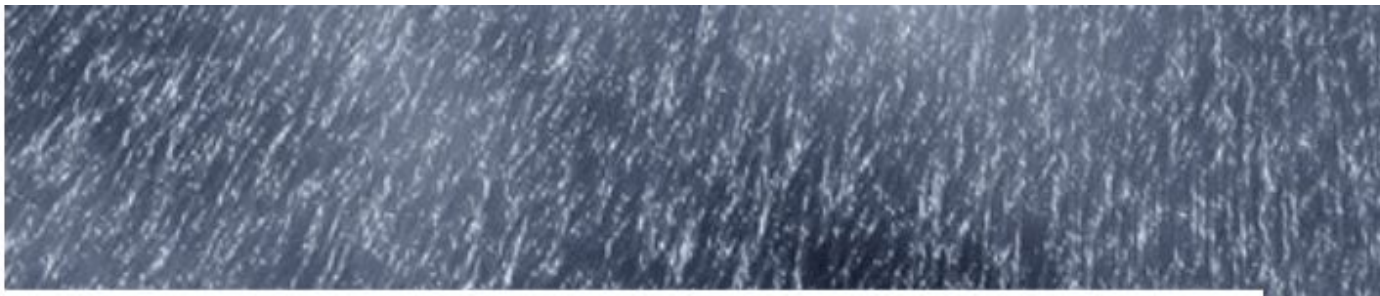

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Smart Rainwater Buffer XXL - Design in Public Spaces

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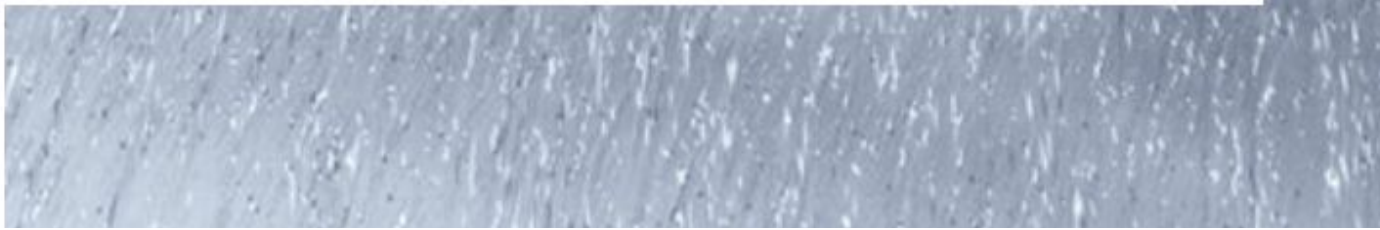

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Table of Contents

Table of Contents **2**

Abstract **6**

Token of Appreciation **7**

List of Abbreviations & Information **8**

1 Introduction **9**

1.1 Context of the SRB XXL and “de Regentoren” Project 9

1.2 Public Challenges of the SRB XXL 11

1.3 Research Question 12

2 State of the Art **13**

2.1 Research on Design Approaches 13

2.1.1 Participatory Design 14

2.1.2 User-Centered Design 16

2.1.3 Conclusion 17

2.2 Current Rainwater Management 17

2.2.1 Rainwater Management in Enschede 18

2.2.1.1 Wadi 18

2.2.1.2 Groene Linie 19

2.2.1.3 Green Roofs / “Ecopan” 19

2.2.1.4 Brooks 20

2.2.1.5 De Regentoren 20

2.2.2 State of The Art 22

2.2.2.1 Slimme Regenton “Diamant” 22

2.2.2.2 Slimme Regenton “Zoho” Zomerhofkwartier 23

2.2.2.3 Rainproof Amsterdam: Circl 24

2.2.2.4 Rainproof Amsterdam: “XL Gevelborder” 25

2.2.2.5 Loxone Rainwater Harvesting 26

2.2.2.6 Singapore Rainwater Harvesting 27

2.3 State of The Art Conclusion 28

3 Methodology **29**

3.1 Ideation 29

3.1.1 Stakeholder Analysis 29

3.1.2 Empathic Design 31

3.1.3 User Involvement 32
3.1.2.1 Collaging 33
3.1.2.2 Scenarios 34
3.1.2.3 Brainstorming & Prototyping 35
3.1.2.4 Interview 36
3.1.4 Double Diamond Model 37
3.1.5 Requirement Analysis 38
3.2 Specification 39
3.2.1 Detail Description of SRB XXL 39
3.2.2 Experience Specification 39
3.2.3 SRB XXL Context 39
3.3 Realization 39
3.4 Evaluation 40
3.4.1 Questionnaire 40

