, a budget, the names, addresses and signatures of 5 residents and a foundation or association to whom the money can be transferred (see figure 21). This can be an existing local association that is unrelated to the project and has to do with the fact that only a legal entity is allowed to receive the payment. Opzoomermee does the payment, but the district council (de wijkraad), which consists of a group of volunteers who are residents of the area and acts as a link between residents and municipality, decides if the initiative will be allowed to receive the subsidy. The subsidy can be used 6 weeks after the permission has been granted. (see figure 22)(Opzoomermee, n.d.)

It appears that it is possible to start an initiative individually and it is not necessary to take up the task together with neighbours. However, when applying for subsidy, signatures of four other neighbours are needed.

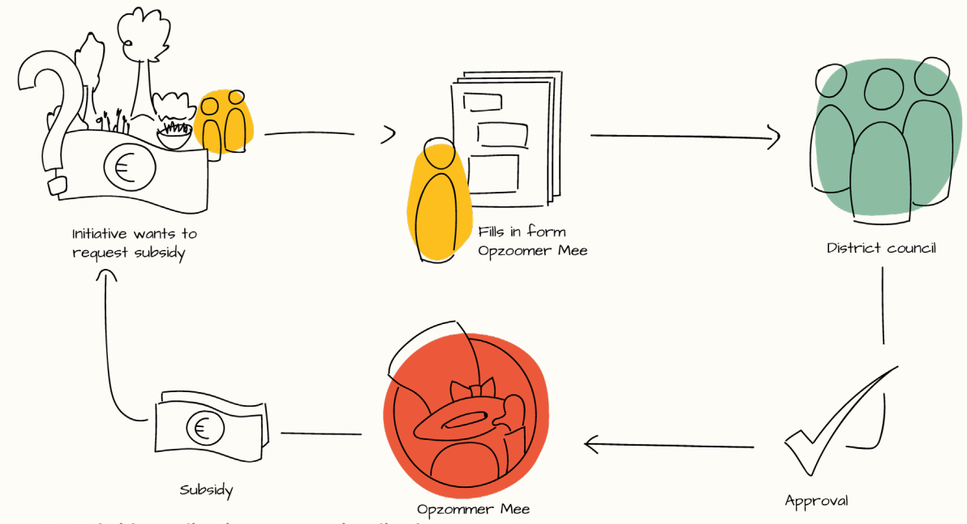


Figure 22 - Subsidy application process visualised

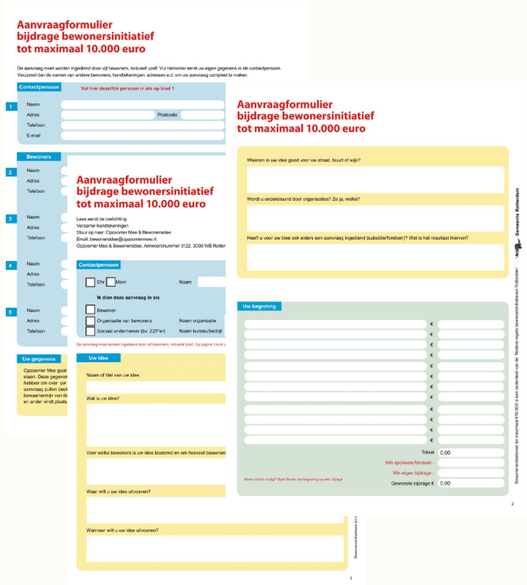
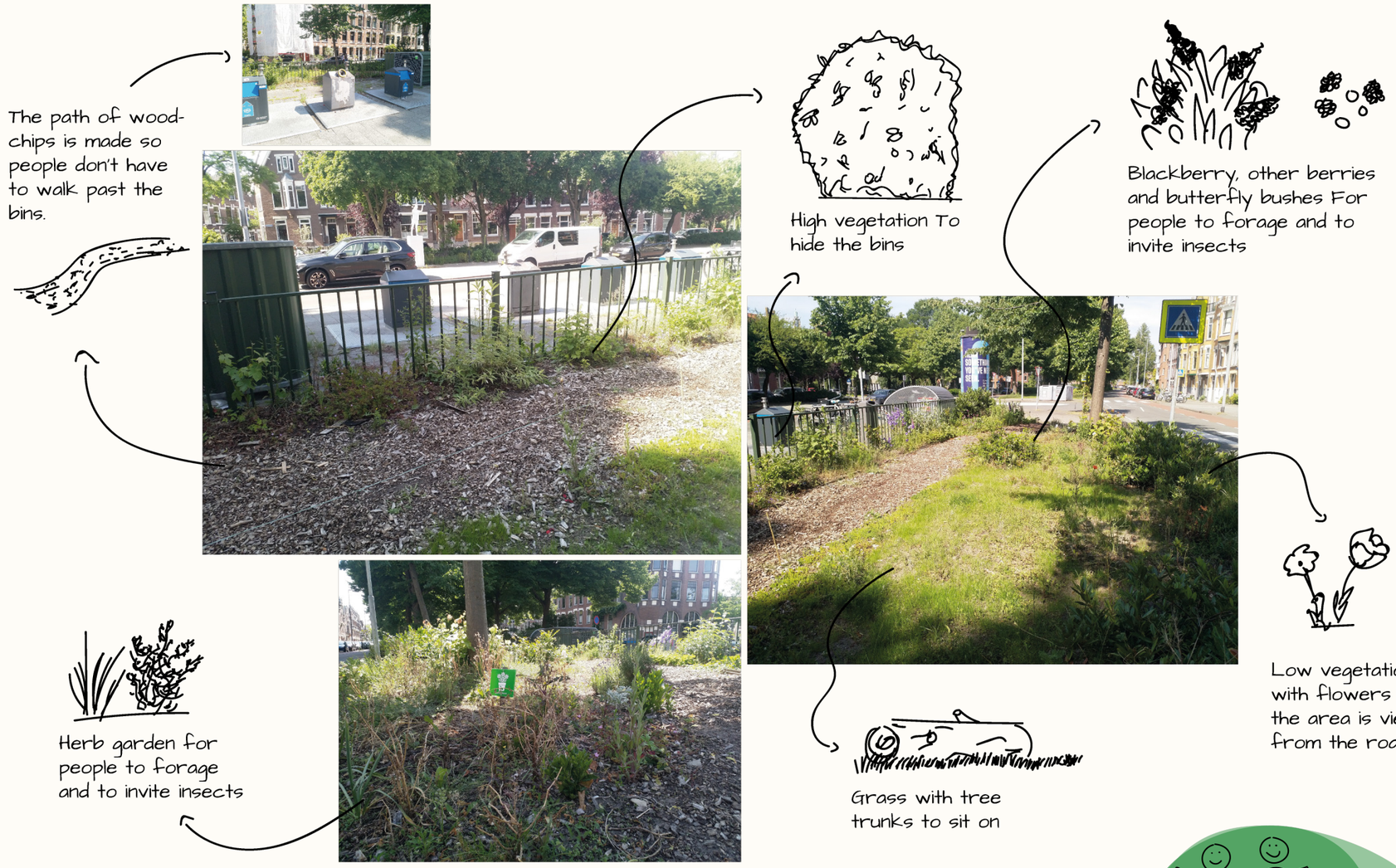


Figure 21 - Application form to apply for subsidy, provided by Opzoomermee

Now we know a little bit more about the structure that is set-up by the municipality. But what do the initiatives that are submitted by the citizens look like in reality? And who are the people behind them? On the following pages will follow three examples of existing citizen initiatives in Rotterdam that were visited and researched during this project. For this project they are given the anonymous names: De Groene Berm, Straatgroen and De Echte Heemtuin.

Figure 23 - Images of De Groene Berm, with descriptions of the elements that are planned or already incorporated in the initiative.



Initiative example 1

De Groene Berm

De Groene Berm is a citizen initiative in the Liskwartier in Rotterdam. It evolves around the transformation of a roadside green space of about 125 m2 that is located in between two busy streets. The trigger that started this project was a mutual frustration about the unpleasant sight of garbage bins. They are currently working on the realisation of their plans.

People involved and dynamics between them

The Bergse Berm-initiative is mostly lead by two enthusiasts, one of them delivering a lot of creative input and the other brings in structure and documentation. Then there are a few people who are less involved but occasionally help out in the Bergse Berm or are present at some of the meetings. Everyone adds their own expertises, like knowledge on plants, experience in gardening, actual gardening tools to work with, know-how on creating a feasible budget, skills in organisation, connections with people and organisations, or awareness of the available funds or subsidies and through which channels to tap into them. Other people who are not directly involved, are the neighbours. Some of which have approached the group while they where working, and all proved to be pleased by the project. (see figure 24)

Their approach

During the planning and the design of De Groene Berm, the people who are involved held regular meetings in which they discussed their plans and visions. They designed the green space step-by-step. Starting with a brainstorm with lots of different ideas. After this, a map was drawn to visualize the different plant-heights and -categories, accompanied by a, what the initiator called 'project-plan', that was required to apply for subsidy. This contained a brief description of their vision and framework conditions, like "it should be safe for children", or "no poisonous plants". They are currently working on a spreadsheet for the borders they are going to create, containing the amount of which exact species of plants they will buy and for what cost, also providing information on when they should be planted and their required maintenance. The website of Intratuin is consulted for this. Next to this theoretical approach are the actual gardening activities, which they mostly do together, but sometimes individually.

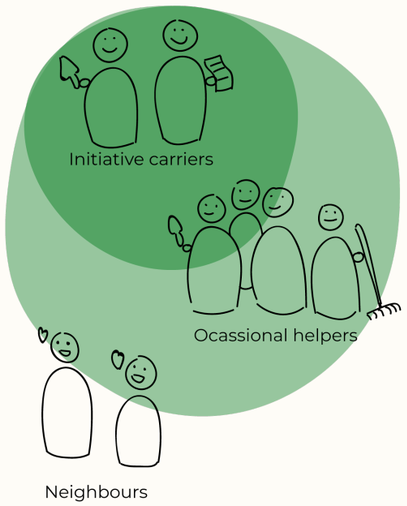
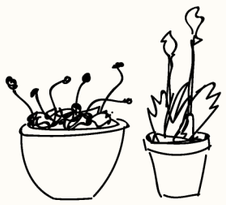


Figure 24 - People involved in De Groene Berm

Figure 26 - Images of Straatgroen, with descriptions of the elements that are or have been ncorporated in the initiative.

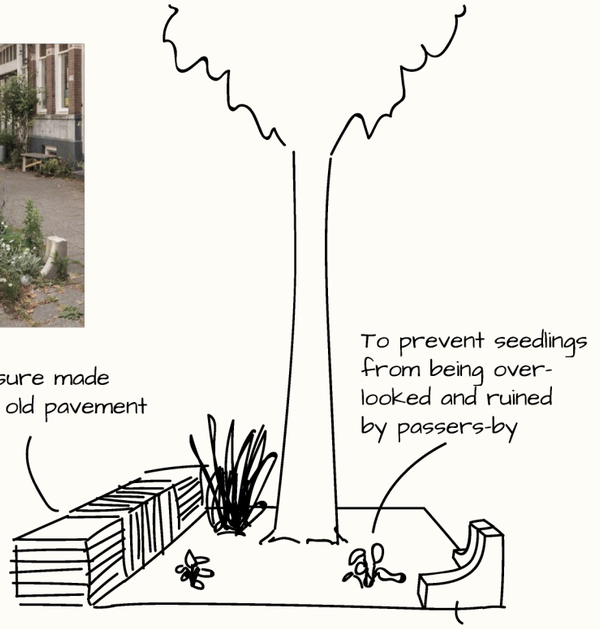
Pockets



Plant pots

Enclosure made from old pavement tiles

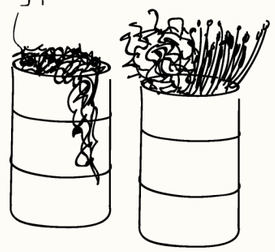
To prevent seedlings from being over-looked and ruined by passers-by



Tree bases

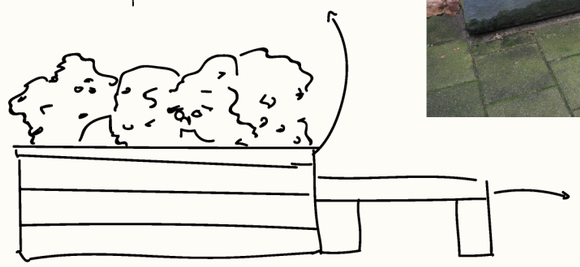
The old tree tiles are used to indicate the corners

No nuisance of dog poo



The first elements: Oil barrels with plants

Later made more durable with recy-cled compressed plastic



Benches were later removed because the wood started to rot

Wooden planters and structures

Initiative example 2

Straatgroen

Straatgroen is an initiative in Delftshaven that started a few years ago and has been evolving over time. It consists of the addition of green elements like planters, façade gardens (voorgeveltuintjes) and green tree bases (boomspiegels) to the street. It evolved from a wish to have more green in the neighbourhood.

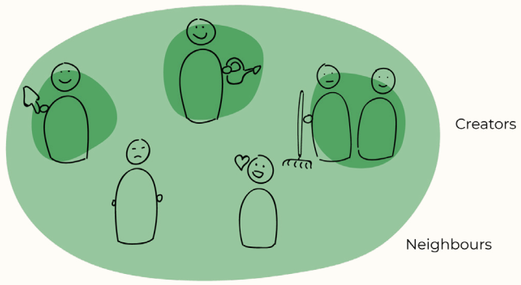


Figure 25 - People involved in Straatgroen

People involved and dynamics between them

This project was started individually by the initiator, who had the wish to live in a greener street and took action. When she added green elements to the street, some of her neighbours got enthusiastic about the results and got in contact with her. She helped them to get started on adding their own green elements. This means that the project works as a cooperative collage of green elements that together create a green street. The responsibility over the different elements is divided over the people who are actively involved (see figure 25). People are therefore free to express their own creativity and attend to their own preferences. Because some elements are placed in front of the houses, windows or doors of other inhabitants of the street, the opinion of these people are taken into account. And as there are quite many inhabitants in the street, there are many different opinions that come at play. These can be positive or negative. An example of this is how one of the inhabitants' dislikes green in general because she is afraid that it will attract rats. This caused the initiator to remove one of the planters that she placed near her door. Another example is how a neighbour kept removing the plants that were placed next to his door by the initiator when they died off in autumn, because he didn't understand that they would grow back the next spring. Then there are the people who just pass by the street and either enjoy the view or not. There have been some cases of vandalism like people who stole plants, which is why they stopped adding planters on a certain corner of the street.

Their approach

As the Straatgroen-initiative consists of independent elements, the project allows for a much less theoretical an a much more hands-on approach. There seemed to be no design phase involved, in which the vision or ideas for the initiative is first drawn on paper. Plants are planted and changes are made when needed. People work individually in their part of the street, but they also have community gardening and cleaning moments, and they organise social gat-to-gathers in the street.

Initiative example 3

De Echte Heemtuin

De Echte Heemtuin is an initiative in Reyeroord that is currently in the starting phase. In this initiative, a piece of land that is part of a public park is taken over by a citizen. She also made an insect hotel in another part of the park. The park used to be a wildlife garden (heemtuin) with educational elements, but the initiator of this project was frustrated about the fact that there is currently little ecological value in the park and started this project to bring back the wildlife.

People involved and dynamics between them

The Echte Heemtuin-initiative is currently carried by one person (see figure 27). She came up with the idea to take over a part of the park to plant native plants and bring back the ecological value after she joined a citizen participation project called Lab Reyeroord. The aim was to realise her idea together with other neighbours. The municipality supported her by organising a gathering to invite neighbours to join the initiative, but this didn't bear fruit. So, she started this project alone, but kept communicating with the municipality.
As she started seeding, maintaining and building an insect hotel, many people who passed through the park started to get interested and to share their opinions with her. This led her to get in contact with two people who were interested in helping out. They lend a hand when needed but the ideas, the plans and the initiative to take action still come from the initiator.

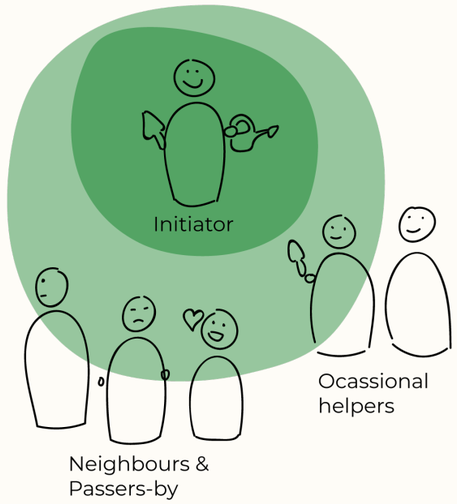


Figure 27 - People involved in De Echte Heemtuin

Figure 28 - Images of De Echte Heemtuin with descriptions of the elements and how they evolved.

Their approach

The initiator of this project had a very clear vision from the start. To be able to realise this vision she had to become acquainted with what it means to take over a public area from the municipality, and with the practicalities of gardening with native flora. Her relationship with the people from the municipality gave her enough confidence and information to be able to initiate the project and receive a green light from the municipality. To get to know how to work with native flora, she quickly applied for a course at FLORON, and did a lot of research on her own by studying different resources.

She received seeds from the municipality and created a wildflower-pocket. Her research gave her the idea to design an insect hotel herself, which is quite unique as it is made from sand instead of hollow tubes. This hotel is now in process. When the flowers had overblown, she made plans for more fixed vegetation and bulbs, which is an idea that is based on the opinions she received from passers-by. This resulted in the creation of multiple wooden planters with each different combinations of plants. At some point she would like to add educational elements.

Comparing the examples

The first thing to notice is that a green urban initiative always involves practical activities, and that therefore their initiators are very pro-active and creative citizens.

In every initiative, a few key moments can be observed (see figure 29). Firstly, there is a trigger; a contextual factor that causes frustration or discontent. Secondly, there is the idea of the initiative. Then there is a phase of setting up the initiative. This contains either a more theoretical approach of planning and doing research, or just coming up with ideas and mentally envisioning. Then there is the actual building and planting. A component that can be part of this phase is to apply for subsidy. Lastly, there is the phase of maintenance, which they tend to individually or in group activities.

Approaches were very different. A theoretical approach could be seen in two of the cases, in which plans are made on paper and research is done about certain topics where knowledge is lacking. Hands-on activity is always part of it, so most green pioneers will contain a practical side.

A few general distinctions can be made in the relations that people have towards the initiatives. There are the carriers of an initiative, who come up with ideas and get things running. Then there can be a rearguard, like in De Groene Berm-initiative, with people who help out occasionally. Then there are the neighbours, who are more involved in the initiative in the Straatgroen-initiative as it plays out very close to their homes. And lastly there are the passers-by, which can have an influence on the initiators by sharing their negative and positive opinions, and in the case of the Straatgroen-initiative even take part in vandalism. All initiators of these examples, seemed to care for the opinion of others, and adjust their actions accordingly. This could end-up in removing or replacing elements, but also in getting new ideas to make future plans.

In all three cases, the people involved seemed to be very capable to bring their initiative to a success. They would own or actively dive into acquiring the required skills, knowledge or resources.
Keeping all of this in mind can guide the design to align with their capabilities, the variance in their ways of approaching the set up and maintenance of an initiative, and the different relations people can have towards an initiative.

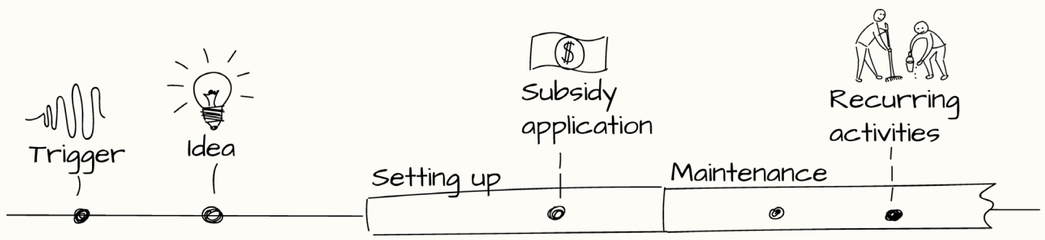


Figure 29 - Key moments observed in each initiative

Summary of section insights
WHO ARE THE GREEN PIONEERS OF ROTTERDAM?

There are a lot of varying factors that make-up an initiative. Seeing these differences in reality helped to get a better view on who the green pioneers of Rotterdam. Awareness of these factors will help to align the design to the people who are going to use them. Differences that were found:

- A green urban initiative can take many forms, from adding just a few elements to the street to managing complete pieces of land.
- There can be a varying amount of people who are carrying the initiative, from the individual to a group of people.
- Ownership of the initiative can be divided over separate elements as in the Straatgroen-initiative, or the initiative can be collectively owned as in the Groene Berm-initiative.
- Green pioneers can have a more theoretical approach or more hands-on.

Other things that should be considered when designing something for green pioneers is that they should be regarded as pro-active and creative people, and supporting them means that this support needs to align to these capabilities.

Furthermore, the influence of neighbours and passers-by on the initiatives and the other way around should be considered. When designing something to support green pioneers, it won't be sufficient to think of the initiatives without taking the context into account.

THEIR INTENTIONS 3.3

Why do some citizens concern themselves with making their neighbourhood greener? In the initiative-examples we saw three different triggers that stimulated the initiators to start their green initiative, but could there be other stimulating factors at play? Let's dive a little deeper in the reason why green pioneers commit themselves to greening the urban environment, and to find out if any of these reasons have to do anything with contributing to climate-challenges. The research questions that are answered in this section are:

2.1 Why do the people in these initiatives start or join the initiative? What is their motivation?

2.2 To what extent do they engage with biodiversity, climate adaptation and climate mitigation? In what way is this present in their motivation?

Secondary research, expert interviews and the case studies lead to insights on these questions.

Why do people start or join an initiative?

According to an article on how the public gets involved in nature-related initiatives (Buijs et al., 2019) motivations to do so can vary. For instance, there are certain factors that people can gain from starting an initiative which can act as motivators, like personal development, a sense of purpose and social interaction. Other motivations can derive from a dedication to a community, like a neighbourhood, church or sports club. Another motivation that is mentioned is the wish to protect nature, together with passing on knowledge and enthusiasm about nature to others.