4 Ideation 41
4.1 Stakeholder Analysis 41
4.1.1 Municipality of Enschede: Hendrijkan Teekens 42
4.1.2 Waterboard Vechtstromen: Jeroen Buitenweg 42
4.1.3 University of Twente: Richard Bults 43
4.1.4 Supervisor: Wouter Eggink 43
4.1.5 Inhabitants of “de Bothoven” Area 43
4.1.6 Inhabitants of Enschede 44
4.2 Participatory Design Session Realization 44
4.2.1 First Round: Collaging 45
4.2.2 Second Round: Scenarios 47
4.2.2.1 Scenario 1: Edgar / Michael 47
4.2.2.2 Scenario 2: Seuren / Dieter 48
4.2.2.3 Scenario 3: Margarita / Sara 49
4.2.3 Third Round: Brainstorming & Prototyping 49
4.2.4 Conclusion 51
4.3 First Design Iteration 51
4.3.1 Design 1: Ribbon 52
4.3.2 Design 2: Tap 53
4.3.3 Design 3: Pavilion 54
4.4 First Round Stakeholder Interviews 55
4.4.1 Co-Designer Interviews 55
4.4.2 “De Bothoven” Resident Interviews 56
4.4.3 Conclusion 56

4.5 Second Design Iteration 57
4.5.1 Design 1: Umbrella 57
4.5.2 Design 2: Garden 58
4.5.3 Design 3: Light Bulb 59
4.6 Second Round Stakeholder Interview 60
4.6.1 Municipality of Enschede Client Interview 61
4.6.2 Supervisor Discussion 61
4.7 Third Design Iteration 62
4.8 Final Design Iteration 63
4.9 Stakeholder Requirements 65

5 Specification 67
5.1 Detail Description of SRB XXL 67
5.1.1 Detail Description 67
5.1.2 Water Scale Educational Facts 69
5.2 Experience Specification 69
5.2.1 Personas 69
5.2.1.1 Persona 1: Dieter Hendriks 70
5.2.1.2 Persona 2: Sujang Park 71
5.2.1.3 Persona 3: Sara Hoekstra 72
5.2.2 Scenarios 73
5.2.2.1 Scenario 1: Rainy Day 73
5.2.2.2 Scenario 2: Awareness 74
5.2.2.3 Scenario 3: Window-View 75
5.3 SRB XXL Context 76
5.3.1 Physical Context 76
5.3.2 Social Context 78

6 Realization of the Scaled Model 79
6.1 Technical Details and Tools 79
6.1.1 Technical Details 79
6.1.2 Tools 80
6.2 Construction of Final Model 81

7 Evaluation 84
7.1 Co-Designers Evaluation 84
7.2 “De Bothoven” Representatives Evaluation 85
7.3 Conclusion 86

8 Conclusion 88
8.1 Reflection on Research Question 88

8.2 Further Recommendations 89
8.2.1 Further User Involvement 89
8.2.2 Design Recommendations 90
References **92**
Appendix A: Co-Creation Session Preparation 101
Appendix B: Co-Creation Session Results 114
Appendix C: Co-Creation Session Participant Interviews **115**
Appendix D: User Focus Group Interviews **124**
Appendix E: Decision Maker Interview **130**
Appendix F: Final User Evaluation Script **132**
Appendix G: Final User Evaluation **135**

Abstract

The project "Smart Rainwater Buffer XXL - Design in Public Spaces" revolves around designing a Smart Rainwater Buffer XXL with aid of co-designers and users, following a participatory and user-centered design approach. Due to its upscaled size, the successor of the Smart Rainwater Buffer raises a lot of attention and is aimed to be placed in "de Bothoven" area in the city of Enschede.

Initiated by the Municipality of Enschede, Waterboard Vechtstromen, and the University of Twente, "de Regentoren" project was created. This project sets to act as a network of multiple SRBs placed throughout the city, in order to prepare for upcoming showers, and monitor water collection. It is aiming to improve rainwater management due to increased rainfall, and also to be useful during regularly occurring phases of drought.

This thesis focuses on researching the best suitable design, following the double diamond approach. Repetition of design iteration and continuous user evaluation yielded the first finalized design for this project, which was translated into a scaled model.

Token of Appreciation

I want to thank many people who have contributed to my success and have supported me on my way through my three years of Creative Technology, and especially my last graduation semester.

Firstly, I want to thank my supervisor Wouter Eggink, and my critical observer Richard Bults who have guided me on my way through this graduation project. Your advice has helped me on my way through the last semester of Creative Technology and led me to where I am now. I also want to thank my professor Kyung Hoon Hyun, who has influenced my career path when teaching me at Hanyang University.

Secondly, I thank my friends, who have supported me and made my study years very enjoyable. I will never forget the struggle we overcame together and look forward to spending many more years together at the University of Twente and beyond. Special thanks to Michael Bui, who has supported me especially on my way to graduation over the past three years. You have been there since day one and I am happy to know that our journey together is not over yet.

Additionally, I want to thank the co-designers and interviewees who participated in my research. Without you this project would not have been possible.

Lastly, I thank my family who has supported me on my way as well. Thank you for making these three years possible, and giving me many chances that I never thought I could take. Special thanks to my sister Sefora, who has influenced me in taking this path and has been there for me since the start.

List of Abbreviations & Information

SRB - Smart Rainwater Buffer (holds 250L); will be purchasable for private households.
SRB XXL - Smart Rainwater Buffer XXL (holds 20,000L - 30,000L)

“De Regentoren” project is set to become a network of smart rainwater buffers that consist of SRBs (for private households) and SRB XXLs (for public settings).

“Red Zone Areas” are identified locations in Enschede that are sensitive to floods and known to be flooded regularly.

“De Bothoven” area is a neighborhood located in the city of Enschede, east of the centrum; it is viewed as an industrial area that is currently gentrified.

The “Performance Factory” is located in “de Bothoven” area and hosts various events and activities for the residents of Enschede. It is considered an attraction in the neighborhood.

1 Introduction

The introductory chapter of this graduation project “Smart Rainwater Buffer XXL - Design for Public Spaces” explains the context of the current project, its challenge regarding public acceptance, and concludes with the research question that winds up from these conditions. The following paragraphs also include the current context in which the municipality decided to found this project, and in which direction research needs to be conducted in order for it to become a success.

1.1 Context of the SRB XXL and “de Regentoren” Project

One problem that the city of Enschede had to face for a long time is the flooding of certain areas of the city, due to rising groundwater levels. The initial causeof these problems can be traced back to the textile industry formerly prevalent in Enschede, that used to detract enough water preventing such soaring levels. However, as the industry disappeared, water levels have been rising, which is one major factor as of why these floods emerge today. (Municipality of Enschede, https://www.enschede.nl).

Especially “Oldenzaalsestraat” has been a victim of these kinds of floods (Municipality of Enschede, https://www.enschede.nl), but also “de oude markt”, which led the municipality to take action against these Problems (Municipality of Enschede, https://www.enschede.nl). Examples of such actions are brooks placed in different parts of the city (Stadsbeek, Beek ‘t Zwering, and Roombeek), so-called “wadi”s, that can be found in Ruwenbos and de Eschmarke, and additionally, Green roofs that also buffer rainwater in Transburg. These projects collectively help fighting against floods in the respective areas of the city.

Another way in to prevent flooding, is the newly initiated “de Regentoren” project, coordinated by Richard Bults. (Vreeman, 2019, https://www.utwente.nl/). “De Regentoren” project is set to act as a network of multiple SRBs placed throughout the city, in order to prepare for upcoming showers, and monitor water collection. It is a joint effort between the Municipality of Enschede, the University of Twente, and the Waterschap Vechtstromen, aiming to improve rainwater management due to increased groundwater levels, and also to be useful during regularly occurring phases of droughts.