To illustrate how these motivations can come at play in reality, let's have a look at the example initiatives of section 3.2. A value for social interaction and community was clearly present in for instance the Groene Berm-initiative, as one of the initiators mentioned that her favourite activities are the meetings with her neighbours and especially the moments when they work together in de Groene Berm, as they sometimes evolved into other social events. The initiator of De Echte Heemtuin mentioned to be missing other project partners. Furthermore, she, as a member of nature association Ijselmonde, has had a personal interest in nature since before she started the initiative, and sees the wildlife garden as an opportunity to bring people from the neighbourhood in contact with nature and show them the value of plants and animals.

The article also mentions the need for a more direct trigger for people to turn these motivations into actions, like for instance a change that has been made in their living environment. Triggers can also come from a frustration about the lack of nature (protection). These kind of triggers are also mentioned by a magazine article

Methods that lead to insights in this section

from Stad + Groen, as common motives to start contributing to a greener direct living area: "The multitude of surfacing and the impoverishment of the greenery are frequently mentioned reasons to take action"(Ketner & Verbrugge, 2021, p.78). The triggers that could be seen in the example initiatives are the collective frustration about an unpleasant sight in the Groene Berm, or the wish for more green in the street where the initiator just moved to in the Straatgroen-initiative. For the initiator of De Echte Heemtuin-iniative it was the frustration about the unnatural way in which a park is managed that is supposed to be a wildlife garden, but she needed the concrete trigger of participating in Lab Reyeroord to start acting.

"There are educational signs about butterflies in this park. What butterflies?! They mow the lawn 22 times a year!"
– Initiator of De Echte Heemtuin

So most direct reasons for people to start or join an initiative are about improving the neighbourhood- or street experience, social interaction with the neighbours and an affinity with nature. In the case of De Echte Heemtuin, this affinity with nature takes shape as stimulating biodiversity. Let's have a further look into this awareness of the citizens' potential to contribute to biodiversity.

Awareness of potential contribution to biodiversity

According tot he article of Stad + Groen, the increasing awareness of people regarding climate change and the decline of biodiversity are a stimulating factor for them to take initiative. According to the experts I spoke with (see appendix C), most people are aware of the issues around biodiversity and climate change, but not everyone is aware of how they can contribute in this. For example, in the district of Reyeroord in Rotterdam, there were many people with an affection for nature, as they were for instance members of nature associations, but the awareness of what they could do to help nature themselves and close to home, is quite low.

This can also be recognized in De Groene Berm. Their initial drive to start the transformation was to cover an unpleasant sight, but by starting a brainstorm together on the possibilities, they got aware of the positive impact they could make on their neighbourhood, regarding people ànd nature. This shows that the motivation was there, but the means came later. Examples of ideas were to add plants that are interesting for pollinators, creating compost, adding a pond which would add an additional biotope to benefit varied species, or adding educational signs near the plants to educate children in the neighbourhood. Not all these ideas made the cut to the final concept, but they might be revised in a later stage of the process. The pond was not chosen as it was experienced as too big of a challenge, so in this case, they got aware of what they could do to contribute, but they were not sure how to execute it.

The initiator of the Echte Heemtuin wanted to concretely contribute something to biodiversity for a longer time, and when she participated in Lab Reyeroord, she realised that she could do something close to home. She says that their living environment is already quite green, but it can be improved. Befor she knew how to take actions within her initative to improve biodiversity, she did a lot of research on how to plant and maintain purely native plants and how to create an insect hotel.

The awareness about how to contribute to biodiversity can also vary within the group of people who are involved within the same initiative. One of the experts explained how different people who are involved within the same project can disagree in performing actions. For instance, when two people decide on the design and maintenance of a façade garden where one of them wants it to look neat and organised, but the other one is aware of the value of providing room for natural processes. In the Straatgroen-initiative, a motivation to contribute to biodiversity was not so much present in the story of the initiator, but she did mention how one of the other actively involved neighbours were working on creating a pocket with only native plants.

Contributing to climate mitigation & adaptation

Except for the mention to create a pond for the added benefit of water-containment in De Groene Berm, a motivation of contributing to climate mitigation and adaptation was not very prominent in the initiatives, nor in the articles that were studied. This might have to do with les alignment with other wishes. One of the experts pointed out that the wish for a higher biodiversity in their green spaces is sometimes formulated differently, through the effects that it can bring to their experience. For instance, more life, more movement, more colour, and therefore more to see and to experience over the entire year.

Summary of section insights
THEIR INTENTIONS

Most direct reasons for people to start or join an initiative are about improving the neighbourhood- or street experience, social interaction with the neighbours and an affinity with nature.

Most green pioneers will be willing to contribute to biodiversity, but they will not always have the right knowledge, experience or inspiration to act on it. Motivations to contribute to climate adaptation and -mitigation are not very prominent.

ACTIONS OF GREEN PIONEERS AND THEIR CONTRIBUTION TO CLIMATE-CHALLENGES 3.4

How can specific actions within a green initiative influence its contribution to the climate-challenges? We've seen some examples in the context and in the example initiatives, but what else is possible? This section will answer the following research question:

3.1 In what ways can citizens contribute to biodiversity, climate adaptation and climate mitigation through their choices and actions?

3.2 What can improve this contribution?

An action analysis, expert interviews and the case studies lead to insights on these questions.

Possible actions

Some actions through which the target group can contribute to climate-related challenges have been observed in the case studies. Like choosing plants that are interesting for pollinators, creating compost, adding a pond which would benefit water-containment and would have created an additional biotope to benefit different species, planting purely native plants and creating an insect hotel. What other options exist?

Different resources were consulted on what can be done in the urban area to contribute to biodiversity, climate-adaptation and -mitigation (see Appendix D). Elements that can be incorporated in self-management initiatives were selected as possible actions. These are presented in a diagram in figure 30, in which they are ordered in the climate-related challenges that they contribute to.

Some of the actions that were analysed, mostly contribute to climate adaptation. They evolve around water containment, which decreases the risks on floodings during heavy rainfall and has a diminishing effect on heat stress. This can be done, for instance, by disconnecting the rainwater from the sewage system so the water flows freely over the area and will get absorbed by the soil. Disconnected rainwater could also be collected by placing a rain barrel so it can be kept for later use. Lastly, the placement of a drainage system can stimulate the infiltration of large amounts of water in the soil beneath paved surfaces.

Then there are some actions that contribute mainly to biodiversity. These actions mostly include the creation of specific habitats. For instance, through the creation of green facades (groene gevels), green quay walls (groene kademuren) or ecological water banks (ecologische oevers), which are banks designed in such a way that they provide a useful environment for animals and improvement of the water quality. Other examples are the placement of hedges to support birds and small mammals, and stacks of branches or stones that allow for specific plant types and fungi to grow and support specific animal life. Placing insect hotels or birdhouses

Methods that lead to insights in this section

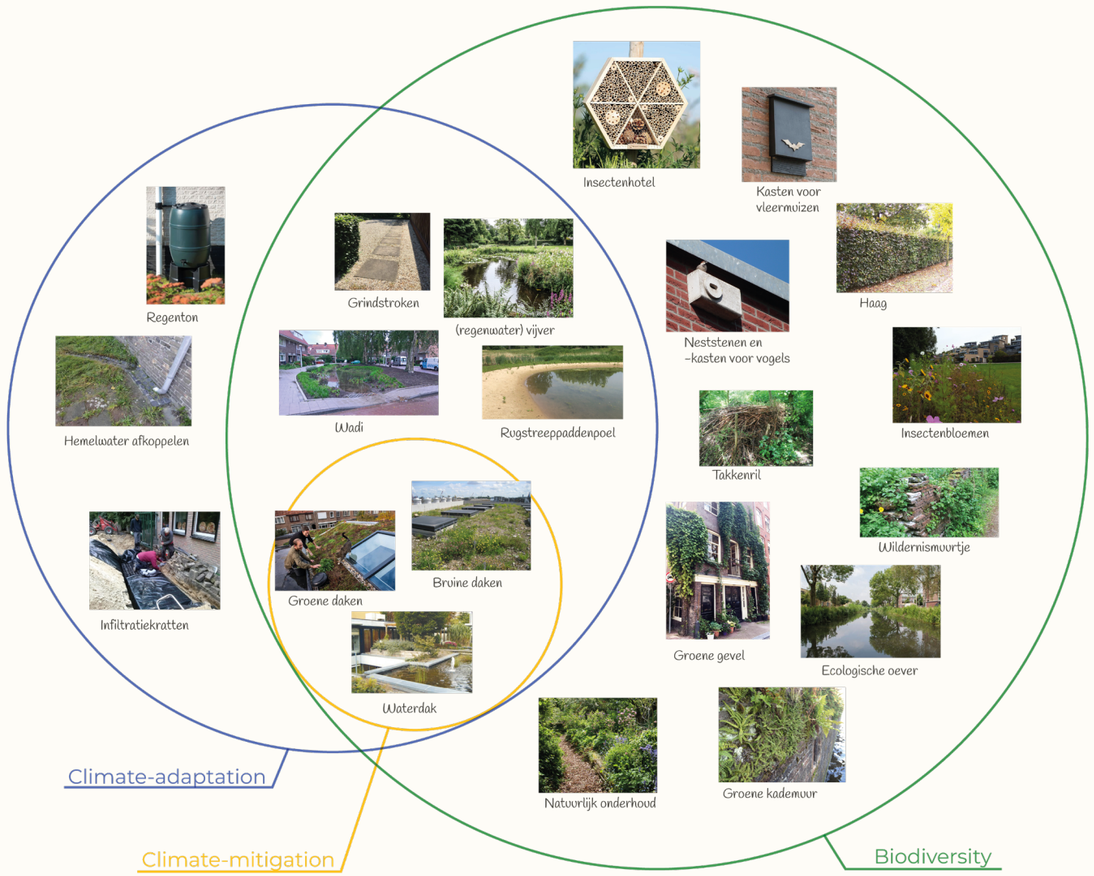


Figure 30 - Diagram with possible actions to take in an initiative and their contribution to climate challenges

provides nesting opportunities and bat boxes provide shelter bats. A last example is to perform a natural way of maintenance. This way of maintenance allows for more room for natural processes, which results in a higher biodiversity.

Others of the found actions provide contributions to both climate adaption and biodiversity, by the creation of a specific habitat through creating a water containment. Examples are the creation of a pond or a wadi. These are both pieces of land that are used to collect rainwater but also provide a specific habitat for birds, amphibia and water-dependant insects like damselflies (waterjuffers) and dragonflies (libellen). Green roofs (consisting of different kinds of plants), brown roofs (consisting mostly of sand and rock) and blue roofs (containing water) each provide different habitats and water containment. And lastly, gravel or other types of permeable pavement make sure that water can sink into the soil beneath it, which at the same time, stimulate a more natural soil life.

The greatest contribution to climate mitigation by the inclusion of green areas in the city is their ability to sequestrate and store carbon, and by positively influencing heat stress, which results in the reduction on energy demand. The only actions for which this contribution is specifically mentioned in the resources are the roofs and facedes, of which is known that they reduce the inside temperatures and thereforehave a direct influence on energy demand.

Many of the actions found are specified to contribute to biodiversity, many of the actions that contribute to climate-adaptation, also have a positive influence on biodiversity, and little information can be found on the specific contribution of actions regarding climate mitigation. Together with the fact that biodiversity is more in line with the intention of most green initiatives, from all three climate-challenges, biodiversity seems the most promising for green pioneers to contribute in.

Ecological gardening

The previously described actions can be taken, when the context of the initiatives allows for them, to improve the contribution within an initiative. As explained, most of these actions evolve around creating a specific habitat. Interesting key words that came back in one of the expert interviews and case studies were ecological and natural gardening.

As mentioned before, one of the experts mentioned that people within an initiative can have different associations with green. Someone could have a more traditional association, where the green space is in control of the human, neat and organised. This means for instance that leaves and weeds are removed, and the soil is neatly raked. Or someone could be more aware of the natural value it can bring to let things go and provide room for natural processes, which would provide a higher contribution to biodiversity. (See figure 31)

The initiator of De Echte Heemtuin also mentioned that her native plants evoke certain reactions that have to do with association. Native plants look more chaotic than the cultivated plants that

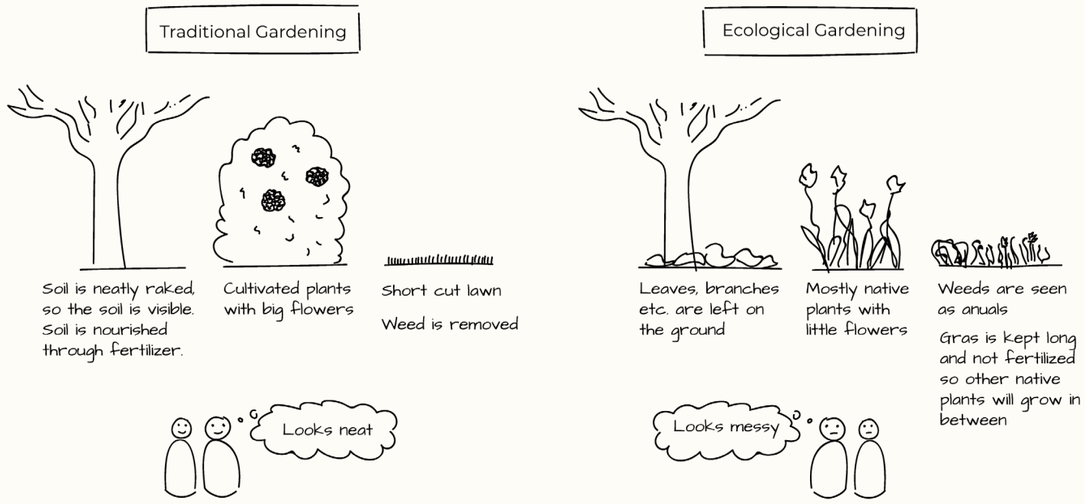


Figure 31 - Differences between traditional and ecological gardening

some people are used to, which makes them perceive the native flower pockets as uncared for. She explains that the municipality is starting to maintain the grass in a more ecological way, which means less regular mowing and more flowers and herbs to appear, but some of her neighbours detest the thistles that appear because of this.

This difference in associations has to do with if someone is aware of ecological or natural ways of gardening or not. Ecological gardening would require a different way to look at green, where letting go of control and giving more attention to observation would be important factors. In this difference in perspective lies an interesting focus point for the design, as shifting this association could help people to improve their contribution to biodiversity.

Summary of section insights
ACTIONS OF GREEN PIONEERS AND THEIR CONTRIBUTION TO CLIMATE-CHALLENGES

There are few specific actions found with which someone could contribute to climate mitigation within their green initiatives.

Many ways to contribute to climate adaptation also involve a contribution to biodiversity. Together with the fact that biodiversity improvement is more in line with the intention of most green initiatives, from all three climate-challenges, biodiversity seems the most promising for green pioneers to contribute in.

A general way in which a higher biodiversity rate can be achieved within a self-management initiative, is by gardening in an ecological way. This means to make a shift from the tendency to intervene and to control, towards giving room for natural processes. Here lies an interesting focus point for the design.

CHAPTER SUMMARY
UNDERSTANDING THE INITIATIVES

This first exploration phase resulted in a better view on who the green pioneers of Rotterdam are, the form in which an initiatives can take place, the approach they can have, their intentions and the possible contribution they could make. I will briefly summarize what I learned about these topics below.

The green pioneers of Rotterdam

Meeting three initiators gave me a better idea of the people behind the initiatives. I have found out that there is a great variety in initiative-forms, composition of people involved, the dynamics between them and how they approach their project. In contrast to the assumption that these initiatives will be led by groups of people, they also can be taken up by individuals. Group-initiatives can make decisions as a group or divide responsibilities, they can plan their actions or work with trial and error. This diversity should be considered when designing something for them that will fit their process and context. One common divider is that their initiatives are public areas and therefore they all can be confronted with the opinions or actions from neighbours and passers-by. These are interesting to consider, as they can influence the choices the initiators make. Another interesting insight is that most initiators seem to be very pro-active, creative and capable to bring their initiative to a success through taking the required actions. Keeping this autonomy in mind might be helpful when designing something to support them.

As these insights can help guide the designing phase, they are translated in design requirements in the next chapter.

Their intentions

Another common divider that I found, is the aim of most initiators to improve the experience of their neighbourhood or street with their initiative. As expected, they have affinity with green and see benefits in having plants in the direct living environment. Most of them mention petrification and decrease of nature in the direct living environment as trigger to start a green initiative. Although it is not always their main motivation, it seems that most people are likely to be willing to contribute to biodiversity but do not always have the right knowledge, experience and resources to act on it. Motivations to contribute to climate adaptation and -mitigation have not been found as very prominent within this exploration.

Their contribution

Next to that biodiversity-improvement seems to be more in line with the intentions of the citizens in green urban initiatives, it also seems to have a higher potential in tailoring actions towards it. A promising way in which the actions within an initiative improve biodiversity, is to manage a green area in an ecological way. This requires a shift from the tendency to intervene and to control (a traditional perspective), towards letting go of control and observation (an ecological perspective).

This insight gives us a new focus point within the goal for this project, which means that the design goal can be sharpened.

CHAPTER 4
ADJUSTING THE COURSE (INTERSECTION)

The previous insights allow for an specification and improvement of the initial design. This chapter explains how and why the design goal is adjusted in section 4.1. Furthermore, some of the insights were translated into requirements for the design and listed in section 4.2.

ADJUSTED DESIGN GOAL

Adjusted design goal

What effect should the design evoke?
As the most promising climate challenge for green initiatives to contribute in, seems to be the challenge of biodiversity improvement, this challenge is therefore chosen as focus for this project. The challenges of climate adaptation and mitigation are thus excluded from the design goal.

How should the design reach this effect?
A promising way in which the actions within an initiative improve biodiversity is found to be through an ecological way of gardening. The actions are therefore redefined in the design goal as an adoption of an ecological way of gardening.

For whom will the design be created?
The green pioneers who are already showing ecological gardening behaviour are not the ones for this project to focus on, as they already make a high contribution to biodiversity. To exclude these from the target group, the 'who' of the design goal is therefore specified to those who are currently performing a traditional way of gardening.

4.1

To support the citizens who are actively involved in green neighbourhood initiatives *with a traditional way of gardening* to make a larger contribution to *the local biodiversity, through adoption of an ecological way of gardening.*

Figure 32 - Adjusted Design Goal

Knowledge gaps

This new focus point introduces a few topics that need to be understood better.

Some characteristics of ecological behaviour were found in the research of the previous exploration phase, but what else does it mean to design and maintain green in an ecological way? To understand the behaviour and perspective that the target group should adopt through the support of the design, ecological gardening behaviour should be explored.

Examples of the behaviours and mind-set of people with a traditional perspective, were seen in the previous exploration phase, but to understand the shift that these people need to make, a deeper understanding of the current traditional perspectives and behaviours will be useful.

When a better understanding is found on the difference between traditional perspectives and behaviours and ecological perspectives and behaviours, a better understanding can be found on what it means to shift from one to the other, with the final goal to find out how this shift could be triggered by the design.

In chapter 5, these topics will be explored.

REQUIREMENTS 4.2

Some of the insights can be reformulated into requirements to guide the designing phase.

1. **The design should tap into the autonomy and competences of green pioneers.**

   The initiators seem proactive and creative people, who (collectively) own a considerable set of skills, knowledge, resources and confidence. This should be considered when designing something that should support them. The design should provide room for these capabilities, as well as for their own expression and creation.

2. **The design should be able to be used by the group, as well as the individual.**

   Neighbourhood initiatives can be carried out by multiple people, but by individuals as well. The design should therefore be able to be used by both.

3. **The design should support communication between the people who are actively involved.**

   In case of a group initiative, there can be different perspectives on green within this group. The interactions between them should therefore be considered.

4. **The design should assist in communication to neighbours and passers-by.**

   As neighbourhood initiatives are always public area's that anyone can visit, the opinion and behaviour of neighbours and passers-by will influence the behaviour and feelings of the people who create and maintain the area, and the other way around. The different perspectives on green (traditional or ecological) will influence this . These interactions should therefore be considered.

5. **The design should fit and be applicable in all different forms in which initiatives can take place.**

   From adding green elements to the streets to the creation and maintenance of city parks.

6. **The design should fit and be applicable in the wide variety of approaches.**

   Every initiative has their own approach and dynamics within the group. The design should therefore consider the different approaches that were seen in the exploration phase.

CHAPTER 5
UNDERSTANDING THE CONTRIBUTION

To be ready to start the concept development, the new focus point introduces a few topics that require a better understanding. This chapter describes the second exploration phase that was conducted to reach that understanding. It covers the topics: 1) traditional gardening, 2) ecological gardening, 3) what it means to shift from one to the other and 4) how this shift could be triggered through the design. Section 5.1 'Methods' will present an overview of the activities that were conducted to find insights on these topics. The topics themselves will be discussed in the subsequent sections. A summary of the insights is provided in section 5.6 'Summary'.

METHODS

Four research methods were used to achieve a better understanding of the topics that are covered in this chapter. Each section of this chapter will display which of the following methods lead to insights on the topic of discussion in that section.

Secondary Research Ecological Gardening

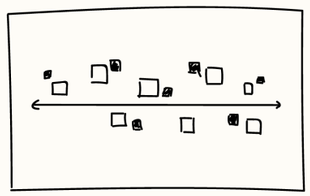
Books and online articles were analysed to reach an understanding of what ecological gardening entails. There are many resources developed for gardeners to teach them how to maintain and design a garden in an ecologically responsible way. A selection of these resources was analysed to find out what ecological gardening means, how it is done and where it comes from. For the complete approach and analysis, see Appendix G.

Observations Natural Gardening Course

To get a deeper and practical understanding of ecological gardening in real life, a three-day course on natural gardening was attended (see figure 33). This turned out to be an opportunity to observe the concerns of the participants and what challenged them to change their perspective and behaviour towards ecological gardening. Through the participants' remarks could be observed what their current focus is when designing and maintaining a garden. See appendix H for the full description.

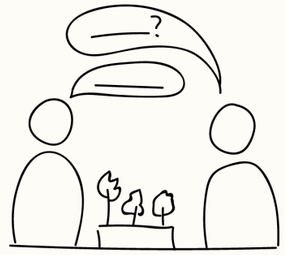
5.1

Figure 33 - Visiting an example garden during the natural gardening course



Ecological Gardening Tool Analysis

The secondary research revealed a variety of resources which act as tools to support a change towards ecological behaviour. As this project aspires to design a toolkit with the same goal, these tools were interesting to analyse. The main questions that were sought to be answered through this analysis were: 1) what tools exist and 2) what do they offer? They were analysed on the type of interaction that they offer, elements that were inspiring or that seem beneficial in changing perspective and behaviour, and their moment of use. See Appendix I for the full description of the analysis.



Conceptual Tests

Two conceptual tests were conducted to get an idea on what can trigger people's perspective and behaviour towards a more ecological one. The tests also provided valuable insights on traditional and ecological perspectives and behaviours. See the next page for further explenation.

Concept test 1: Designing a garden

The main trigger tested was the use of animal perspective. Six participants with a different knowledge on gardening were asked to design a garden by discussing a presented mood board and creating a mock-up garden with a building kit. Secondly, they were asked to read a story that was written from the perspective of a hedgehog. Finally, they were asked to analyse and possibly revise their garden. To get a better understanding on why people make certain choices and what people's perspectives are when designing a green space the participants were questioned about their choices and preferences. For a full description of the approach and the data that was gathered, see Appendix E.

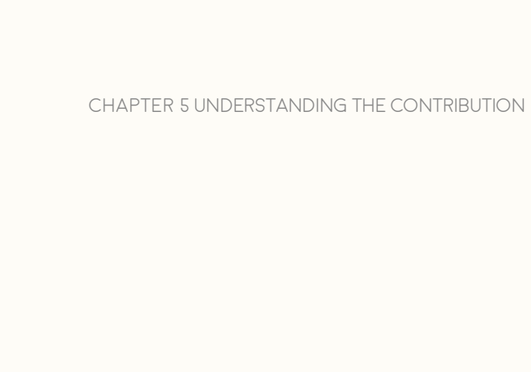


Figure 34 - Materials and set-up of concept test 1

Concept test 2: Maintaining a green space

The second conceptual test was conducted to see if showing the unexpected value of specific natural elements could trigger a change in behaviour and perspective. Four participants with different knowledge on gardening were asked to react on prompt cards that contained an event that can occur in the garden. They were asked to do this from their own perspective, but also by considering the perspective of other species for which they were provided with information cards. By discussing the participants' proposed actions, a better understanding was found on what can drive people to make certain choices and their mind-set when maintaining a green space. For a full description of the approach and the data that was gathered, see Appendix F.

Figure 35 - Materials used for concept test 2

ECOLOGICAL GARDENING 5.2

What is ecological gardening behaviour? In this section we take a deep dive into the concept of ecological gardening, the meaning of it, the awareness that comes along, and the behaviours that it encompasses. The main question that is answered in this section is:

4. What does it mean to design and maintain self-created green in an ecological way.

The meaning of ecological gardening

The resources that were used to understand the meaning of ecological gardening would either use the term ‘ecological gardening’, ‘biological gardening’, or ‘natural gardening’. Although some differences can be found, their common denominator is that they are all about constructing and maintaining a garden in a way that resembles the natural way. To clarify, the natural way refers to the way things would occur when humans would not interfere.

So what is the natural way? This can be explained best through explaining the main processes that occur in nature (Flowerdew, 2016; Gommers et al., 2014):

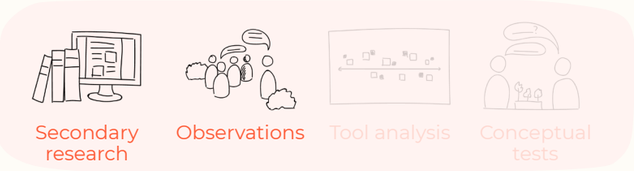
- Natural area’s go through successional stages, creating a layering of vegetation. This means a dense and rich vegetated area, which attracts a great variety of animals and other organisms, and therefore contains a rich biodiversity.

- Nature keeps itself in balance due to its rich biodiversity. When a species expands, the presence of its natural enemy, or the absence of an excessive amount of its natural food source reduces its numbers.

- Local vegetation fits its context and therefore supports the local animals and other organisms. This may seem obvious, but it is an important factor that distinguishes natural environments from areas that are influenced by humans, who introduce exotic or cultivated plants with sometimes little natural value.

- Nature is self-supportive due to its rich biodiversity. All natural elements play a role in their local ecosystem and their existence is interdependent. Thus, diversity in all life is vital. The greater the biodiversity in plants, the greater the biodiversity in animals, as different animals need different offers in food, shelter, and nesting opportunities. As plants are dependant on a healthy soil, the biodiversity in soil life plays a key-role in the support of a natural area.

Methods that lead to insights in this section



For example: a bird needs insects as a food source, while the insect eats plants. Plants need nutrition provided by soil life, while soil life needs vegetal and animal waste to produce this nutrition. This waste can in turn provided by the droppings of birds, the dead bodies of insects and the dead branches and leaves of plants.

The aim of ecological gardening is therefore to aspire a balanced and natural ecosystem.

The principles and behaviours of ecological gardening

There are many actions that can be taken to garden in an ecologically responsible way. To structure all the ecologically responsible behaviours that were found, the actions and their reasoning behind them were summarized into five clusters, which could be seen as five ecological gardening guidelines.

1. Attract as many animals as possible

The main reasoning behind this guideline is that all animals are part of an interactive system of nature, and to stimulate a balanced ecosystem, these interactive life-chains should be maintained as much as possible. Another reason is the fact that the living areas of many insects, birds and other animals are decreasing, which is causing the general decline of biodiversity. Animals can be attracted by providing more living space in the garden. Actions that can be taken by ecological gardeners to attract more animals have to do with avoiding garden elements with little natural value, providing different habitats, answering to different needs of different animals, and buying plants that are ecologically cultivated. Examples of actions can be seen in figure 36.

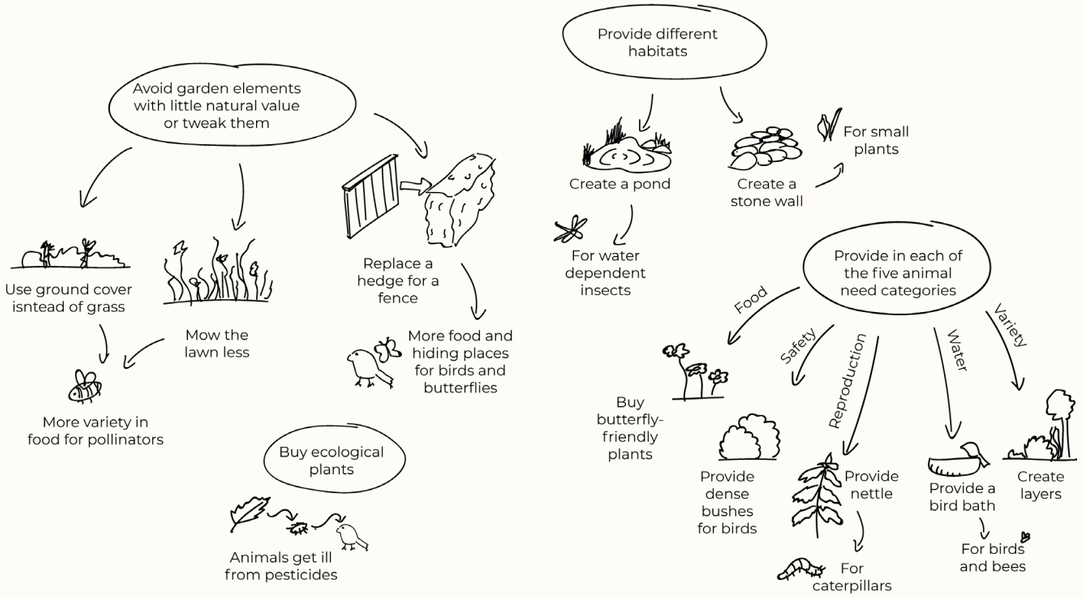


Figure 36 - Actions to attract as many animals as possible

2. Relinquish control / Give room to nature

Behind this guideline lies the understanding that the maintenance in a garden is equal to interference of the successional stages that an area goes through. The loss of biodiversity of an area is essentially caused by the interference of people, as a balanced ecosystem would occur when humans would not interfere. Actions that can be taken by ecological gardeners to relinquish control come down to cleaning less and leaving the garden “messier”. (see figure 37).

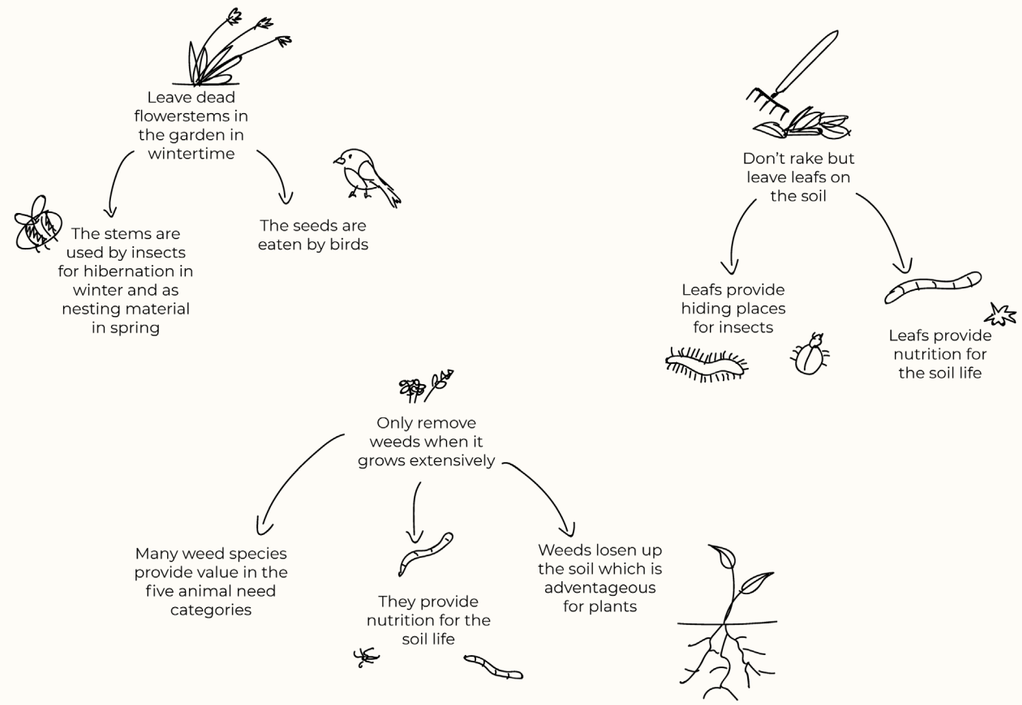


Figure 37 - Examples of how to relinquish control

3. Make minimal adjustments

This guideline goes hand in hand with the latter. It says to only make adjustments when needed, in a way that does not diverge too much from the natural way, but to use these natural processes where possible. This has to do with soil-improvement, pest- & weeds-control and minimal pruning (see figure 38).

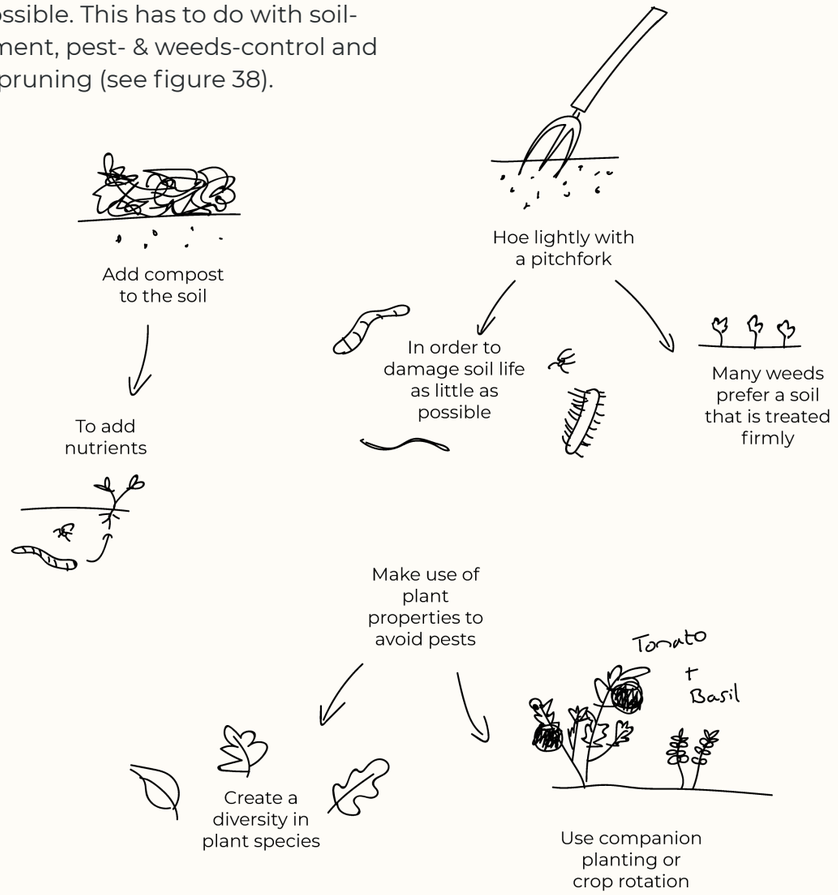


Figure 38 - Examples of how to make minimal adjustments

4. Adapt to the given situation

Adapting to the given situation means not to fight against natural processes. For instance, to get to know your garden and to buy plants that fit the context in terms of soil, sunlight, humidity and their origin. Additionally, it means to take time to observe your garden and let things happen when they happen. Examples of behaviours can be seen in figure 39.

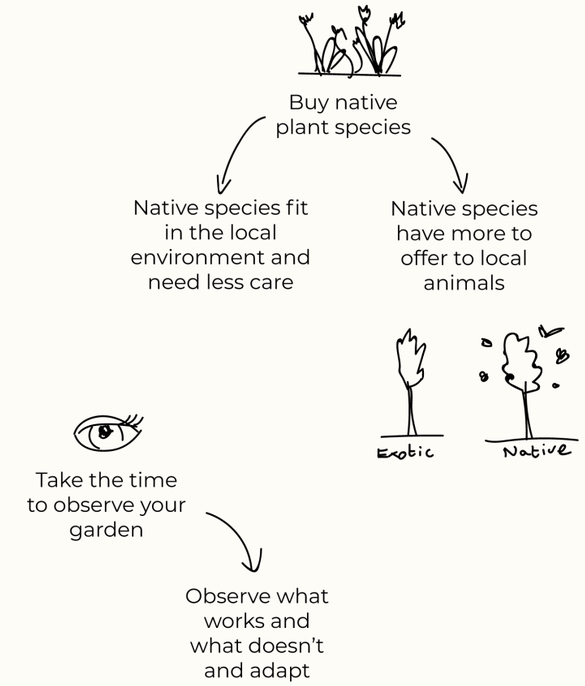


Figure 39 - Examples of how to adapt to the given situation

5. Take care of and support a healthy soil and soil life

This principle is in line with the first one, but with the focus on soil life. This is based on the awareness that a healthy soil is at the core of a healthy ecosystem. What is important here is to know how the natural nutrition system works, and to make optimal use of these natural processes. The principle to minimally interfere in the natural processes comes at play here as well; soil should be left alone as much as possible. (See figure 40)

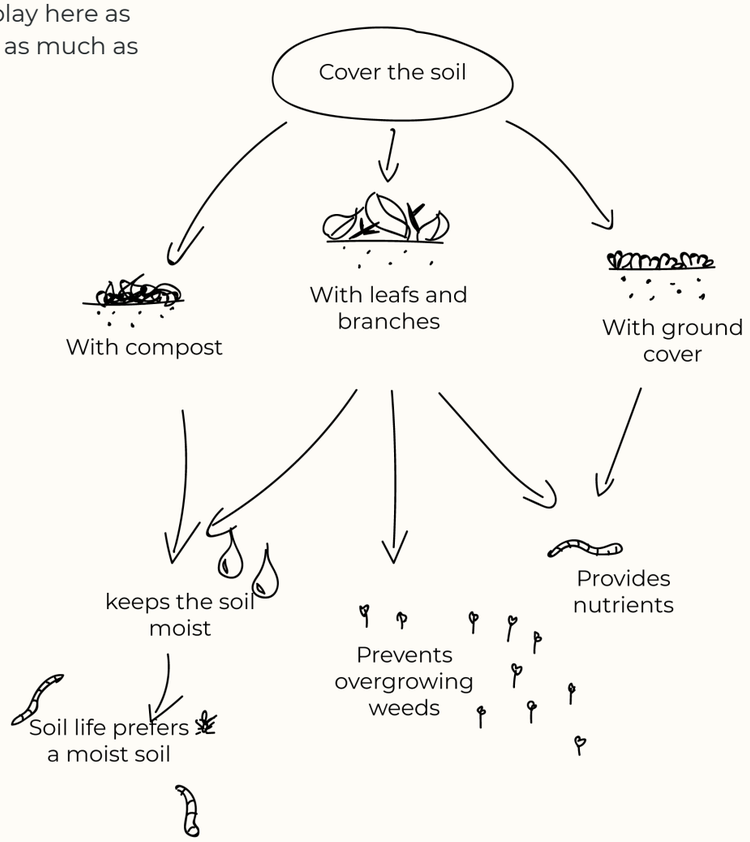


Figure 40 - Examples of how to support soil life

This gives some insight on the behaviours that the design should support green pioneers to adopt. To understand how the design should support this switch, let's first have a look at the behaviours they currently show.

CURRENT RELATIONSHIP TO SELF-CREATED GREEN 5.3

Now the base of how ecological gardening behaviour could improve the citizens contribution to the local biodiversity is explained, there are still some questions to be answered: 1) What behaviours are they currently showing? 2) What is the traditional way of gardening exactly? 3) And why do they show this behaviour? Answering these questions help to understand what could help them to let go of old behaviours and adopt an ecological way of gardening. In this section the relationship people can have with gardening and what influences their behaviour will be discussed. The main question that is answered is:

5. What are the current perspectives and behaviours around self-created green?

Values of gardening

When questioning the participants of the concept tests about the reasoning behind their gardening choices and observing the questions asked during the natural gardening course, many interesting influential factors were observed. First of all, five different values that influenced their choices are highlighted.

A value that is often linked to green space is that of the **aesthetic pleasure**. Plants and green areas are often experienced as aesthetically pleasing, and this can be a main driver to make certain decisions. A common principle that is valued and could also be observed in the concept tests, is that the garden should not look too messy. For instance, with leaves lying around or when plants are not trimmed properly. This aesthetic value therefore causes an urge for many people to keep the natural elements they added to their garden in control, so they look as they envisioned. It also causes people to keep their garden clean and neat. However, some of the participants actually valued the spontaneity of natures creations and thought this to be more aesthetically pleasing.

> “On second thought, I’ll chose a fence instead of a hedge. As the designer you want to create consistency, and with a hedge you can’t control if there will be dead leaves etcetera.”

> “I find tree trunks in a forest really nice; they are sort of a climbing frame. But I don’t imagine those in my garden, I want my garden to be a bit neater.”

> “High grass, especially with little flowers, looks nice to me. I like that there are these dots that pop up her and there.”

Another common value to influence choices is the **amount of maintenance** something will acquire. For some people, this means they want to do the bare minimum. Often this result in a choice for unnatural elements like fences or tiles, but sometimes people use ecological processes to reduce maintenance. For others, the work to be done in the garden is what they

Methods that lead to insights in this section

actually value. They see working in the garden as a creative outlet and part of the purpose of having a green space. Some of the participants therefore chose to have one part in their garden design with the purpose to allow them to create and work in.

> “I don’t want all my plants to be overgrown by weeds, but I also don’t feel like being busy weeding all the time, so I would choose plants that can’t get overgrown by weeds easily.”

> “I find tree trunks and branches rather nice! I will just leave them be. But I am a very lazy gardener, I would do the minimum in my garden.”

> “In this part, nature can do its thing. But this other part is where plants are planted intentionally, so you can roll up your sleeves and do your own thing.”

Other reasons that could be observed have to do with the **function** that a green space. Like for instance the ability to walk safely through the area, to sit on a terrace, or to play games or perform sports on the grass

> “I would like to have a walkway through my garden. And I would have the urge to keep it clean. Also, to make sure you don’t slip in the dark.”

> “I would like to have an area with tiles to sit on. In the summer it is nice and warm. And it is also more pleasant when the weather is less good, so you don’t have to sit on the grass that is all wet and dank.”

> “The lawn should be kept short, otherwise you can’t play on it as a kid.”

> “I would want to have a type of wood in my garden that I can use for personal projects.”

The last value that could be seen is an **ecological value**; the value for animals, or the effect on the ecosystem. Some of the choices fuelled by this value had to do with the experience it brings, as enjoying seeing living creatures in the garden. The awareness of the decline of populations, or the value of a healthy ecosystem for the garden were the driving forces for some participants.

> “I would like to have an area with tiles to sit on. In the summer it is nice and warm. And it is also more pleasant when the weather is less good, so you don’t have to sit on the grass that is all wet and dank.”

> “Just leave the dead plant parts be in the winter. Then they will have added benefit tot the soil.”

"It is often the case that, the more natural an area is, the more insects can live there. And hopefully the more birds get attracted to them in turn."

"I think this would be nice for insects. And I've understood that it is a good thing to have insects."

"If I would have a bigger garden, I would definitely place something like an insect- or bee hotel in there. To help the bees, because they need it. And of course, it is a good thing for your garden to have insects and bees."

"I would like it if, when you take a look at your garden, that you see some moving-around."

When different values came at play, sometimes one value was considered more important than another, like keeping function of a pathway versus the preference for low maintenance, or the function of a neatly cut lawn versus the ecological value of high grass. Sometimes both values were given space, by combining aesthetic value with ecological value.

"I would let maintenance lead. I do want a piece of grass, and I will mow a pathway in it. It is fine if leaves would fall on the ground, but I would rake the pathway clean, so it is still visible."

"The short grass is of course not so appealing. Or I imagine it wouldn't. But it has to stay, because that would be a great loss."

"I will keep it like this. I already designed it in such a way that nature can partly do his own thing, and partly it is more for me."

"I would like to do something with tree trunks, but I would see how you can make sure to make it look nice, and not like sort of an organic waste pile."

In these examples can be seen how people find their own personal balance between more human-centred values; the aesthetics, amount of maintenance, function and experience. And more nature-centred values; the value something has for animals or the effect it has on the ecosystem.