Project leader Bults (2019) expects to realize “a total additional storage capacity of three million litres of water in Enschede in the coming years”. However, such numbers are still not enough to prevent flooding in the city, as the municipality needs to rely on drainage that comes from private households. Therefore, “de Regentoren” project “actively involves residents and businesses in water management, and it is easily scalable” (Bults, 2019, as cited in Vreeman, 2019).

Although there are already pilots to test whether the “de Regentoren” project is market-ready, it is not clear yet if the effects will fulfill the current expectations, as it strongly depends on the number of people placing the SRB in their gardens. There are already ideas in order to stimulate residents to buy a private SRB (Ruimtelijke Adaptatie, https://ruimtelijkeadaptatie.nl/), however one cannot rely on such methods only. Hence, it was proposed to develop a SRB XXL, being a larger version of the private buffer, to enhance the effect drastically. In contrast to the regular SRB carrying 250L, The SRB XXL is supposed to hold twenty to thirty thousand litres, and be placed in a public setting such as “de Bothoven” area; it is close to the “Twentsche Foodhal”, where also several other companies are located. Additionally, it is planned to place an SRB XXL in private neighborhoods in the future, in order to prevent floods in so-called “red-zone areas”. These areas are especially sensitive to flooding in the city of Enschede, and suffer from flooding regularly.

The reason why it was proposed to place an SRB XXL into the city of Enschede is, that “de Regentoren” project was interested in upscaling the current design, in order to show its effects in the city, and help to take action against flooding. Therefore, a suitable design in order for it to be accepted by the public needs to be developed.

The municipality of Enschede, the client of this project, is therefore asking for a design that can be translated onto the concept of the SRB XXL, in order for it to be placed in public areas around the city. More precisely, it was requested to design a Smart Rainwater Buffer XXL that the residents of the city will not reject, but accept, and is placed in “de Bothoven” area in the city of Enschede.

1.2 Public Challenges of the SRB XXL

The biggest challenge of the design of the Smart Rainwater Buffer XXL revolves mostly around the acceptance by the residents of the affected neighborhood in which it will be installed. It is planned to be placed it in “de Bothoven” area, as it is close to the “Oldenzaalsestraat”, which is identified as a so-called “red zone area”, that is flooded regularly.

Residents are supposed to accept, enjoy and appreciate the aesthetic of the Smart Rainwater Buffer XXL in their area, rather than refuse its presence. It is intended to integrate a different functionality, apart from solely buffering the water, which is supposed to stimulate interaction between the SRB XXL and the residents of the city. However, while the satisfaction of the residents is one of the top priorities, the design must also suit the taste of the client, as they are the decision-making instance in this project.

In *fig. 1.1* the exact location of the SRB XXL can be seen. The tank will be placed on the right side, on the empty space between the Polaroid and Performance Factory.

fig.1.1 Google Streetview of SRB XXL Location Between Polaroid Factory (right) and Performance Factory (left)

Additionally, there is a lot of room to design, considering the scale of the project, which leads to another challenge as a designer. *How to make use of the broad spectrum and the potential it is offering?* There are many possibilities and different design approaches that can be used, in order to create a design that will not only make the Smart Rainwater Buffer XXL look aesthetically pleasing, but will also enrich the neighborhood.

1.3 Research Question

Considering the context, the challenge, and also the focus of prior research findings, the following research question was concluded:

How to design the appearance of a Smart Rainwater Buffer XXL, placed in "de Bothoven" area, which residents of the affected neighborhood accept, and appreciate, represented by a scaled model?

This research question covers the restrictions of the area in which the SRB will be placed, and also the kind of challenge this project will face. The following sub-questions will help to answer the main research question:

What design approach is most suitable in order to design the SRB XXL?
What research methods should be used in order to gain the best user input?
How can meaningful interaction be achieved in order to make the SRB XXL more desirable?

All these questions will be answered throughout the thesis in order to create a successful design for the SRB XXL.

2 State of the Art

This chapter covers research about the chosen design approaches and similar installations that can be related to this project. The state of the art explores different kinds of design perspectives, which approaches can be used, and in what ways they should be executed. The examples include not only pure designs for the rainwater buffer, but also technical solutions, and different kinds of spatial design. Additionally, current water management solutions are stated as well.