The 'ecological gardener' vs the 'traditional gardener'

It was assumed that people will either be quite aware of ecological values and would therefore mostly choose actions of high ecological value (the ecological gardener), or they will not be aware and would mostly choose actions of low ecological value (the traditional gardener). However, it became apparent that this wasn't exactly the case in the concept tests and gardening course, and therfore won't be the case for the green pioneers of Rotterdam. People can show a mix of behaviours with different ecological values.

Some would for instance choose to divide the design of the garden in an area which would be wilder and more natural, while the other part would be for the designer itself. Some would take almost no control and let nature run wild but would interfere when a mole would create molehills in the grass by placing traps.

Some people show more ecological awareness, but this doesn't mean they will show only ecologically responsible behaviour. As choices are not only led by awareness, but also by other values.

It is therefore unrealistic to aspire 'traditional gardeners' to shift completely towards a fully 'ecological gardener', but rather to aspire any gardener to adopt more ecologically responsible behaviours then they did before.

Take for instance the owner of one of the natural example gardens that were shown during the gardening course. She knows that leaving dead plant parts untouched during the winter has an ecological value, because they provide hibernation possibilities for insects and nutrition to the soil. But as she doesn't like the vibe of a garden that is completely withered away, she does clean up the garden when summer is over.

Associations with natural elements

Another interesting influential factor that was noticeable is the associations people have with animal or plant species. Positive or negative associations were often mentioned in their reasoning behind choices. As the first principle of ecological gardening is to attract as many animals as possible, this is interesting to investigate.

Some associations are shared with the common view. For example, the majority of people like butterflies, ladybugs and birds, while common dislikes are spiders, worms, nettle and thistle. Some associations were formed by the background-knowledge they had, but they could also be caused by a lack of background-knowledge or understanding. In some cases, an experience they had with the animal- or plant species influenced their association, like the physical experience of the sting of nettle.

> "Moles are very tedious, because they eat all your plants and all of the animals. My parents used a trap to get rid of them."

> "I don't understand moles, they seem rather stupid to me. As if they are just digging around here and there and then, when they surface, they find out: 'oh, here is no soil'. And meanwhile they leave a trail of destruction. So, when I see a mole pile, I just have the gut-reaction of: was this really necessary?"

> "I really hate ladybugs. They pretend to be cute but when you zoom in om them, they are real scumbags, with their weird fang-mouths. And that is also a little bit caused by the movie 'bugs life', I think."

> "I am terrified of spiders. For me, getting a spiderweb in your face is the worst feeling."

Negative associations sometimes lead to toleration or choosing to remove them. While the animals and plants with positive associations are usually tolerated and welcomed to the garden. Think of people who add birdhouses and birdbaths in their garden to attract singing birds, or flowerbeds and insect hotels to attract bees and butterflies.

Influencing these associations could be an interesting concept to explore in order for the toolkit to support people in attracting more animals to their green space.

> "Rainworms are still nasty, but they can stay."

> "Placing traps would go a little bit too far for me, but I would find out what I could do to chase them from my garden."

> "So, I'm just thinking, oh shit what can I do I get rid of these aphids to not get those ladybugs in my garden"

> "I don't like nettles. Especially when you have kids, then you wouldn't place nettle in in your garden right! So, let's get rid of the nettles"

CHAPTER 5 UNDERSTANDING THE CONTRIBUTION

Associations with natural elements

Gardening equals creation, and with it interference with the natural processes. People have a vision for what their green space should look like, or ideas they want to realise through their green space and this is a great part of the fun they get out of it.

Next to this there can also be a fear of letting things get out of hand. The dialogue in the natural gardening course was often focussed on the actions to take in the garden to control things, like weeds and pests. A certain level of hostility against certain weeds could be observed. Some participants couldn't get rid of very persistent weeds like dandelion and ground elder. Removing them by hand was not sufficient and some had been trying to fight the weeds for years.
How does this rhyme with an ecological approach, in which natural processes are supposed to get supreme power?

Summary of section insights
CURRENT RELATIONSHIP TO SELF-CREATED GREEN

There is no such thing as a division of people in the groups of "the traditional gardeners" and "the ecological gardeners". People can show a mix of behaviours. It is therefore unrealistic to aspire 'traditional gardeners' to shift completely towards a fully 'ecological gardener', but rather to aspire any gardener to adopt more ecologically responsible behaviours then they did before.

Choices are being influenced by the association people have with specific animal- and plant species. Influencing these associations could be an interesting concept to explore in order for the toolkit to support people in attracting more animals to their green space..

Gardening equals creation, and with it interference with the natural processes. How does this rhyme with an ecological approach, in which natural processes are supposed to get supreme power?

SHIFTING TOWARDS ECOLOGICAL BEHAVIOUR 5.4

Having a better idea of the starting point and the finish line, it is time to bridge the gap between those two. This section brings all the insights on ecological gardening and the current behaviour together to sketch the shift of an individual towards a more ecological perspective and behaviour. The main question that will be answered is:

6. What does it mean to shift from current behaviours to a more ecological way of designing and maintaining green spaces?

During the secondary research an underlying layer could be observed that explains the attitude towards self-created green that someone should have when gardening in an ecological way. This attitude could be summarized as follows. Firstly, the gardener needs to design and maintain with the aim to stimulate life, so choices should be focussed on what they will mean for the life of animals, rather then what they will mean for the creator themselves. Secondly, natural processes as they happen in the garden should be acknowledged and observed, as these are the core of a natural green space. Furthermore, maintenance should be done with the goal to make small adjustments to the natural processes. And lastly, the natural balance that will occur needs to be trusted.

By comparing this ecological attitude to the current values and perspectives towards green as examined in the last section, three possible mind-set shifts which the toolkit could support are formulated:

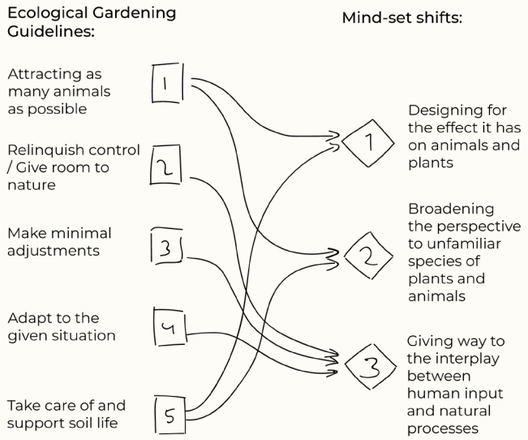
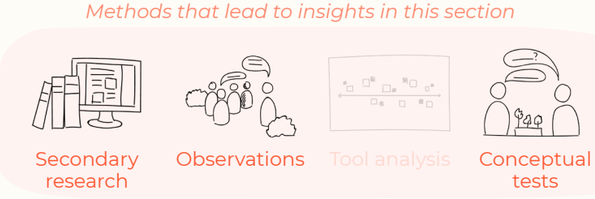


Figure 41 - Overview of how the ecological gardening guidelines relate to the formulated mind-set shifts.

Methods that lead to insights in this section



1. **Designing for the effect it has on the life of animals and plants.**

   As explained in the previous section, people can have different values in designing a green space. It is common for people to see the purpose of green from a more human perspective; to pleasure the human senses and experience. But people might also acknowledge a purpose from a non-human centred perspective. Because people create a green space out of different motivations, it is unrealistic to ask them to create a green space completely for non-humans. People will have their own balance between these values. The shift that should therefore be aspired in the design is, to stimulate green pioneers to move their physical and mental space towards the animal- and plant- needs.

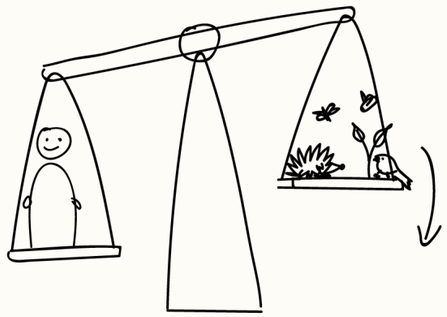


Figure 42 - Designing for the effect it has on the life of animals and plants.

2. **Broadening their perspective to unfamiliar species of plants and animals.**

   It seems that the natural elements that people have positive associations with, might be welcomed by them, while others might not. As we understood from the ecological mindsets and behaviours, it is aspired to stimulate all life, to create a balanced ecosystem. So not only the birds, the bees and the butterflies, but also the worms and the spiders. Associations seemed to be linked to background knowledge and experiences. Therefore, a shift should be made. Broadening their perspective by introducing them to elements they are not familiar with or by overcoming negative associations.

Figure 43 - Broadening their perspective to unfamiliar species

3. Giving way to the interplay between human input and natural processes

Many reasons to make certain decisions about a green space have to do with the idea of the garden that they have in mind, a certain look, an experience, or a certain function. The green space is a platform to express their creativity. Therefore, completely letting go of control is not feasible for active gardeners. The question is where people draw the line between controlling the green space themselves and giving control away to natural processes. Not everyone will require every aspect of the garden to be under control, and not everyone will be content with giving all control back to nature. Most people act somewhere in between. A shift that could therefore rather be stimulated is that the interaction with a green space is less experienced as a one-way creation and more as interplay between human input and natural processes.

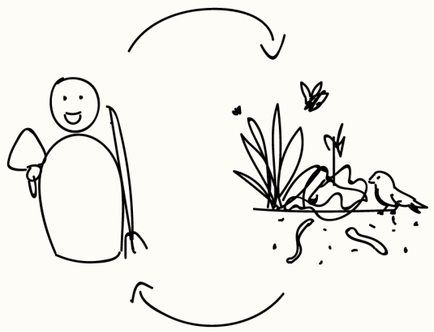


Figure 44 - Giving way to interplay between human input and natural processes.

> "The other day, a blackbird just trashed the soil and threw it all over the pathway."

This quote from one of the participants of the natural gardening class shows how the human perspective can be prevalent in a given situation. The participant was quite indignant about how the blackbird, from his perspective, disturbed the purpose of the garden. This is an example of how someone could see their garden more as a one-way creation.

> "I initially just planted what I liked, the strong ones then survive and that is how the balance is formed."

During the gardening class observations, one of the owners of an example-garden that we visited, showed a perspective of co-creation with the natural elements. She said she sometimes interfered in the garden but didn't carry out too much work. She had a certain trust in the natural balance of the garden. There were for instance snails present, but she did not take action to remove them as "they were no burden to her", she said, and she had birds and hedgehogs visit or live in the garden and eat them.

Summary of section insights
SHIFTING TOWARDS ECOLOGICAL BEHAVIOUR

Three possible mind-set shifts which the toolkit could support are:

1. Stimulating green pioneers to design more for the effect it has on the life of animals and plants and less for the result of the green space for the creators themselves.

2. Broadening their perspective towards unfamiliar plants and animals, to stimulate them to support more species of plants and animals.

3. Let them experience their interaction with their self-created green more as interplay with the natural processes and less as a one-way creation.

HOW TO SUPPORT THE ADOPTION OF NEW BEHAVIOUR 5.5

Acknowledging what it means for someone to shift toward showing more ecologically responsible behaviours, the question remains: how to shift the perspective and behaviour, supported by a toolkit. The secondary research, tool analysis and conceptual tests served as input for the ideas that are presented in this section. The main question that will be answered in this section is:

7. How can a shift towards more ecological behaviours and perspectives be triggered?

Providing inspiration on possible actions and their ecological effect

Ecological gardening includes a wide variety of behaviours. For someone to be able to shift towards an ecological way of designing and maintaining, they need to be aware of the possible ecological behaviours and their effects. The toolkit should therefore provide this inspiration to the green pioneers.

Elements that can be used

The analysis of existing tools showed examples of how they try to trigger a shift towards a more ecologically responsible mindset and behaviour. They made use of different combinations of four main elements: inspiration, education, observatory exercises and support (see figure 45). Tools that educate and inspire, mostly provide ideas, examples and perspective. Therefore they will likely be used in a phase in which the intention is formed to make changes to or maintain the garden in a more ecologically responsible way. Most supportive tools guide the actual behaviour of designing, creating and maintaining the green space and will therefore likely be used during a phase of planning and when taking action. These types of tools can make a change of behaviour easier to incite. Most tools that include observatory exercises, incite a moment of reflection. These tools provide positive reinforcement and stimulate improvement of behaviour.

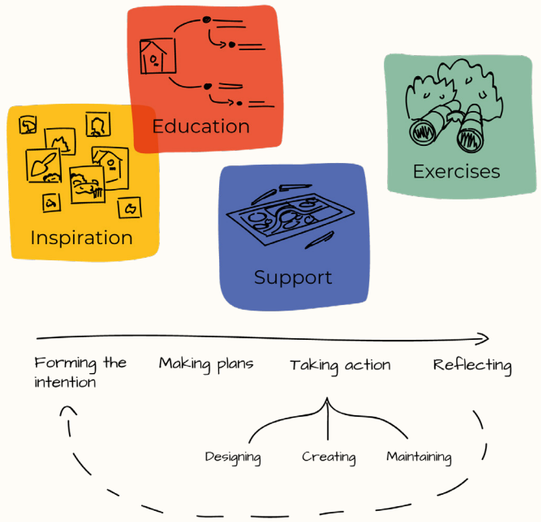


Figure 45 - Elements that can be used

Methods that lead to insights in this section

Practical approach

Most tools and resources on ecological gardening offer mainly theoretical support. As green initiatives comprise practical work, offering practical support in the green space itself to support a shift in mindset and behaviour simultaneously, could be interesting.

The tools show interactions to different degrees. Many tools a re primarily senders, while only a few tools allow for input from the user, and even less of them react on their input. For instance, tools provide knowledge through text or video's, they provide examples of actions as inspiration, or they offer exercises. The user can choose to act on these given opportunities, or not. To support a more practical approach, the toolkit should include a translation or encouragement for the user to take action.

Fun and rewarding

Considering that people in green initiatives are spending their spare time on their initiatives, the design should strive to create a fun additional experience to the current process. And to make sure it is rewarding enough for the time and effort it requires.

Presenting the perspective of animals and plants

Considering that people in green initiatives are spending their spare time on their initiatives, the design should strive to create a fun additional experience to the current process. And to make sure it is rewarding enough for the time and effort it requires.

> " I really liked the idea that a hedgehog could maybe reproduce in my garden. That I could be sort of a vanguard in that, that I could create the proper circumstances for that. Because then you really offer something to nature. "

Observing animals

This feeling of pride and enthusiasm could be enforced by letting people observe the effect of their actions, in other words, the animals that they support.

Showing the value of natural elements to other species

To give green pioneers a broader familiarity with animal- and plant species, they could be showed the value that natural elements can add for other species. One of the concept tests showed that teaching about a natural element's role in relation to other natural elements, can influence the action that is taken. Learning about the role of certain natural elements also seem to increase the awareness that all elements can be valuable in their local ecosystem.

> "This made me start to think. Before this game, I would have definitely found that a mol should just be gotten rid of. But now I started to think: Why do they actually do this? I actually want to get to understand them better, so I know what kind of function it has."

CHAPTER 5 UNDERSTANDING THE CONTRIBUTION

Observing natural processes
Many tools for ecological gardening provide observation exercises as an important tool to open up the dialogue between nature and gardener. For instance, by monitoring the changes that happen over the seasons or by waiting and observing before acting. Paying more attention to the natural processes, might help to encourage an interplay-experience between the gardener and natural processes.

Summary of section insights
HOW TO SUPPORT THE ADOPTION OF NEW BEHAVIOUR

Some ideas on how the toolkit could trigger a shift in behaviour.

The toolkit could provide inspiration on the possible actions and their ecological effect to the green pioneers.

The toolkit could offer practical support in the green space itself to support a shift in mindset and behaviour simultaneously and include a translation or encouragement for the user to really take action.

The toolkit could strive to create a fun additional experience to the current process and to make sure it is rewarding enough for the time and effort it requires.

The toolkit could enforce a feeling of pride and enthusiasm by letting green pioneers observe the effects of their actions, or in other words the animals that they support and by showing them the perspective of animals and plants, to help them make decisions with a focus on their effects on animals and plants

The toolkit could show green pioneers the value that natural elements can add and their role in relation to other natural elements, to give them a broader familiarity with animal- and plant species.

The toolkit could stimulate green pioneers to observe the natural processes, to encourage an interplay-experience between them and the natural processes that take place in the green space.

CHAPTER SUMMARY
UNDERSTANDING THE CONTRIBUTION

This exploration phase resulted in a better understanding regarding the shift in mindset and behaviour from a traditional way of gardening to a ecological way of gardening, and how this shift can be triggered. Below a summary of the findings on these topics is presented.

1) There is no clear division in people that are “traditional gardeners” and “ecological gardeners”. People show a mix of behaviours that can be more ecologically responsible or more traditional. So, the shift that the design should aim to trigger for them to adopt more ecologically responsible behaviours then before.

2) Choices in design and maintenance can be influenced by values that are more human centred or more nature centred. The shift towards showing more ecologically responsible behaviours requires therefore that some part of someone’s physical and mental space that is occupied by human needs, give way to the animal and plant needs. This can be stimulated by shifting the focus to the life people can facilitate with their green space, letting them experience or observe this effect and letting them feel proud and enthusiastic about this achievement.

3) Choices can be influenced by the associations people have with specific natural elements. Ecologically responsible behaviours include the support of as many possible natural elements as possible, as they all play a role in balancing the local ecosystem. This can be stimulated by broadening their familiarity with animal- and plant species and the values of these species to other natural elements.

4) Active gardeners such as the target group use their green space as a platform to express their creativity. However, ecological behaviour requires that the interaction with a green space is less experienced as a one-way creation and more as interplay between human input and natural processes. This could be encouraged by stimulating to observe natural processes.

CHAPTER 6
FINAL DIRECTION (INTERSECTION)

The insights that were found during the second exploration has led to further finalization of the design goal. Section 6.1 of this chapter explains how and why the design goal is finalized. Furthermore, some of the insights were translated into solution spaces, used as guidelines in the designing phase. These are explained in section 6.2. Lastly, other insights were translated into additional requirements for the design and listed in section 6.3.

FINAL DESIGN GOAL

6.1

What effect should the design evoke? &
For whom will the design be created?
The previous design goal contained the intention to help the target group to completely switch from a traditional behaviour to adopting an ecological way of gardening. In the previous explorations, it appears it is not realistic to frame this change as such, as people will likely show a mix of behaviours. Therefore, the specification of the target group as 'traditional gardeners' is excluded from the design goal. The intention of the design goal is changed to helping green pioneers shift towards more ecologically responsible behaviour.

How should the design reach this effect?
The insights on how this shift can be triggered gave some interesting pointers. These insights include that some of the target group's physical and mental space should shift towards the animal- and plant-needs, to be able to design with greater awareness for the effect the green space has on the life of animals, to spend time on observation of the natural processes, to broaden familiarity with natural elements and their roles in relation to other plants and animals and to see the interaction with the green space more as interplay than a one-way creation. In summary, this all boils down to the target group's connection and interaction with the nature in their self-created green space. This is captured in the core concept of the final design goal.

To support the citizens who are actively involved in green neighbourhood initiatives to shift towards *more ecologically responsible behaviour, through connection and interaction with the nature in the green space they created.*

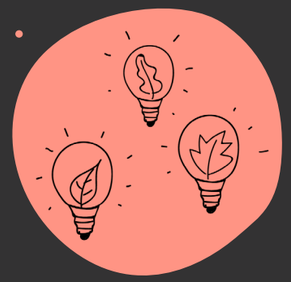
Figure 46 - Final Design Goal

SOLUTION SPACES

6.2

The design goal shows the main aim of the project in a succinct way. However, this brevity precludes the inclusion of information that was found through the explorations that will be useful in guiding the design. To complement the design goal, four solution spaces based on the insights about the shifts that need to take place when shifting towards more ecological behaviour were formulated.

1.



2.

3.

4.

Providing inspiration on possible actions and their ecological effect.

People can have different levels of awareness on the possible ecologically responsible behaviours. To help the target group to shift towards more ecologically responsible behaviours, one of the solution spaces for the design is to inspire them to acquire more knowledge on the possible ecological actions and understanding of the reasoning behind them. Presenting the perspective of natural elements can help to reach this understanding.

Stimulate to make decisions with greater awareness for their effects on animals and plants.

People can have different levels of awareness on the possible ecologically responsible behaviours. To help the target group to shift towards more ecologically responsible behaviours, one of the solution spaces for the design is to inspire them to acquire more knowledge on the possible ecological actions and understanding of the reasoning behind them. Presenting the perspective of natural elements can help to reach this understanding.

Broadening the perspective to unfamiliar/unattractive animal- and plant species.

People can have different levels of awareness on the possible ecologically responsible behaviours. To help the target group to shift towards more ecologically responsible behaviours, one of the solution spaces for the design is to inspire them to acquire more knowledge on the possible ecological actions and understanding of the reasoning behind them. Presenting the perspective of natural elements can help to reach this understanding.

Encouraging an interplay-experience between input of the green pioneers and input of natural processes

Active gardeners such as the target group use their green space as a platform for creativity while ecological gardening requires room for natural processes.
To support the target group to shift more towards ecologically responsible behaviours, one of the solution spaces is to encourage them to experience the interaction with their green space less as a one-way creation and more as interplay between human input and natural processes. This could be done by letting some part of the urge to control and create make place to paying attention to natural processes.

REQUIREMENTS

6.3

Some of the insights resulted in additional requirements for the design, which are listed below.

7. The design should be used in the context of the green space itself

By allowing the design to be used in the green space they created themselves, a better connection and engagement can be achieved.

8. The design should include a translation/encouragement to take action

Allowing for input from the user and reacting on this input can stimulate engagement in the process, making the target group more inclined to actually take action.

9. The design should be rewarding enough for the time and effort it requires

The target group spends their spare time on their initiatives. The design should take this into account, while offering positive reinforcement to have a motivating effect.

10. The design should provide a deeper understanding of ecological responsibility while not requiring too much time and effort.

The design should try to reach the design goal while taking into account that the target group spends their spare time on their initiatives.

11. The design should be experienced as a fun addition to the current process

When the tool is experienced as fun, it is more likely to engage the user.

CHAPTER 7
DEVELOPING A TOOLKIT

As we now have a clear view of the target group and how we can help them to improve their contribution to the local biodiversity rate, enough information and inspiration is gathered to start designing. This chapter describes the process of ideation that results in a concept for a toolkit that meets the final design goal. It starts with an overview of the process in section 7.1 'Process overview'. Which will be followed by the consecutive phases of idea generation presented in section 7.2, the creation of concept ideas in section 7.3 and iterations towards the final toolkit in section 7.4.

7.1 DESIGN PROCESS OVERVIEW

Figure 47 shows an overview of the ideation process. The process starts with a brainstorm, using the final design goal and the four solution spaces as a starting point. To conclude this brainstorm, the result ideas were disaggregated into separate elements to create a clear inventory of ideas. These elements were then used to create five concept ideas. Merging and iterating on these concept ideas, while taking the design requirements into account, resulted in one final toolkit concept.

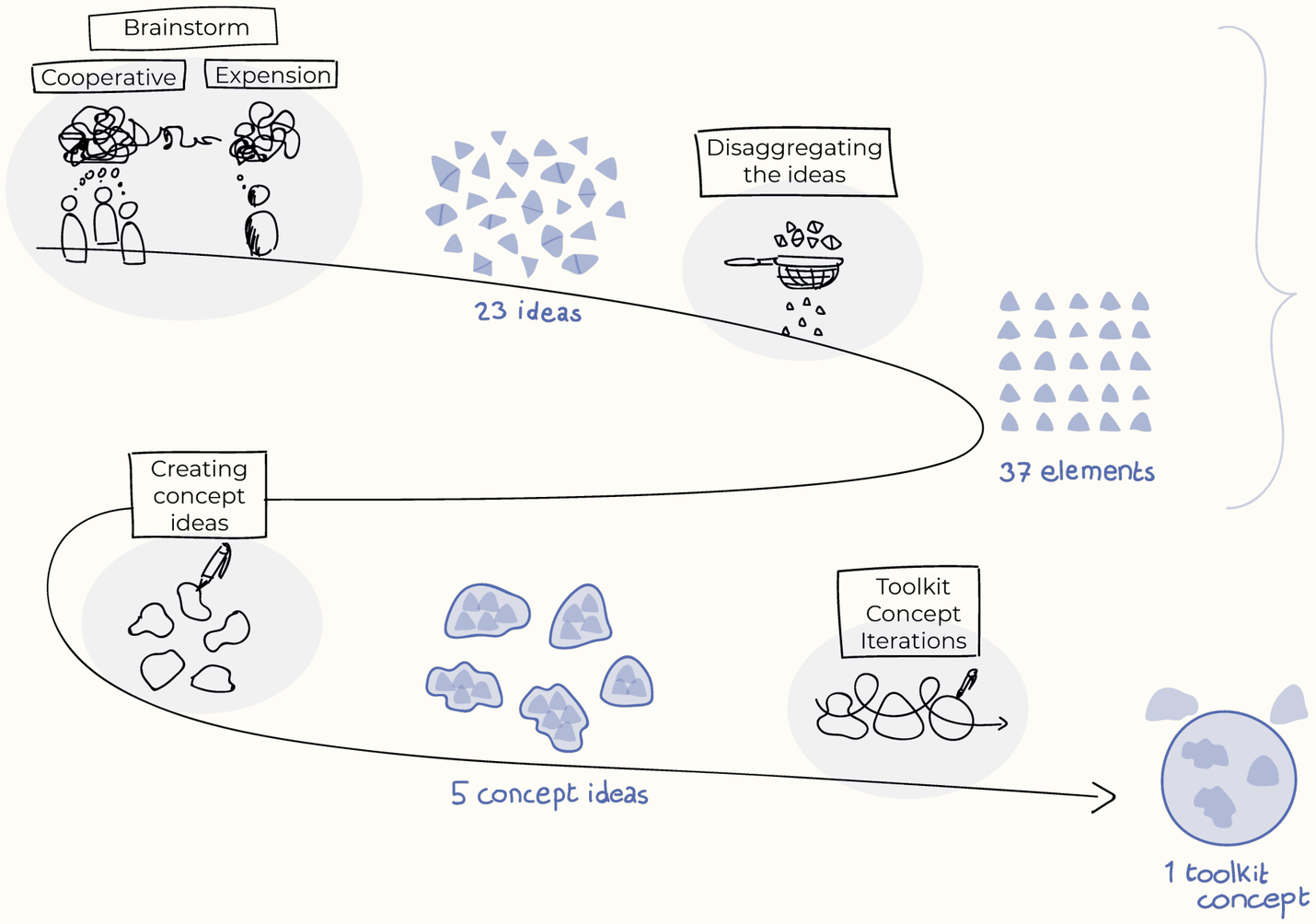


Figure 47 - Overview of the ideation process

IDEA GENERATION 7.2

Goal

As a first step for developing a toolkit, the goal here is to generate as many ideas as possible to explore every possible solution. These can later be used for selection and creating usable concepts.

Process

The idea generation process can be described as a two-part brainstorming session, and a concluding activity of inventory.

A cooperative brainstorm session

To provide fresh input, a brainstorm session was held with 3 designers from outside the project. The design goal and solution spaces were used as the starting point for this session. To see the full approach, see Appendix J.

Figure 48 - The cooperative brainstorm session

An individual expansion of the session

Many potential ideas came out of the cooperative brainstorm. To expand on these ideas, a longer individual session was held, using the same method as used in the cooperative brainstorm. See the full description in Appendix K.

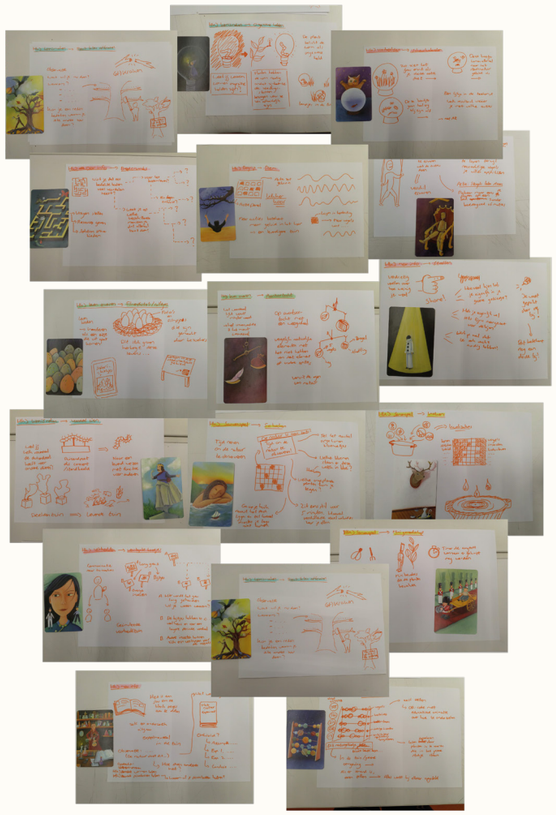


Figure 49 - Individual expansion on the brainstorm

Disaggregating the results

The ideas that came out of the brainstorm could be broken down into multiple components. The components were colour-marked to make visible which solution spaces can be related to the ideas. See the full description in Appendix L.

Results

The complete idea generation resulted into 38 ideas (see figure 50). Some of which provide a solution in multiple solution spaces. These ideas have various levels of abstraction. For instance, some provide an idea for a certain form of a product (mini gardening tools nudge people in adjusting the green space in a minimal way), while others are more conceptual (A plant or animal highlight another species as an unnoticed hero).

Figure 50 - The disaggregated ideas that came out of the idea generation presented on cards

Extending the design to the citizens that are influenced by green pioneers

In the brainstorm, the concept of communicating to neighbours and passers-by as formulated in design requirement number 4, recurred in a number of ideas. This brought the insight that the solution spaces are missing a crucial aspect: who are they targeted at? As neighbourhood initiatives are always public area's that anyone can visit, it is insufficient to only consider the green pioneers themselves, and the interactions between the initiative and the neighbours and passers-by need to be included. These were therefore incorporated in the existing solution spaces:

1. 
Providing inspiration to green pioneers and the citizens they influence, on possible actions and their ecological effect

2. 
Stimulating green pioneers to make decisions with a focus for their effects on animals and plants

3. 
Broadening the perspective of green pioneers and the citizens they influence to unfamiliar or unattractive animal- and plant species

4. 
Encouraging an interplay-experience between the input of the green pioneers and the input of natural processes

CREATING CONCEPT IDEAS 7.3

Goal

The considerable number of ideas on diverse levels of abstraction are used to generate concept ideas.

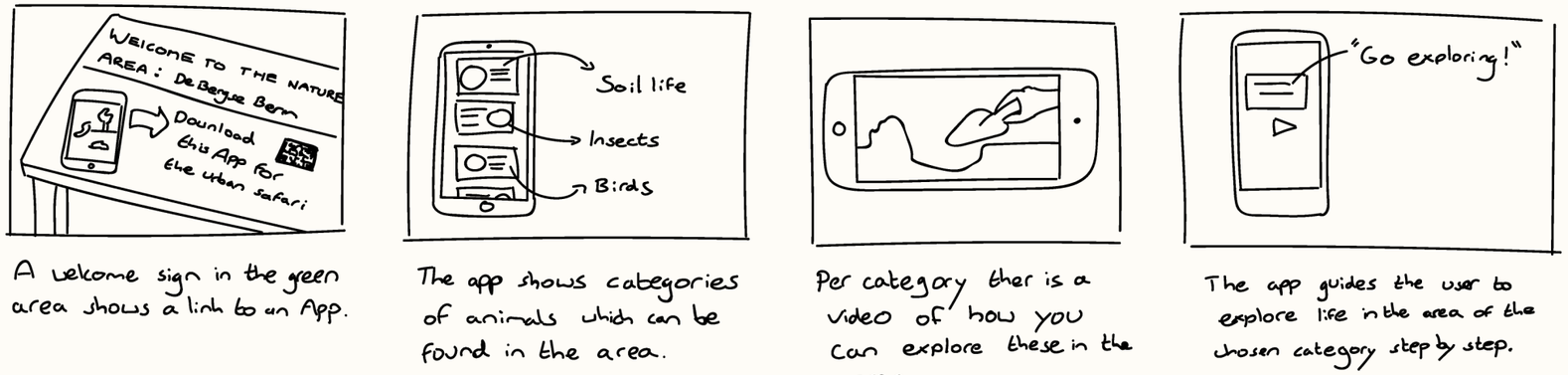
Process

The elements with the most potential were combined to create five concept ideas. These concept ideas were each separate ideas for a product that would answer a number of the five solution spaces each. However, they did not yet act as a complete toolkit. To see the full description, see appendix M.

Results

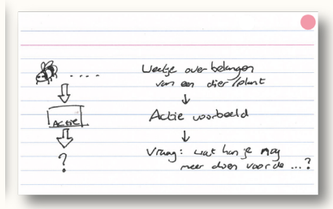
The five concept ideas that were created are briefly described below.

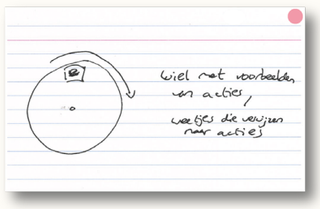
Concept idea 1
An application that can be used by the target group or anyone who visits their green area. It guides the exploration of the life that is supported in the area.

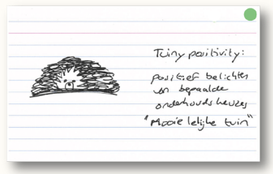


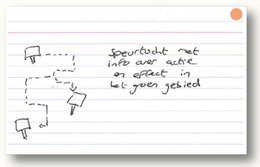
Concept idea 2

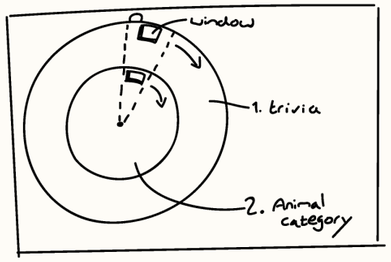
A wheel that inspires to carry out ecologically responsible actions in the green area. It shows the needs of animals that are provided in through these actions as well, and provides an option to set out a discovery trail in the green area for visitors.



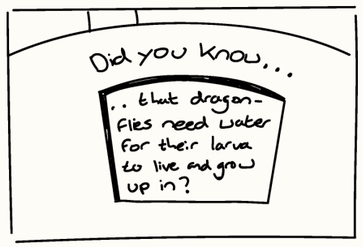




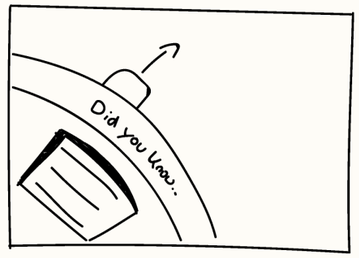




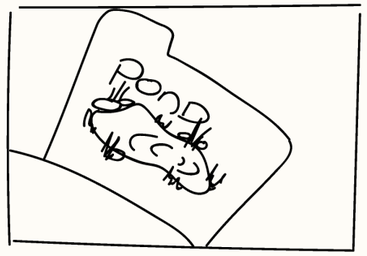
This wheel contains two layers. The layers can be rotated to make underlying information visible through the little windows.



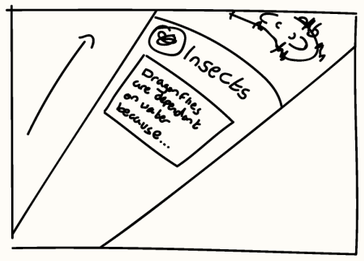
The layer of trivia shows facts that teach something about the needs of a particular animal species.



Beneath each fact there is a card that can be pulled out of the wheel.

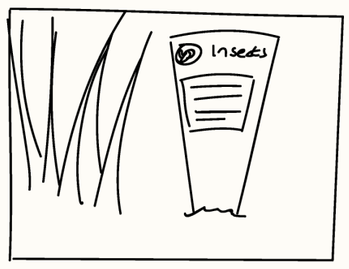


This card shows the action that can be undertaken by the user to look after the need presented in the trivia.

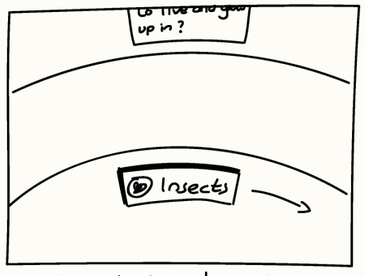


When the card is pulled out further, the bottom part fully explains the effect of the action on the animal species and the corresponding animal category.

The top part of the card can be seperated and be placed in an accompanying card holder. This card holder can be placed in the green area when the action is carried out.

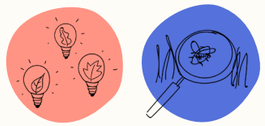


The bottom part can be placed elsewhere to create an exploration possibility for visitors.

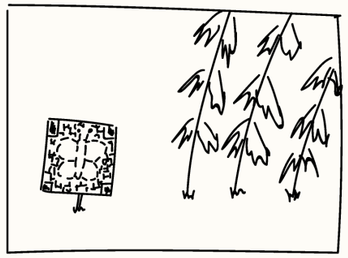


The first wheel can be rotated to get intrigued by other trivia. The second wheel can be rotated to find other actions that can be taken for the same or other animal categories.

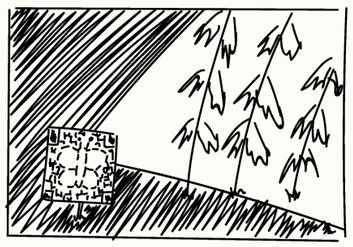
Concept idea 3
An app with which the user can explore the green area through the perspective of different animal types.



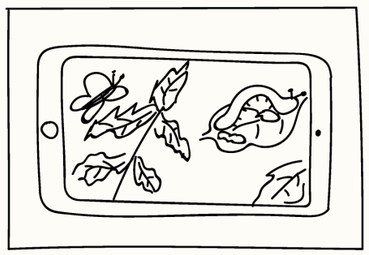
This is an app with which the user can explore the green area through the perspective of different animal types.



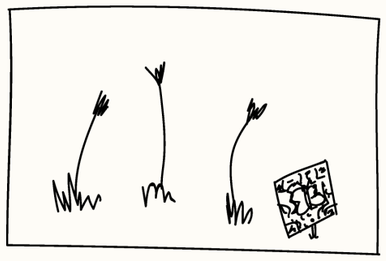
QR signs should be placed at certain elements in the green area to point out the 'unnoticed heroes'. Like for instance a butterfly QR sign near a bunch of nettle.



The sign shines a light on the 'unnoticed heroes' when the QR code is scanned with the app.



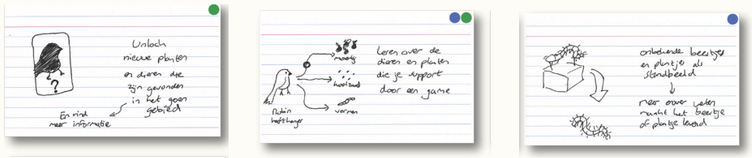
An edutainment video explains the value of the accompanying natural element.



For each animal species is a QR code available for food, safety, reproduction and water.

Concept idea 4

An app that helps the user to learn more bout the needs of animals that can be found in their green area.



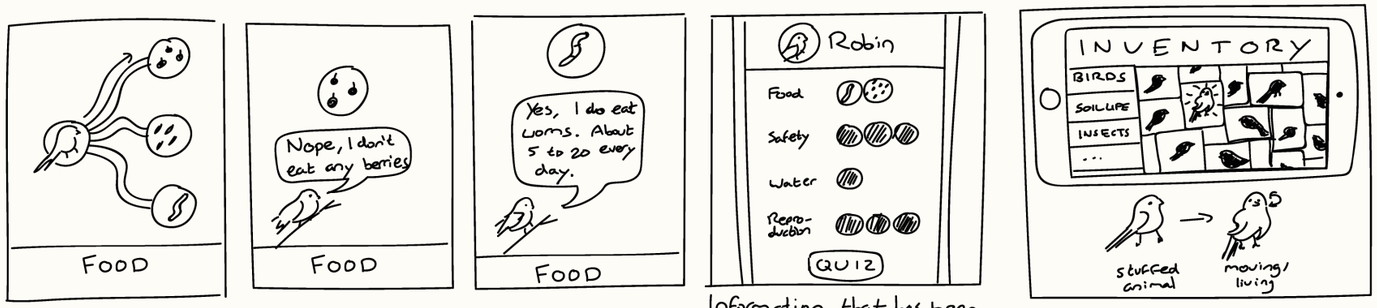
This apps helps the user to learn about the needs animals that the find in their green area.

The user finds an animal in the green area and selects it in the app.

The animal species that u identified by the user gets unlocked in the inventory.

When the user clicks on an unlocked species, an overview of the needs of that species is opened. This can be filled with information by doing quizes.

A quiz can be done on each type of need: food, safety, water and reproduction.



The quiz is set up as a lou-key exploration game

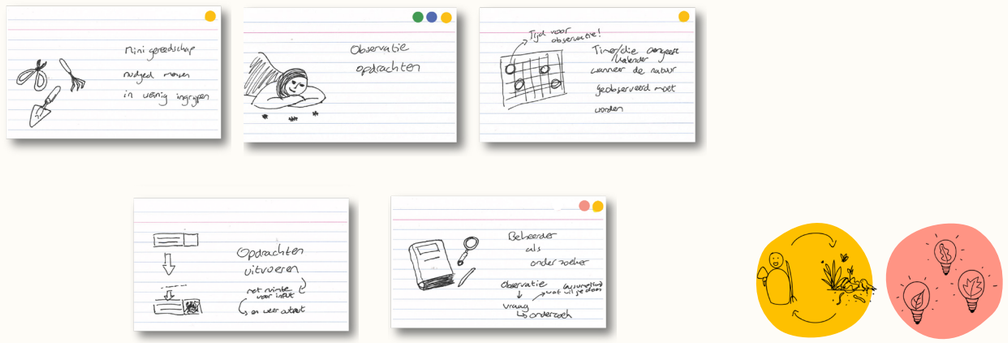
Explanations are given when false answers are given.

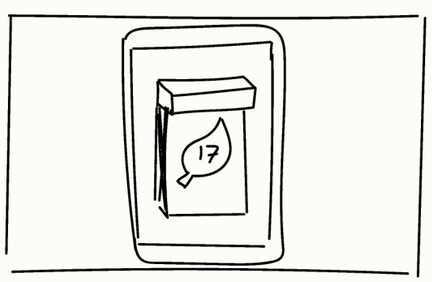
The user can continue exploring to find the right answer.

Information that has been learned through the quiz gets unlocked in the species overview. An unlocked element can be clicked to find actions that can be taken in the green area to support the species even more.

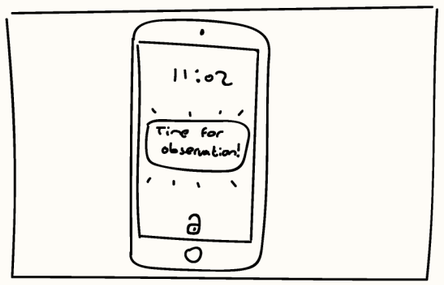
The animal species in the inventory comes to life when all types of needs have been explored.

Concept idea 5
A calendar app that provides observational exercises in the green area of the user.
It helps with understanding the natural processes that are observed and provides actions that can be taken.





This is a calender app.

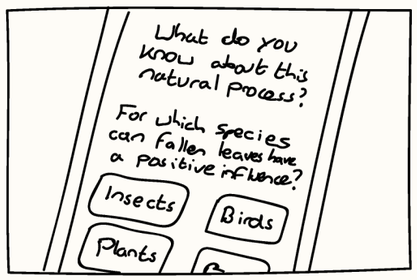


It presents an observational exercise at fixed moments.

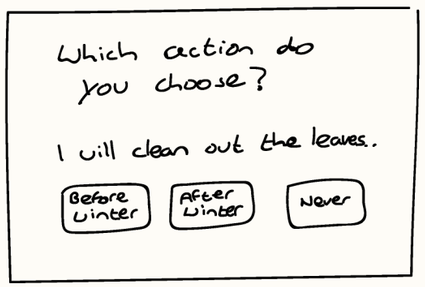
The exercises provide room for input from the user.

When an exercise is finished, it is showed as a new leaf on their progress wall.

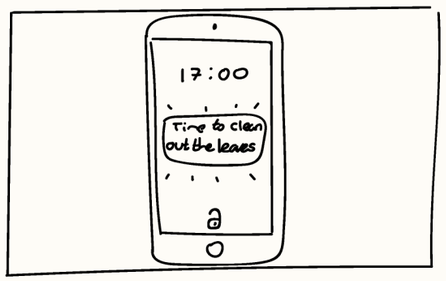
Some observational exercises incite an action that can be taken in the green area.