2.1 Research on Design Approaches

Given that the Smart Rainwater Buffer XXL is a big-scale project, it is essential that prior research on possible design approaches is conducted well, to be able to choose the most suitable one for this purpose. Focus was put on approaches that are currently practiced in the development of products and services; in *fig. 2.1* multiple approaches, that are in the current landscape of human-centered design research are outlined (Sanders & Stappers, 2008). These will serve as a foundation to design the Smart Rainwater Buffer XXL.

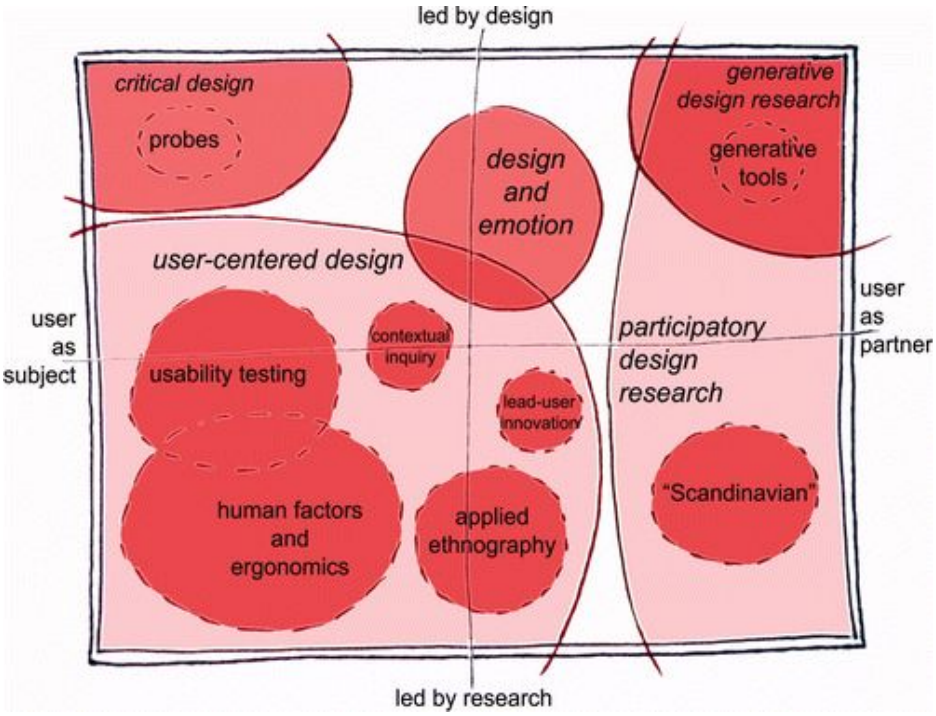

fig.2.1 Current landscape of human-centered design research as practiced in the design and development of products and services (Sanders & Stappers, 2008, p.1)

The diagram is divided into four conditions; “user as subject”, “user as partner”, “led by design”, and “led by research”. Depending on the position of design approach inside the diagram, it informs the viewer which of the four conditions describes its methods most accurately.

Different design approaches, that can be used in order to determine the design for this project are visible; *Critical Design, Design and Emotion, Generative Design Research, User-Centered Design,* and *Participatory Design Research*. The two most highlighted ones are the *User-Centered Design*, and *Participatory Design Research*.

The main difference between these approaches lies in which way the user acts during the research. User-Centered Design treats the user as a “subject”, while Participatory Design Research (also called Co-Design, or Co-Creation) focuses on having the user as a “partner” during the designing process (Sanders & Stappers, 2008).

This project will focus on these two design approaches, as User-Centered Design and Participatory Design Research are fundamentally different, but can be intertwined in later stages of the project. Given that the SRB XXL project’s success will be heavily influenced by how the affected residents react to its design, it is important to properly understand the user; not only in the form of personas, as it is introduced in User-Centered Design, but also as a partner that helps designing it actively, as it is proposed in Participatory Design.

Since this project will heavily rely on research, the other three options (Critical Design, Design and Emotion, and Generative Design Research) are not available, as these are mainly led by design. Participatory Design Research does also fall under that category, but since it offers a wider spectrum, regarding in what ways it can be led, it offers a more interesting approach.

The chosen approaches will be discussed in more detail below.

2.1.1 Participatory Design

As aforementioned, Participatory Design mainly focuses on having its users actively participate in the design process as partners in a focus-group, rather than being interpreted as personas. This leads to the assumption that every partner must have a certain degree of creativity, in order to be able to keep up with the designing process (Sanders & Stappers, 2008).

As these partners, or also called “co-designers”, are not professional designers, the leader of the focus-group must understand under what “category of creativity” the partners fall into (Sanders & Stappers, 2008). These can be divided into four different levels, as depicted below under *tab.2.1*.

Level	Type	Motivated by	Purpose	Example
4	Creating	Inspiration	“Express my Creativity”	Dreaming up a new dish
3	Making	Asserting ability or skill	“Make with my own hands”	Cooking with a recipe
2	Adapting	Appropriation	“Make things my own”	Embellishing a ready-made meal
1	Doing	Productivity	“Getting something done”	Organizing my herbs and spices

tab.2.1 Four Levels of Creativity (Sanders & Stappers, 2008, p.6)

It is important to note that, even though co-designers do offer ideas and concepts, they are not to be mistaken with the leading designers, as these hold special skills that the co-designing partners do not have (Sanders, Brandt, & Binder, 2010). The designers figure out the complexity of newly developed ideas and concepts, and act as translators to turn these into fully-fledged designs.

The partners must continuously be included in the design process with the aid of a diversity of methods to achieve maximum efficiency in terms of money and insights. It is advised to include the partners in early stages of the designing process, as each change in later stages will result in an increase of expenses. This is due to having to make bigger changes towards the end of the process, making early decisions irrelevant (Grufberg & Holmquist, 2011). However, before inviting the co-designers, the target audience must be clearly defined first, which can be done by utilizing interviews, guided tours, or focus groups (Design Kit, http://www.designkit.org/). To conclude, a thorough preparation followed by early involvements of co-creation partners is most insightful.

Many people from different educational backgrounds are included, as they are not designers, but will end up being the users of the designed product or service instead. A design dialogue needs to be sparked that leads further into the co-designer’s everyday practices (Sanders, Brandt, & Binder, 2010). This can be stimulated by different kinds of exercises that the co-designers can perform. Examples of such exercises include brainstorming sessions

(performing a collection of many ideas within a group), or entire co-design sessions and workshops (activities worked out by participants with a leading instance), that will help co-designers get into a designer's mindset (Grufberg & Holmquist, 2011). While it is said that sparking creativity is sufficient, others claim that such workshops should be led by professionals, in order to keep the participants on the right track (Svanaes & Seland, 2004).

2.1.2 User-Centered Design

Differing from the aforementioned design approach, user-centered design does not include users as prominently in the designing process, but focuses on user interviews, questionnaires, and personas instead.

These so-called personas are viewed as "fictitious, specific, concrete representations of target users" (Pruitt & Adlin, 2006, as quoted in Miaskiewicz & Kozar, 2011) and considered as abstractions of real consumers to reduce empathy gaps between user and designer. In order to remove these egocentric approaches towards users that differ from the designer, personas are used to promote empathic design approaches. These help overcome limitations amongst the designing team, as it is easier to emphasize and imagine different perspectives to properly design for the target group (Haag & Marsden, 2018). Personas support the design process as they underline common behavioral characteristics (Miaskiewicz & Kozar, 2011).

However, as there are various methods to involve users into the designing process, importance is placed on putting the user center stage. The designer needs to make sure that the product or service is used as intended, with a minimum amount of effort to learn on how to use the design (Abras, Maloney-Krichmar, & Preece, 2004).

Listening to users and discussing design alternatives helps the designer's understanding of what the user is looking for in the desired product or service. Additionally, with the cycle progressing and having prototypes built, user tests can be conducted in order to check the user's satisfaction on these services early on. As user tests are performed, there are five different criteria a designer needs to pay attention to: *effectiveness* (How effective is the design?), *efficiency* (How efficient is the design?), *safety* (How safe is it for the user to use?), *utility* (How easy is it for the user to use?), *learnability* (How easy is it for the user to learn?), and *memorability* (How long does it take for a user to memorize how most common tasks are performed?) (Abras, Maloney-Krichmar, & Preece, 2004).