These exercises will be followed by a quiz that helps understand the natural process/value.



A choice of action is presented afterwards, with possibilities of different ecological value.



The action will come back in the calender.

ITERATIONS TOWARDS THE TOOLKIT 7.4

Goal

The last step that needs to be taken is to go from the previous concept ideas into a concept for a complete toolkit. The goal of creating this final concept is answering both to the design goal and the five solution spaces, while considering the perspective and usage of the target group. To make it meaningful, effectful and functional to the user.

Process

The previous concept ideas acted as a starting point for multiple iterations. All concept ideas together answer to all 5 solution spaces. However, they do not yet act as a functional and complete toolkit for the user.

To make it functional, it should fit the contexts of use of the target group. Therefore, four contexts of use for the toolkit were formulated. These were based on the phases that were formulated earlier in the tool analysis: designing the green space, execution of the design, maintaining the green space, and reflection on the results.

Using elements of the five concept ideas, together with the four contexts of use and the list of requirements have led to an iterative process with expanding and specifying ideas to come to one solution (see figure 51).

See appendix N for a more detailed explanation of the ideation process.

Results

These iterations finally resulted in a final concept for the toolkit, containing an introduction booklet, an inspiration seed box, an executed action display, exploration signs, a safari app, a maintenance diary, a design and execution workbook and activity calendar. The concept will be explained in more detail in chapter 8.

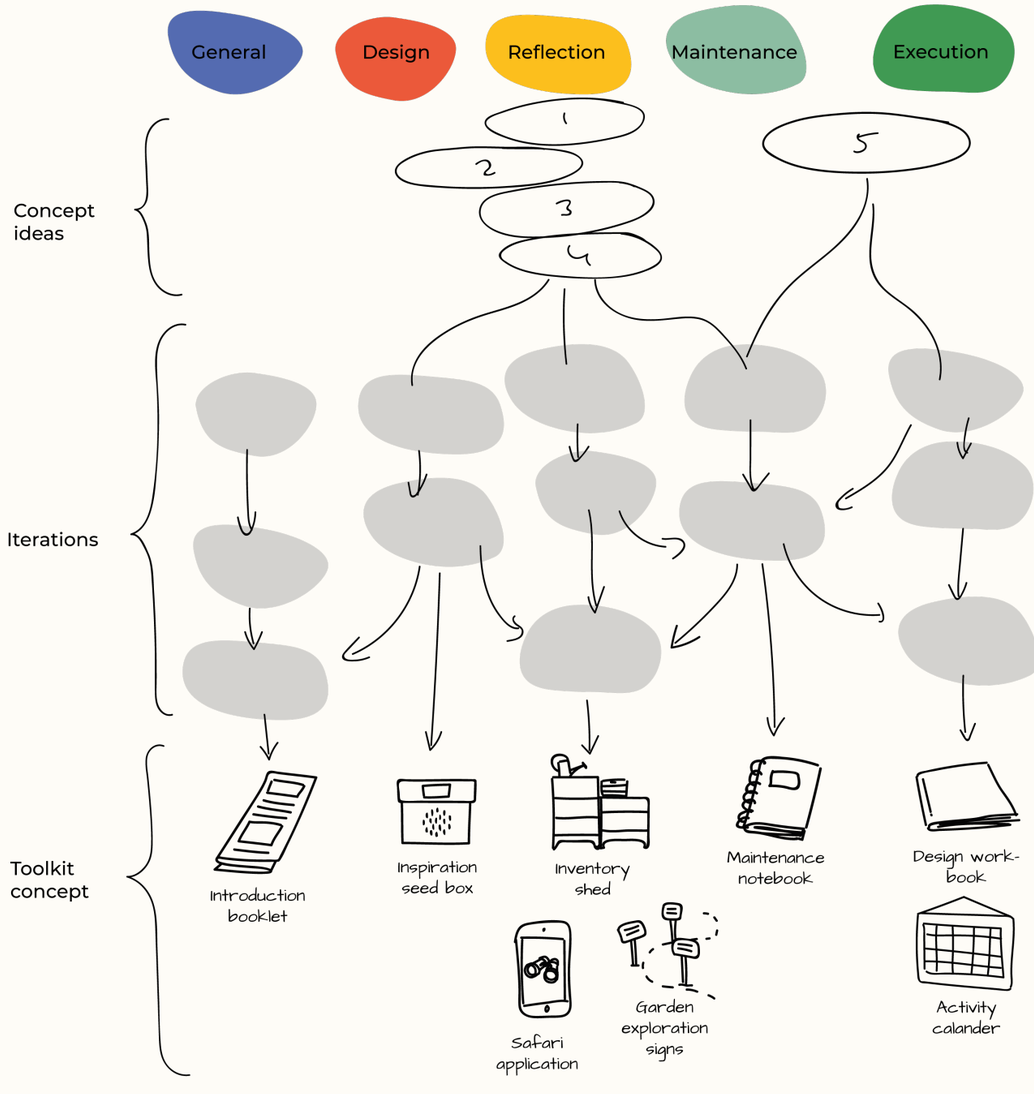


Figure 51 - Overview of the iteration process

CHAPTER 8
THE TOOLKIT

In this chapter, the concept for the toolkit is presented. The toolkit in general is explained in section 8.1 'introducing the toolkit'. Its separate items are further explained in sections 8.2 to 8.8. Lastly, some extra explanation is given on how different tools answer some of the design requirements in section 8.9 'conclusion'.

INTRODUCTION TO THE TOOLKIT 8.1

This toolbox is created for the green guardians of Rotterdam: the citizens who are making the urban environment a little bit greener, in any possible way. It provides support and inspiration to help them optimize the biodiversity of the ‘natural site’ that they create.

It can be incorporated in any approach, initiative type and group structure. It consists of 8 items with various functions and goals.

Figure 52 - Prototype of the toolbox, showing seven of the eight items.

1. Introduction booklet
The introduction booklet is not prototyped as it seems sufficient to substitute it by a verbal explanation for now. But it should include the following:

1) An explanation of the function of the toolbox and brief explanation of ecological gardening
2) An explanation of the tools and their usage
3) An explanation of the animal- and need-categories that are found in the toolbox

2. Box of inspiration seeds
Contains proverbial ‘seed packages’ with examples of actions that can be taken in the green area to improve biodiversity, while showing which effect this action would have on the relevant animal species.

3. Green area design workbook
Assists the user stepwise in performing the provided actions.

4. Activity calendar
Helps the user to perform the chosen action by reminding them of the activities that are required to take the actions.

5. Exploration signs
Show other people which actions are taken and why.

6. Inventory shed
Keeps track of the actions that are taken.

7. Maintenance notebook
Assist the user stepwise in maintaining the area while also maintaining its biodiversity.

8. Safari app
Shows the user the effect of their actions by stimulating the user to explore the animals that are supported in the area.

Items 2 till 8 will be further described in the subsequent sections.

BOX OF INSPIRATION SEEDS 8.2

The packages in this box ‘plant’ the metaphorical ‘seed’ by providing inspiration for ecological responsible actions that the user can take. The focus of these seed packages lies on the effect that each action would have on the life of a specific (group of) animal species, by highlighting their perspective.

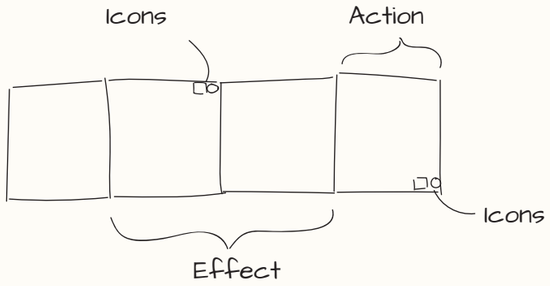
Tool break down

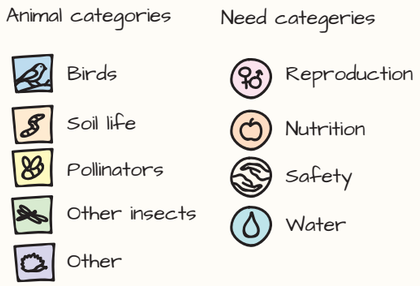
A particular species or group of species state an intriguing fact that shows their perspective (a ‘*did you know* …’), followed by further explanation.

The seed package concludes with the action that can be taken to answer their needs.

If the user is interested in performing the action, they can find the matching worksheet by searching for the relevant animal-category in the design workbook.

Icons show for which animal category the action is useful, and in which type of need it provides. In this prototype, there are five animal categories included that should cover all the local species. The needs of each animal category are broken down in four categories. At least one inspiration seed should be included for each animal category and favourably in combination with each need-category.





Design choices explained

The perspective given by the animal species are meant to act as inspiration for the user to find out what they can do to support these species in their own green area, and look up the relevant action in the workbook.

The effect that can be achieved was chosen to be presented first through the perspective of the relevant animal species, to move the focus of designing from the actions in the garden themselves towards the effect it has on animals and plants.

The set up of this tool is chosen to stimulate the user to pick a random seed package, so they learn about the perspective of unfamiliar or un-attractive animal- and plant species.

The tool is related to design requirement:

10. Provide a deeper understanding while not requireing too much time and effort

GREEN AREA DESIGN WORKBOOK 8.3

The design workbook contains worksheets that guide the realisation of the actions that are present in the inspiration box. The main functions of this tool are to explain what each action entails, and to stimulate to really take action, by breaking them down in activities that should be performed to realize the action.

Tool break down

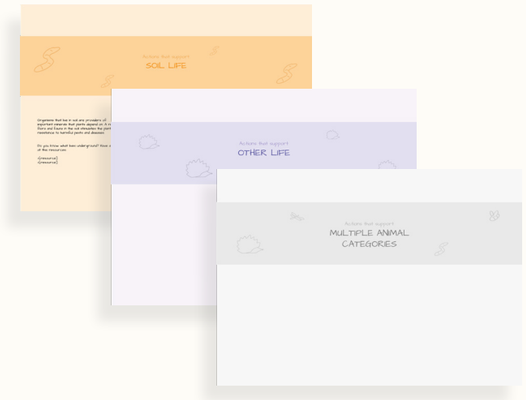
The worksheets are organized in five chapters for each of the five animal-categories, plus an extra chapter for actions that support the life of multiple animal-categories.

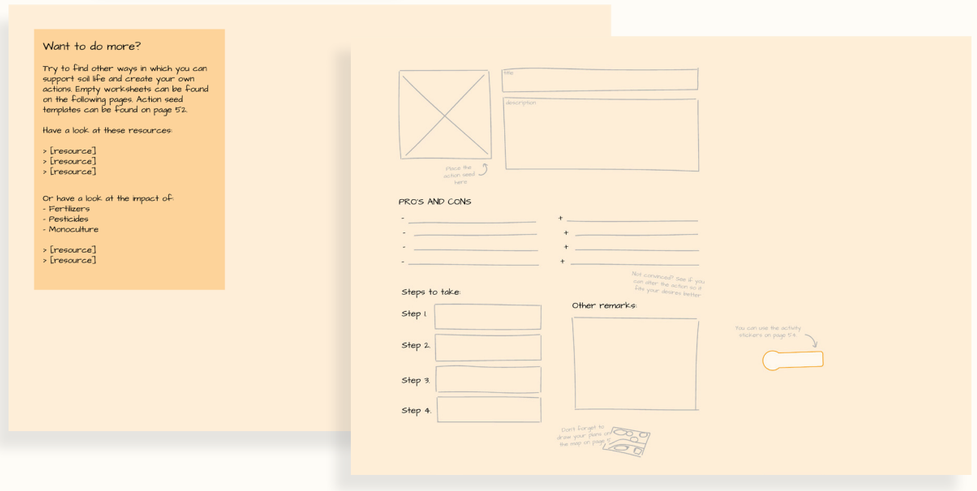
Each chapter contains prefilled worksheets and empty worksheet templates for the user to add their own found actions, including provided resources or research.

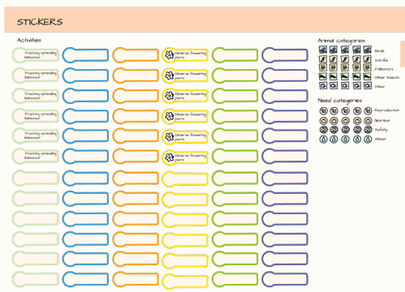
Stickers are included that involve the activities that need to be taken for some of the actions. These can be placed on the calendar.

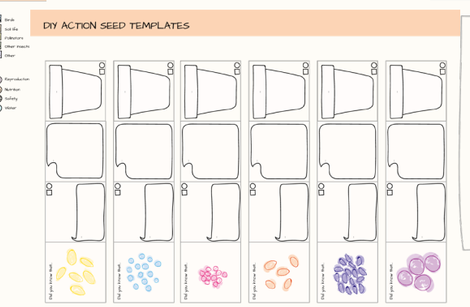
Empty seed package templates are included in the workbook to allow the user to add their own formulated actions in the toolkit.

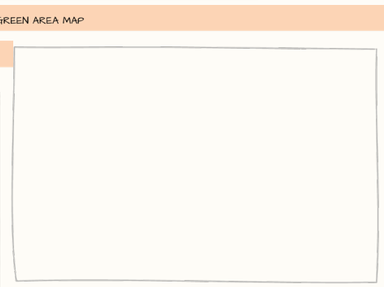
Includes a space for the area owner to draw a map of their area.











Design choices explained

Includes follow-up options for the user to dive deeper into the subject and to stimulate the user to research and create their own actions and find out the effects that they can achieve for the lives of animals. Empty templates are included to allow the user to add their own formulated action worksheets and seed packages.

To stimulate moving physical and mental space towards the animal- and plant-needs, but allow room for other personal values as well, an (semi-)open list of pro's and cons is included.

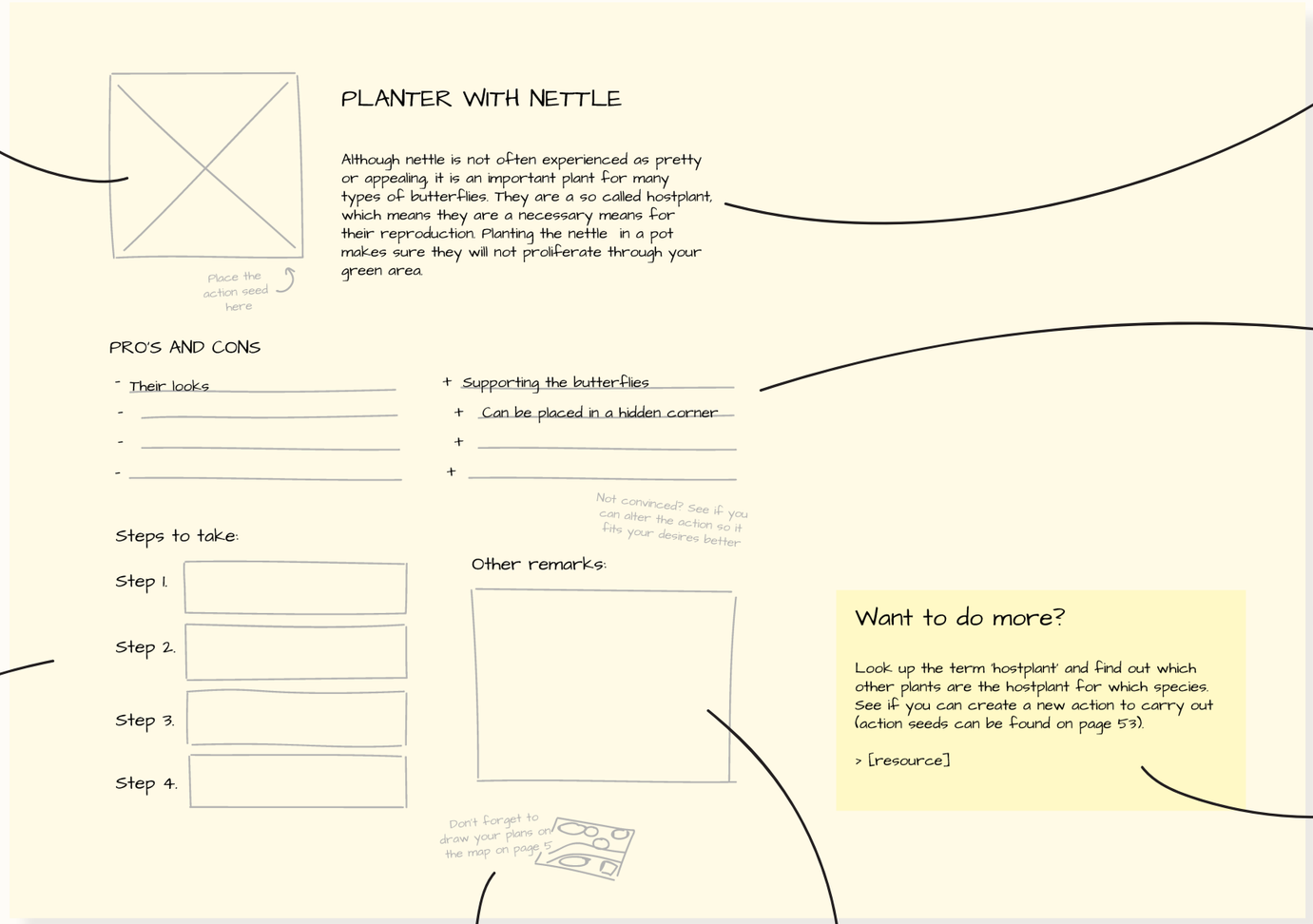
The tool is related to design requirements:

8 Include a translation to take action

10. Provide a deeper understanding while not requireing too much time and effort

Example of a worksheet

An empty space with slots in the corners to place the chosen seed package, for the user to communicate to himself or to others: “this is what we are going to work on.”



An explanation of what the action entails.

A, sometimes partly prefilled, pro’s and cons list, to allow the user to develop their own opinion and to choose if they want to perform the action or not.

Follow-up options that show relevant resources in case the user is interested and wants to do more.

Steps to take, sometimes provided by the workbook, sometimes open for the user to fill in.

A reminder to fill in the action in the map in the front of the workbook.

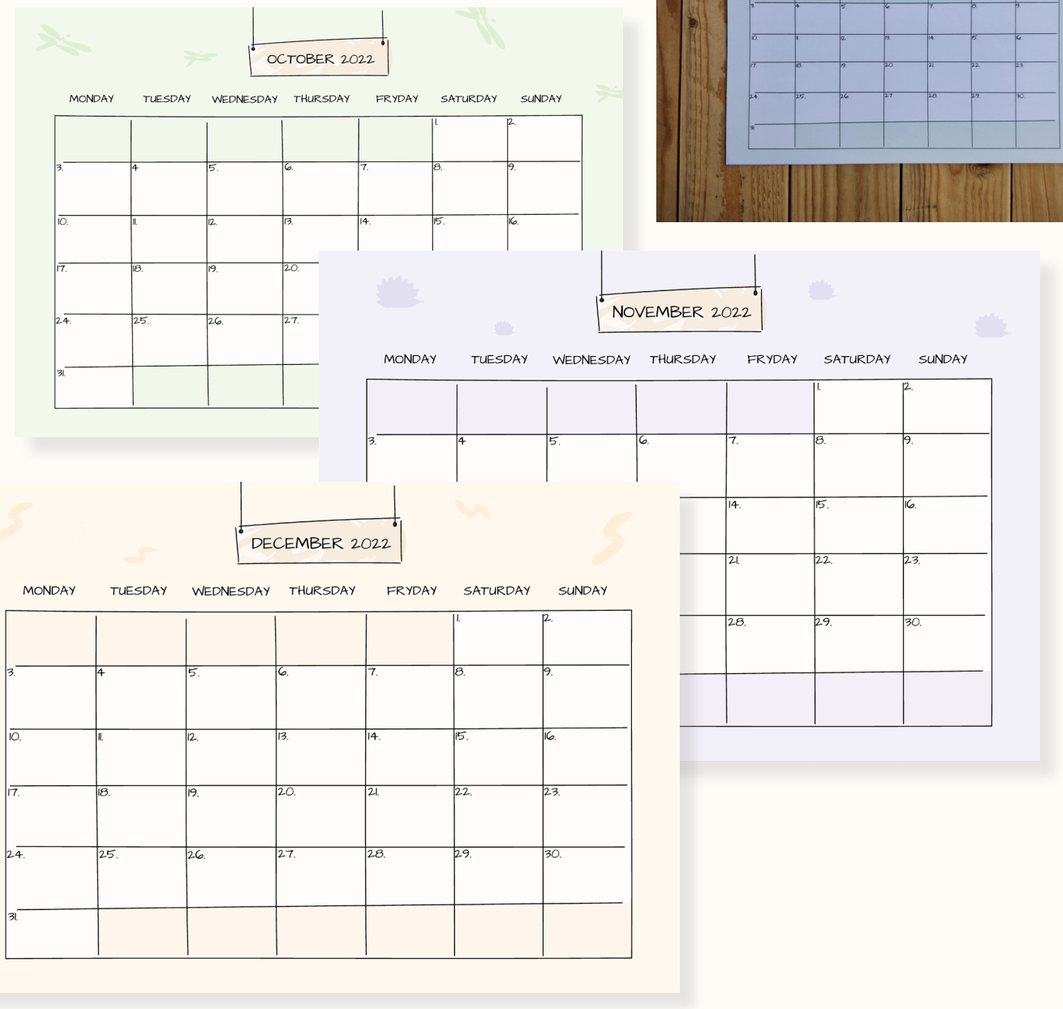
A blank space open for interpretation of the user.

ACTIVITY CALENDAR

8.4

The calendar provides the opportunity for the user to plan the activities that should be executed to realise the chosen actions. Empty and pre-filled activity stickers are provided in the design workbook. The main function of this item is to remind the user of really performing the actions.

This also provides the option to communicate and plan with potential others involved in the design and maintenance of the green area, and to divide activities among them.



The tool is related to design requirements:

8 Include a translation to take action

3 Support communication within the people involved

GREEN AREA EXPLORATION SIGNS 8.5

The before mentioned actions and their effects on the seed packages can be copied and placed as separate signs in the green area for other people to explore, so other people that come through the green area can learn about ecological gardening as well. At the same time, these signs allow the owner of the area to explain why certain choices are made and why their area might look less well-groomed to others, and maybe open up or support conversations. It also inspires neighbours and passers-to learn about ecological gardening and biodiversity.

Tool break down

Multiple signs should be included in the toolkit, so the owner can place multiple seed packages and explain multiple choices at ones.

There is an action-sign, that shows the realised action.

And an effect-sign with two sides: The ‘did you know’ side, and the explanation side.

Both signs stimulate the reader to look for and find the other sign to create a fun exploration experience.

Ziplock bags shield the seed packages from humidity.

Effect sign

Action sign

Design choices explained

The seed packages were chosen to be copied by the user, instead of providing copies in the toolkit, because self-made seed packages should be usable in the signs as well. The sings include the neighbours and passers-by and inspires them ass well.

The tool is related to design requirements:

7 Be used in the context of the green space

11 Be experienced as a fun addition

INVENTORY SHED

8.6

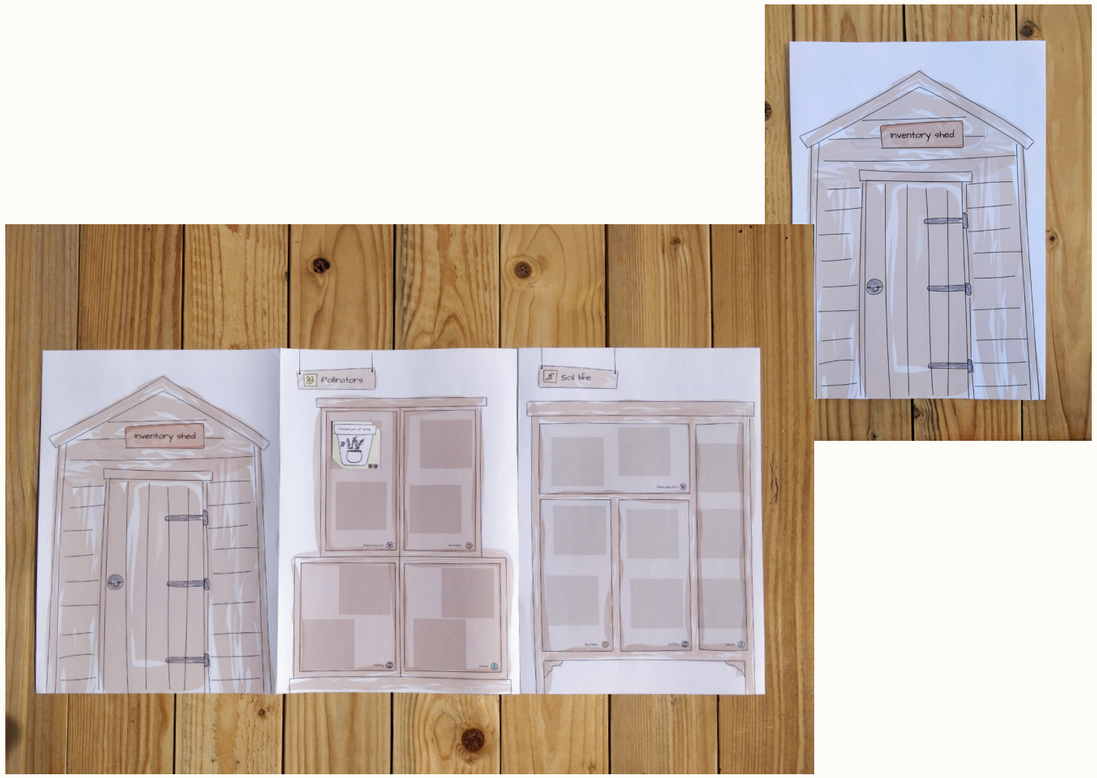
This is a harmonica booklet in which the user can keep an overview of the actions that they have realised in their green area, categorised per animal- and need-category that are relevant for the actions. There are two main purposes to this. Firstly, it should contribute in providing positive reinforcement about their accomplishments. Secondly, it stimulates to improve their green area for as many animals as possible, in as many needs as possible. Because supporting more animals improves biodiversity.

Tool break down

Each page covers one of the five animal categories, to provide a clear overview of which animal categories are supported by actions that are taken.

Four need-categories per animal-category, to see in which needs the animals are supported.

The sheeds contain open spaces with slots in the corners for placement of the seed packages.



Design choices explained

The realised actions were chosen to be categorized in the needs of the local animals that they provide for, to bring the focus from the users' actions themselves towards the effect that these actions have on the life of animals. To make them see: 'look, this is what you did for these species', and let them be proud of their accomplishments.

The idea is that the gaps in this overview stimulate the user to broaden its focus along all of these categories instead of just one that is appealing to them.

The tool is related to design requirements:

9 Be rewarding enough for the time and effort it requires

MAINTENANCE NOTEBOOK

8.7

This notebook guides the user in the context of their green area and maintaining it in an ecological way. It imitates a game of chess between nature and gardener : providing a step-by-step guide that alternates observation of nature and taking control by the gardener.

Tool break down

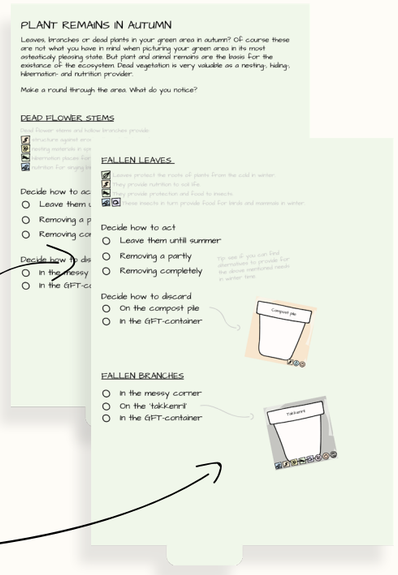
In this prototype there are worksheets for four different subjects: Unintended plants (weeds), Plant remains in autumn, Vermin and Pruning.

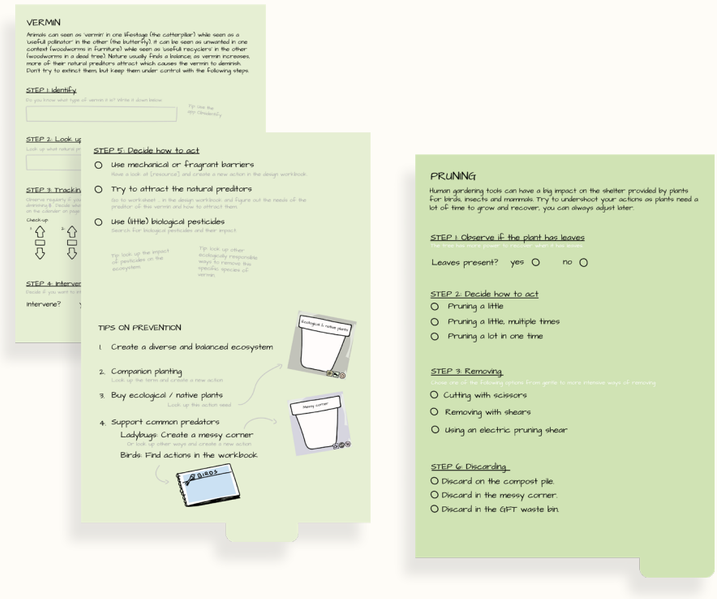
There are multiple copies of each subject, to fill out every time a situation occurs (so for every weed that pops up etc.)

Each worksheet includes an explanation of why it is good to not immediately take control but first go through the steps in the worksheet.

Options for control are presented from a less intensive to a more intensive impact to nature, in order to provide room for other values as well.

The worksheets refer to relevant seed packages that contain design actions that influence the way of maintaining.





Design choices explained

The notebook refers to relevant seed packages and provides options and resources for further exploration of the topics.

The set up of the notebook is chosen to imitate a game of chess, to stimulate the user to move from complete control to interplay with nature.

The tool is related to design requirements:

7 Be used in the context of the green space

8 Include a translation to take action

10. Provide a deeper understanding while not requireing too much time and effort

SAFARI APPLICATION

8.8

The safari application guides the green area owner and other people in experiencing the green area in different ways and to connect with its nature. The main function of the app is to show the user the effect of the actions they have performed by exploring the animals and their lives that they supported.

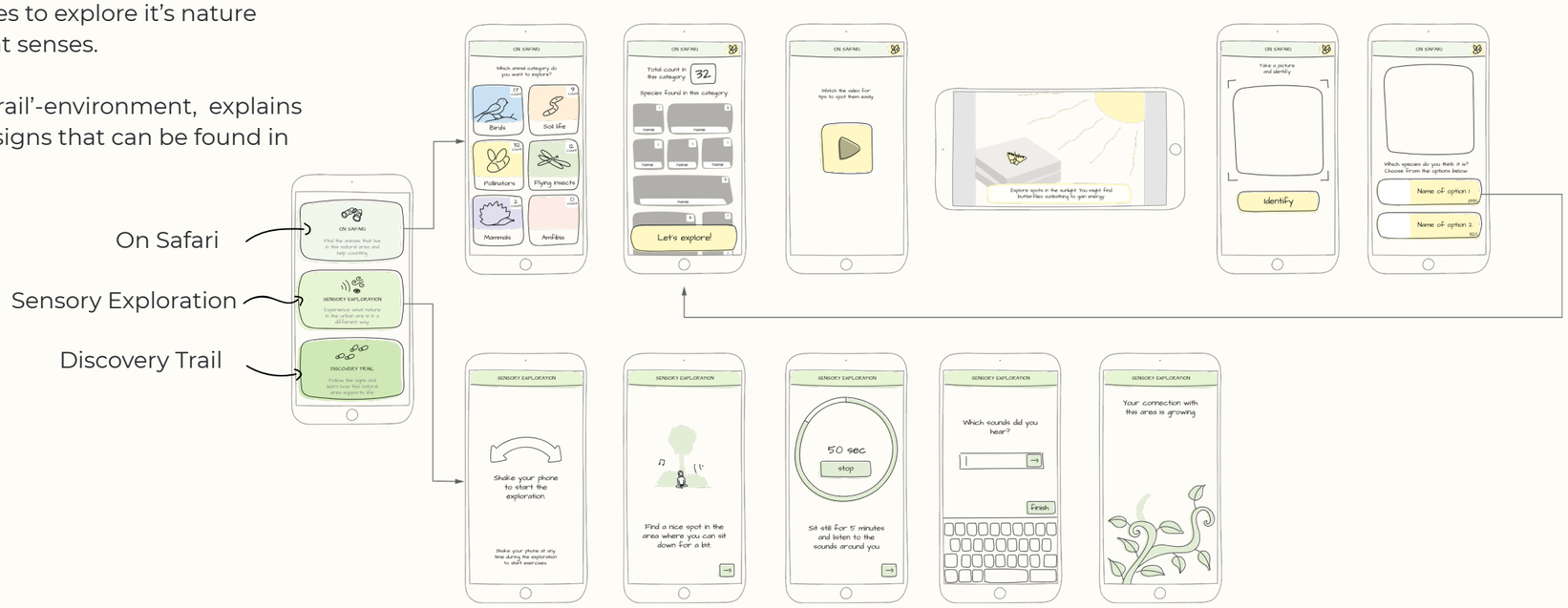
Tool break down

A QR code in the green area shows other people where to find the app.

The ‘On Safari’-environment, affords the user to explore and count the animals that are supported through the green area.

The ‘Sensory Exploration’-environment, provides exercises to explore it’s nature through different senses.

The ‘Discovery Trail’-environment, explains the exploration signs that can be found in the area.



Design choices explained

By providing exploration possibilities of the animals that are present, the user experiences the green area at the level of the effect, instead of the green area itself or its aesthetics.

By exploring these animals, green pioneers, neighbours and passers-by will learn about the life of unfamiliar species.

By shifting the attention to observing nature and natural processes, the user is encourage to experience the interaction with their green space less as a one way creation and more as interplay between human input and natural processes.

The tool is related to design requirements:

7 Be used in the context of the green space

9 Be rewarding enough for the time and effort it requires

CONCLUSION 8.9

Design requirements and the toolkit

The workbook and notebook are set up in such a way that it provides options to do more research. Additionally, they give enough bite-sized information as the user can decide themselves how much time they will spend on the toolkit.

1 Tap into autonomy and competences of the target group

9 Be rewarding enough for the time and effort it requires

10. Provide a deeper understanding while not requireing too much time and effort

The toolkit is set-up so it can be used by a group or the individual and can be integrated into any kind of approach and project.

2 Be able to be used by the group as well as the individual

5 Be applicable for different types of projects

6 Be applicable in the wide variety of approache

The tools are set up with little interactions such as the stickers and the placement of the seed packages, to make it a fun and creative experience. Images and step by step information is used to make it approachable.

11 Be experienced as a fun addition

Interactions between the tools explained

(See overview in figure 53) The user can start with getting a **seed package** from the inspiration seed box. The user can then find a matching worksheet in the **Design Workbook**, and temporarily place the seed package on the sheet. Activities that need to be taken to perform the action are provided as **activity stickers** in the workbook, which can be placed on the **Activity Calendar**. If the action is performed, the seed package is moved to the overview of performed actions in the inventory shed. It can be copied to place them in the garden with the provided Exploration signs. **The Safari Application** mentions and introduces other people to the exploration signs. The **Maintenance Notebook** refers to related actions in the **Design Workbook.** These last three tools are meant to be used in the actual green area itself, while the other tools are more suitable for inside usage.

Figure 53 - An overview of how the components are interlinked with each other

CHAPTER 9
DISCUSSION AND CONCLUSION

In this final chapter, the toolkit concept is evaluated on its feasibility in section 9.1 and on achieving the desired effect in section 9.2 'evaluation'. These resulted in recommendations for the toolkit in section 9.3. The project will be concluded in section 9.4.

FEASIBILITY 9.1

In this section the toolkit will be analysed on its feasibility; Can it be produced? As there is no company involved yet, the concept has been developed without any costs requirements in mind. This gave great design freedom and kept the main focus on the effects and functions that needed to be achieved. However, it is likely that the concept needs to be narrowed down when it will be really developed. The goal of this feasibility estimation is to be able to give recommendations on if and how the core of the concept should be altered or compromised in order to reduce costs. Therefore, a rough estimation is sufficient. First, an estimation of the required production costs for the current concept is given. Then, comparison is done with the prices of existing similar products that are sold on a similar scale to estimate its feasibility.

Cost estimation

(See figure 55) A quick search on the internet was done to define the production costs for the printed products (including a presentation folder as container, an introduction booklet, 20 seed packages, the design workbook, the calendar, maintenance notebook and inventory shed) and the costs for purchasable items (including a cotton bag as container for the seed packages, 20 exploration signs and 40 small plastic bags to protect the seed packages form rain when placed in the exploration signs). Experts were consulted on the required hours for graphic design and the required hours and licenses for the development of the safari app.

As a specific quantity couldn't be specified, final costs per toolkit were calculated for three different quantities: 1000, 2000 and 3000. They resulted in the following cost estimations:

Costs per toolkit total	
Quantity:	**Costs:**
1000	**119.18**
2000	**78.29**
3000	**64.65**

Figure 54 - Production costs per toolkit

This seems quite high, especially when considering the fact that a few costs are not yet incorporated in this estimation. Firstly, the costs for the manual labour of placing the seed packages in their container. And secondly, a few specialised production methods were not included as they need to be requested separately and a quotation needs to be made by the company. The final production costs per toolkit will therefore likely turn out higher in reality. This is also dependent on the actual production quantity and the amount of profit that needs to be gained by the company that will eventually produce the toolkit.

		Production costs per toolkit				
		Subject	**Price**	**Per..**	**# per toolkit**	**Price per toolkit**
1	**Container**	Total production	1903.99	1000.00	1.00	**1.90**
2	**Introduction boolket**	Total production	563.69	1000.00	1.00	**0.56**
3	**Seed 'packages'**	Purchase bag	17.50	50.00	1.00	**0.35**
		Production 'packages'	233.02	1000.00	20.00	**4.66**
4	**Design workbook**	Production workbook	7871.80	1000.00	1.00	**7.87**
		Production stickers	2764.02	1000.00	1.00	**2.76**
5	**Signs**	Signs purchase	19.99	50.00	20.00	**8.00**
		Plastic bags purchase	15.87	500.00	40.00	**1.27**
6	**Calendar**	Total production	3359.93	1000.00	1.00	**3.36**
7	**Maintenance notebook**	Total production	4932.37	1000.00	1.00	**4.93**
8	**Inventory shed**	Total production	219.24	1000.00	1.00	**0.22**
9	**App**	Licenses	1.5	1000	1000.00	**1.50**
					Total	**37.39**
		One-time costs				
		Subject	**Price**	**Per**	**# needed**	**Price total**
1-8	**Everything else**	Graphic design printables	54.45	hour	80	**4356.00**
9	**App**	Graphic designer app	54.45	hour	40	**2178.00**
		Animations	5000	animation	6	**30000.00**
		Software developer app	113.14	hour	400	**45256.00**

Figure 55 - Production costs estimation

To get a better image of how profitable the toolkit could be, the prices of other toolkits are taken into consideration.

Prices of similar products

A number of products were selected based on various similarities (see appendix O for further explanation of the selected products) and their prices were compared (see figure 56). All selected products are focussed on nature exploration or gardening. A few kits are included, of which some contain both printed products and (purchased) material items. For instance, a kit to explore mushrooms in the wild, containing an information booklet, a little mirror, a magnifying glass and a guiding book for € 15,-. Or a set for animal friendly gardens, which can be bought separately but in total consist of 6 flow-chart cards and 6 signs that can be placed in the garden, which comes down to € 52,-. Other kits solely contain printed items. These range from € 14,95 for a set of 5 animal and plant search cards (produced by Natuurmonumenten), to € 66,- for a similar set of 7 search cards (produced by IVN). Lastly, there are a few singular products selected, like the app Obsidentify, that can be used to identify plants and animals through image recognition, for € 0,- , the individual animal friendly garden signs costing € 5,75 and a number of books with a price range from € 20,- to € 29,95.

Figure 56 - Prices of similar products

Comparison and conclusion

Regarding the amount and type of items included in a kit, the toolkit is most similar to the 'Kriebelbeestjes' kit for € 39,95, which contains a similar amount of purchased and printed items (see appendix O for the complete list). However, this product might have a higher production scale than the toolkit, as it is targeted at people with children and schools. The scale of production of the toolkit might be more similar to that of the Animal Friendly Garden products, as they are targeted at green area-owners who are interested in improving biodiversity as well. These include the singular signs for € 5,75 and the set of 6 flowchart cards for € 17,50. People will likely pay within a range of € 23,25 for the flowcharts with one sign, to € 52,- for the complete set. One element that is present in the toolkit but missing in both of these products, is the inclusion of an app. Considering that in the cost estimation for the toolkit the costs for the application development are the highest, it is surprising that the Obsidentify app can be purchased for free. It is questionable if a similar app like the Safari App would increase the value of the toolkit.

Based on this analysis, a feasible price for the toolkit would be around 30 or 40 euro's. Based on the assumption that the final price of the toolkit should be profitable, or at least not loss-making, this means that the costs for the toolkit as defined by the current concept are significantly too high.

Advise

There are some changes that can still be made in order to reduce the costs without changing any of the functions of the current concept. In figure 55 the highest costs are highlighted. Some ideas on how these costs could be reduced, can be found in Appendix O. However, this feasibility analysis suggests that these individual changes together might not to be sufficient. This means, core changes should be made to the concept. As costs for the app are the highest. It might be worth considering to include its features in the toolkit in another form. The following section will further explore this challenge, where the evaluation of the toolkits' effect and desirability will give more insights on how to make some core changes.

EVALUATION

9.2

The goal of this section is to evaluate if the concept will reach its intended effect and what changes could be made to improve this.

The main question therefore is: does the concept connect enough to the green pioneers of Rotterdam to incite action and what could be improved?

To answer this question, two separate evaluation sessions were conducted with two people who are well involved with the target group. See appendix P for a description of the sessions.

Results

In figure 57 an overview of the feedback per tool can be found, including positive feedback, negative feedback and idea's for improvement.

The toolkit was experienced as inspiring, insightful and positive. Its creative and playful elements were seen as a pro that would make it fun to use the toolkit. Some of the elements were expected to get people into action. The variety of the toolkit was seen as a plus, as it provides different levels of experiencing ecology, and serves people with different interests. Some tools were rated as usable with multiple people, like the inspiration seeds, the inventory shed and the application. Lastly, the participants mentioned that it is an advantage the toolkit can be used the whole year through.

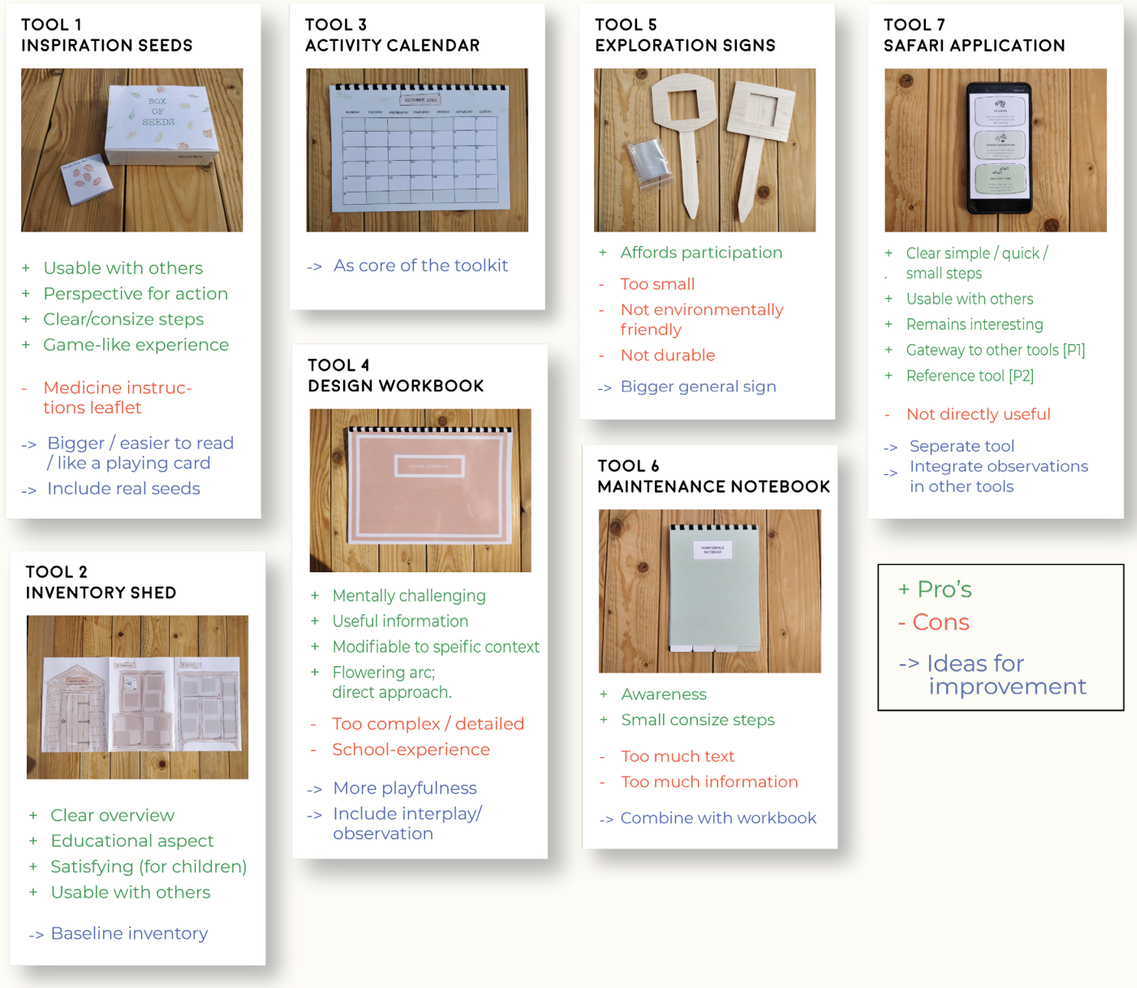


Figure 57 - Feedback per tool

The main negative feedback on the toolkit was that it is too complex and too complicated.

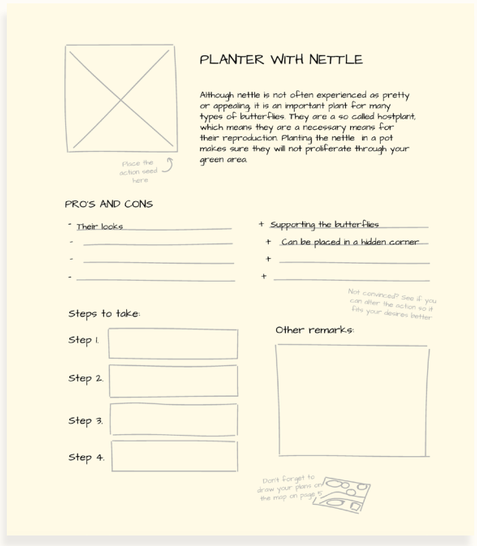
It contains too many items that refer to each other, which makes it playful but also complicated for the user, as it asks for extra steps. The participants were worried that people's attention span will be challenged by this, and they might drop out.

Furthermore, they pointed out that there are too many redundant steps within the tools. For instance the pro's and cons in the Design Workbook (see figure 58). These were chosen as means to break down the actions and make it more approachable for the user to get into action, but as these steps require attention before actually getting into action in the garden, it actually postpones the action and works counterproductive.

For example: if the user is intrigued by an Inspiration Seed to perform the action, they first need to find the action in the workbook, fill out the steps and only then they can go to their garden to actually take action. Most people will just want to get started instead of filling out a form at their desk. Although the Maintenance Notebook is meant to be used in the context of the green area, the steps within it were assessed as counterproductive as well.

A last factor that was mentioned as contributing to the toolbox's complexity is the amount of text. For instance in the

Maintenance Notebook, where the steps are wrapped in so much text, it is not appealing anymore to perform them.



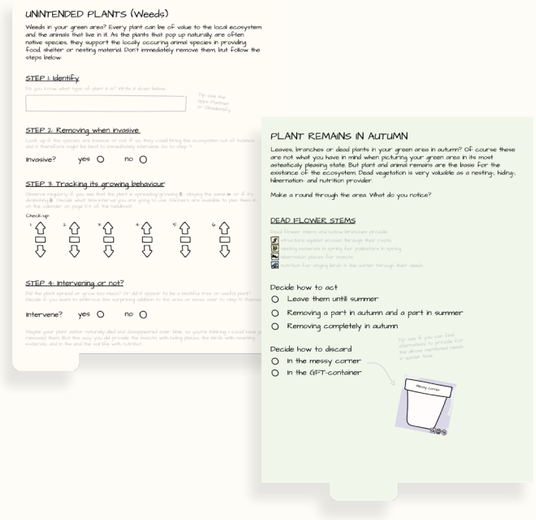


Figure 58 - Elements that make the toolbox too complex

Conclusion

The elements within the tools are inspiring, but the complexity of the complete toolbox counters the desired effect. The small steps that were provided in some of the tools were meant to provide action perspective, but turn out to be assessed as redundant and counterproductive. Some of the elements that do well in inspiring to activate, are the Inspiration Seeds and the flowering arch-template in the Design Workbook. The factors that made them reach the aspired effect, are that they are both very visual and contain clear and concise steps. These factors should be utilised in the complete toolkit.

7 Be used in the context of the green space

Using the tools in the context of the green space itself appears to not necessarily be a requirement to stimulate activation. Giving positive examples of what an action could look like could be a better stimulation.

RECOMMENDATIONS

9.3

The main direction for the real toolkit is clear: It needs to be less complex. This will make it more feasible, desirable and effective. But how to do this? Of course it will not be sufficient to simply delete some of the tools, as desirable functions will be lost. The challenge is to change the concept in such a way that it includes all or most of the desired features, while minimizing complexity. Figure 59 shows an overview of the features of each tool that should be pursue in the final version of the toolkit to keep its essence and the features that were rated positively during the evaluation sessions.

Inspired by some of the ideas for improvement from the evaluation sessions, a suggestion for a possible refinement of the concept is given (see image 59).

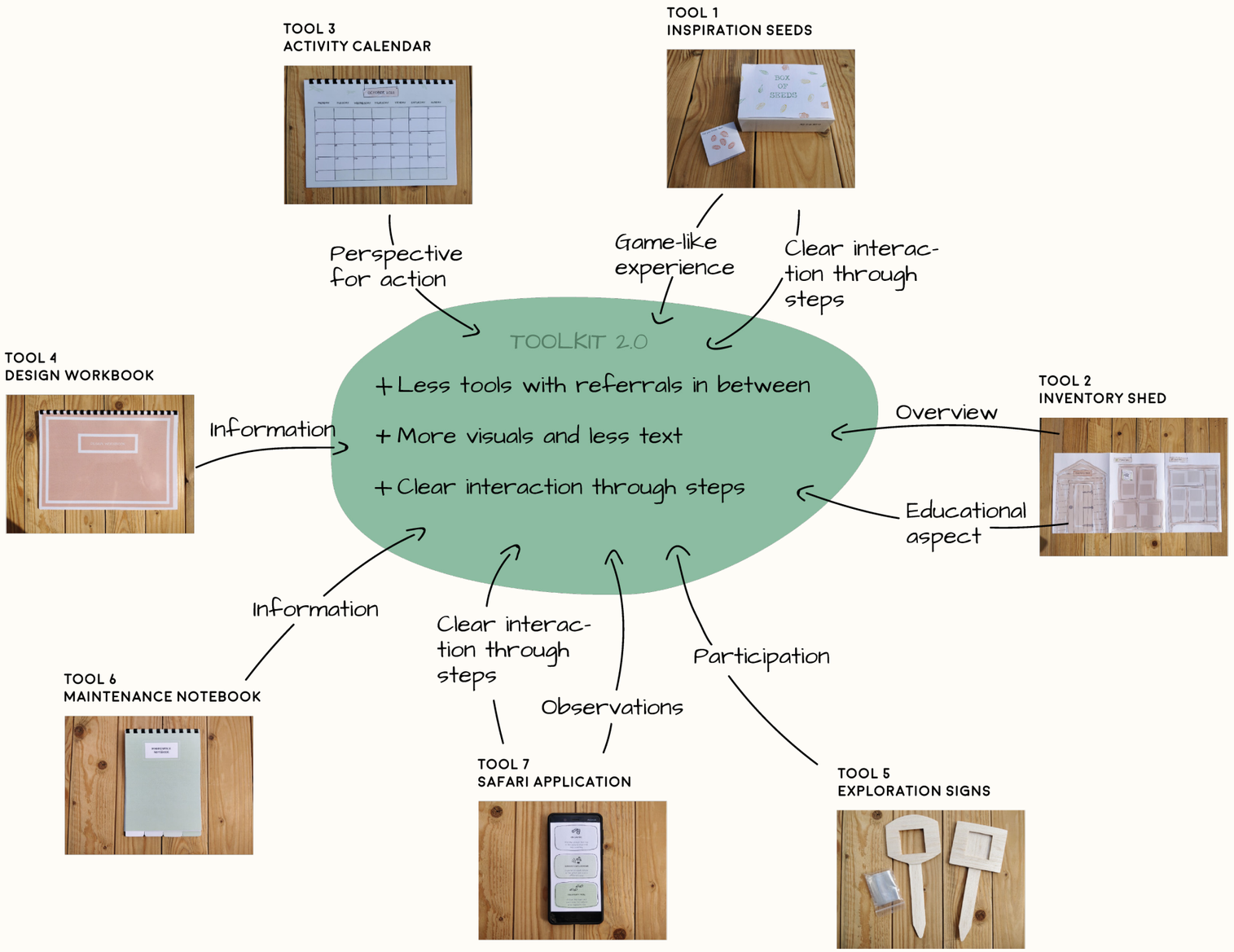


Figure 59 - Elements that should be incorporated

Suggestion

In this concept, the calendar is the main item, in which most of the features of the other tools are combined. (See images 59, 60 and 61)

The step-built-up of the **Seed Packages** proved favourable, could be largely taken over in this calendar. By using the calendar format, the randomness factor of the seed packages is included.

The information on what the action entails as is shown in the **Design Workbook**, is presented directly in this tool. The extra steps of the Workbook are mostly left out, as they proved counterproductive. Open templates and referrals to resources for further research could still be included but might rather be presented at the end of the calendar or as a separate tool, to be purchased by people who developed further interest for the topic of ecological gardening.

The information from the **Maintenance notebook** is included as well. However, without options for the user to react. The previous referrals to relevant design actions in the Design Workbook are excluded, as the user will naturally come across the actions at some point in the calendar.
The observation from the Safari App will be included in the calendar and directly follow up on relevant actions and maintenance tips.

The **Inventory Shed** can be largely taken over as a separate tool, with a focus of presenting it outside in the green area so it can be shared with group members and other people.

The **Exploration Signs** could be included, similarly as separate signs but more durable and environmentally friendly or as a general information/inspiration sign in which the finished calendar sheets are taken up.

An added feature could be to provide something that would organise the finished or ripped calendar sheets so it can be used as a reference book afterwards.

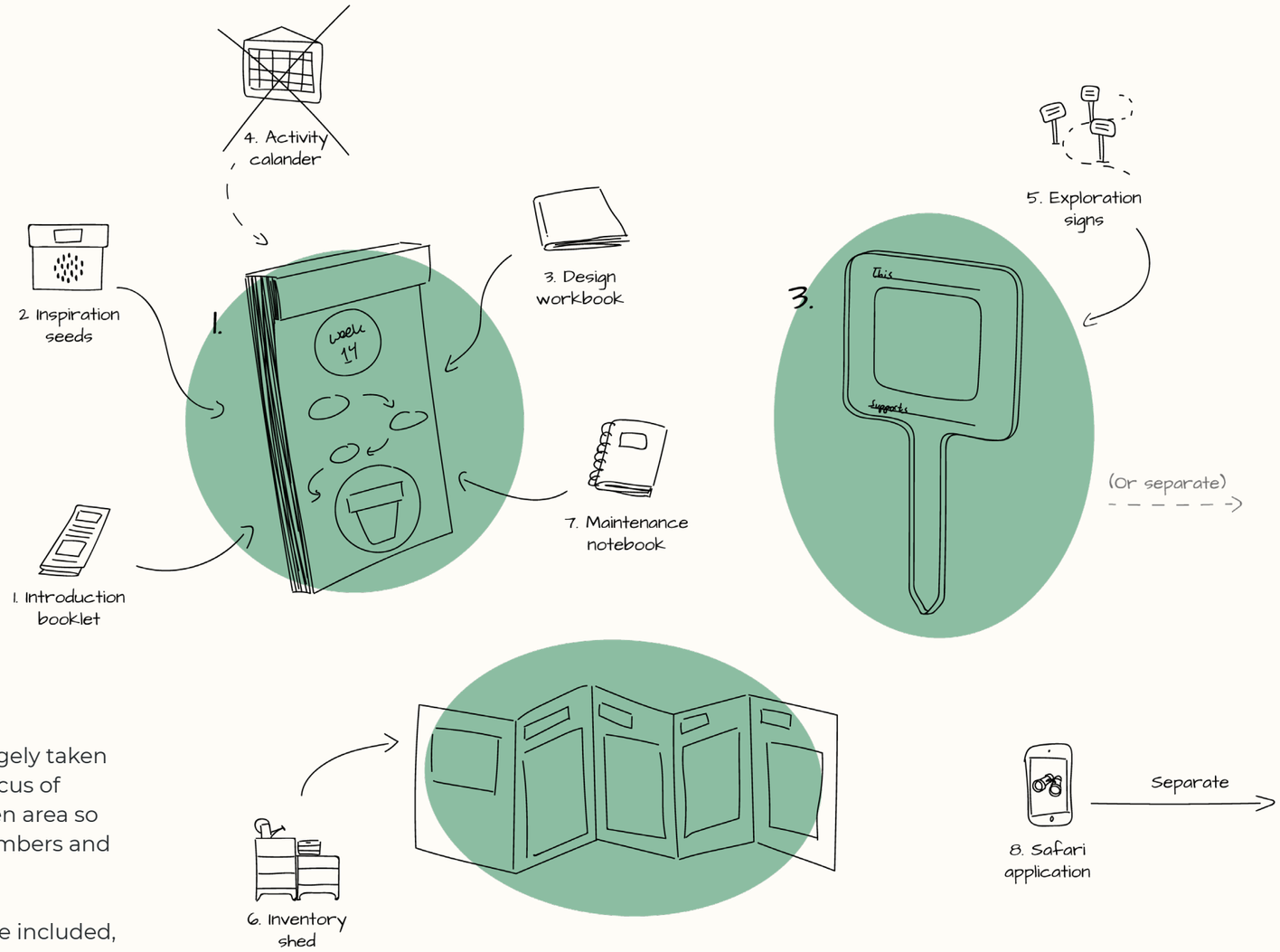


Figure 60 - A suggestion for a possible refinement of the concept

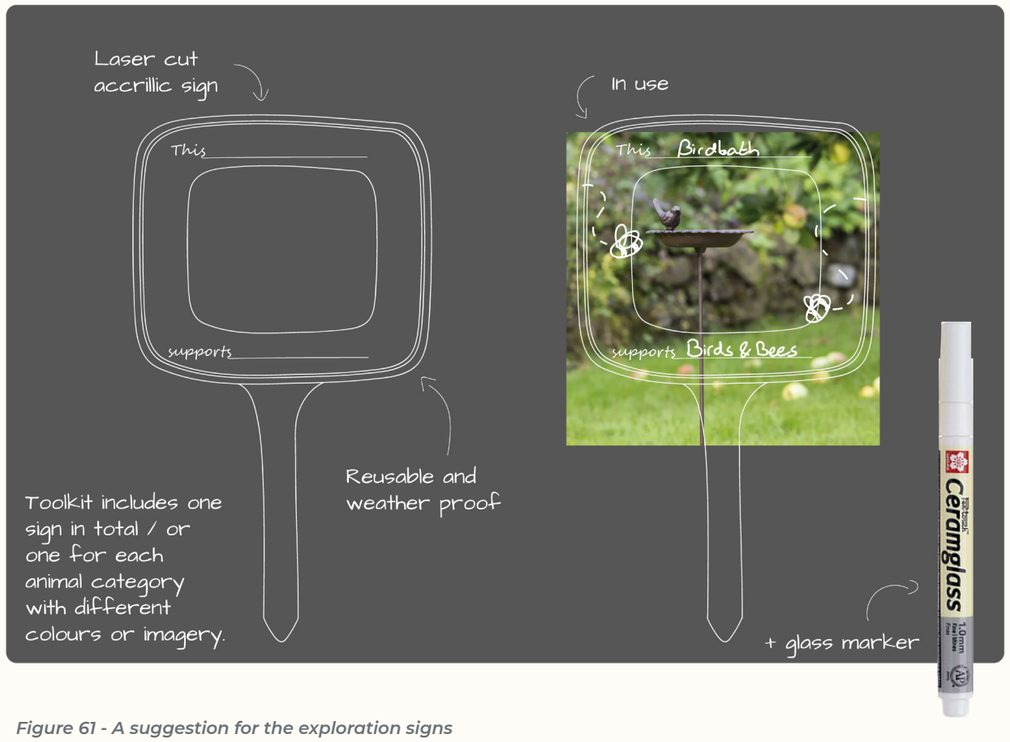


Figure 61 - A suggestion for the exploration signs

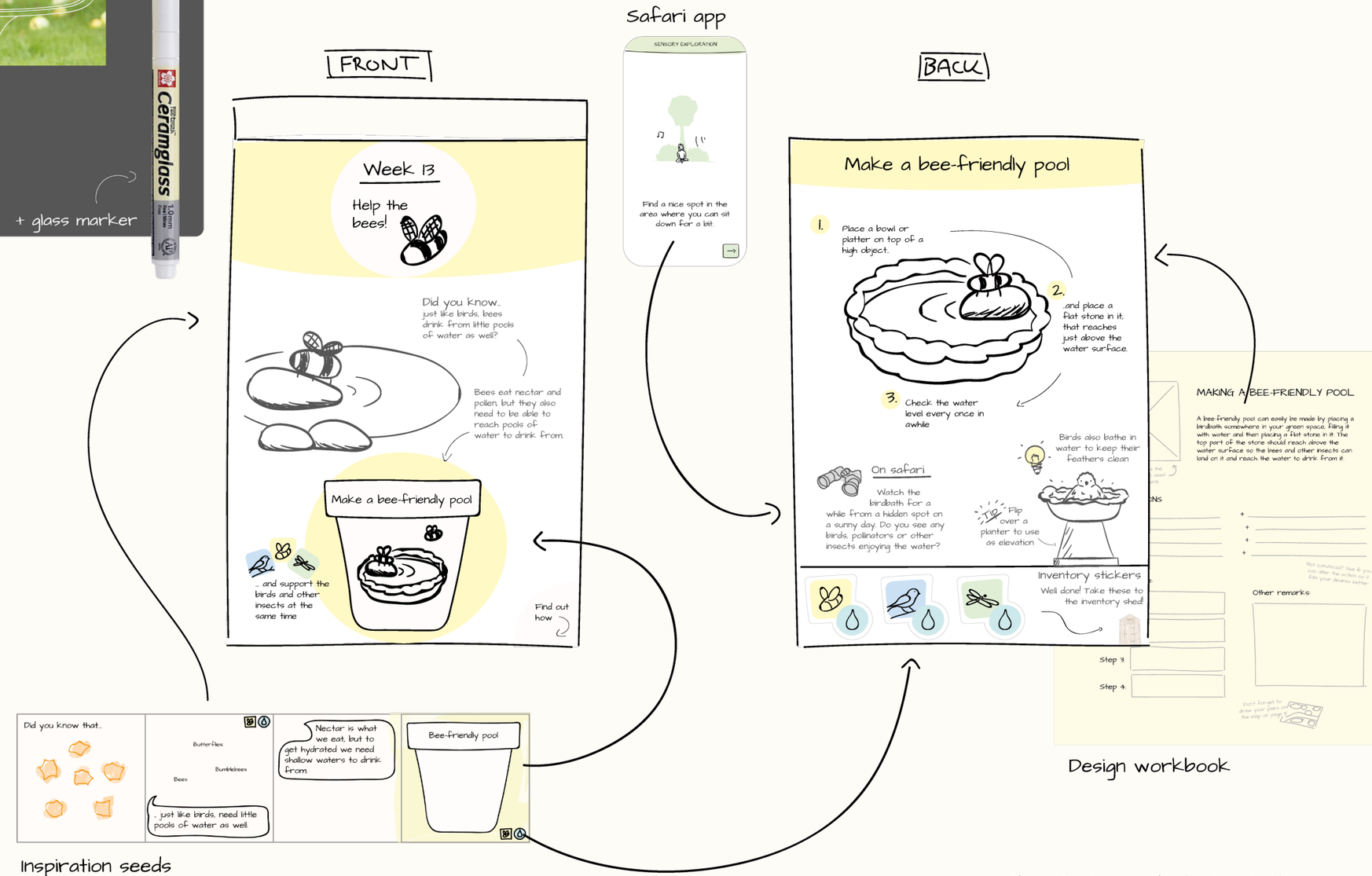


Figure 62 - A suggestion for the calendar

CONCLUSION & DISCUSSION 9.4

This project started with the goal to help green pioneers improve their contribution to the local climate-challenges. Better framing of the project in the beginning could have resulted in better insights in the beginning phase of the project. For instance, it was already the aim in the beginning to design a toolkit. Finding stakeholders who could have produced and sold the toolkit in the beginning of the project would have helped to make the project less theoretical.

A first exploration phase was targeted at finding a solution space for the design. This resulted in a better image of the target group and a better focus for the design, namely the focus on ecological gardening, but not yet a solution space to start designing from. The focus within the case studies could have been expended to the activities that they performed within their initiatives. Better framing of the goal of the project at the start would have helped to do so.

A second exploration phase was incorporated, to explore ecological gardening and the difference between current gardening behaviours. Both the secondary research and the concept tests that were conducted were quite theoretical. Observing a natural gardening course was meant to offer more practical insights, but turned out to be more theoretical as well. Observing and questioning a few people while they were working in their garden or initiative, would have been a good alternative.

The second exploration phase resulted in enough insights and inspiration to start designing. The toolkit that resulted from the designing phase was very broad in order to achieve all the desired effects. The evaluation sessions were very fruitful as they gave very clear insights on why they would or wouldn’t fit the green pioneers of Rotterdam. This helped to narrow down the concept while still performing the desired features and effects.

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