As referenced in Abras, Maloney-Krichmar, and Preece (2004), Dumas and Redish (1993) claim that usability testing aims to achieve the following five goals:

- Improve the product's usability
- Involve real users in the testing
- Give the users real tasks to accomplish
- Enable testers to observe and record the actions of the participants
- Enable testers analyze the data obtained any make changes accordingly.

2.1.3 Conclusion

Concluding from these findings, it becomes apparent that continuous inclusion of users in early stages is an essential aspect to the design process. This holds for both participatory design research, and user-centered design. This involvement can be expressed in different forms, for instance utilizing a co-design session, structured in such a way to support stimulation of the participant's creativity. Another example are usability tests, as introduced in user-centered design, that require users to test prototypes in order to understand what lacks in the current design iteration.

To conclude, intertwining these approaches will lead to the most valuable insights. Consequently, both approaches will be utilized in order to collect ideas together with co-designers and conduct interviews to determine the usability of the concluded designs. In addition to these findings, it is important that not only attention to raw data is paid, but also emotional perception and observing the user's values is taken into account in order to have the co-designers be guided smoothly through the workshop.

2.2 Current Rainwater Management

This paragraph is divided into two different parts; one of them outlining current rainwater management solutions to the flooding problem in Enschede, while the other offers existing design solutions. The approaches and concepts should be considered as inspiration, rather than directly projected onto the SRB XXL, as they are successfully accepted by the residents of the affected areas.

2.2.1 Rainwater Management in Enschede

The municipality of Enschede is working on different solutions that are implemented in the city in order to fight flooding, especially in “red-zone” areas, for instance around “Oldenzaalsestraat” and “de oude markt”. The concept of the SRB XXL is an innovative alternative in order to make this process more efficient and achievable.

However, the question of why there is risk of flooding in the city remains. Enschede used to have no problems with floods, especially rising groundwater levels, as there used to be a big textile industry in the area (Municipality of Enschede, https://www.enschede.nl/). The industry influenced the groundwater levels enormously, as they made use of the given water in their production process. Due to the textile industry having moved away from Enschede, there has been no other factor that made that much use of the groundwater, hence water levels rose (Municipality of Enschede, https://www.enschede.nl/). Other factors, like heavy rainfall due to climate change (Demirel, van Ommeren, Rietveld, Martens, & Chang, 2010) have increased the severity of the problem, and solutions in order to keep the water levels checked have been introduced since then.

Projects that have been introduced by the municipality of Enschede in order to fight the flooding in the area are for example “Wadi”s, green roofs, brooks and the “groene linie” (Municipality of Enschede, https://www.enschede.nl/). Each of these solutions buffers the heavy rainfall in a way that is naturally integrated within their environment and does not require further effort from the inhabitants of Enschede. They are “hidden” solutions, whereas “de Regentoren” project intends the inhabitants to take action themselves. Similarly, the SRB XXL intends to be a clear statement publicly visible in neighbourhoods of Enschede, further supporting their efforts.

2.2.1.1 Wadi

The so-called “Wadi”s (Dutch: **W**ater **A**fvoer **D**rainage **I**nfiltratie-voorzieningen) are systems that store and purify water where it falls, letting the rain flow into sloped down areas and allowing the collected water to slowly subside into the ground. These systems also function as prevention of rising groundwater levels, using a drainage system below the ground. Additionally, flowers are planted, which support the cleansing of water, and also offer a more aesthetic street view.

These “wadi”s are installed in Ruwenbos, de Eschmarke, and later also in the “Groene Linie” (Municipality of Enschede, https://www.enschede.nl/).

fig.2.3 Wadi in Enschede

2.2.1.2 Groene Linie

“Groene Linie” is a project to be realized in the city center, below the “Oldenzaalsestraat”, aiming to keep the city centre dry; it is planned to also add greenery to enhance Enschede’s beauty and attractiveness towards visitors of the city. Together with the Wadis, it is said to be able to hold seven million litres of water. The trees and plants planted around the wadis do not only make the city more environmentally friendly, but also help cleansing the subsiding water (Municipality of Enschede, https://www.enschede.nl/).

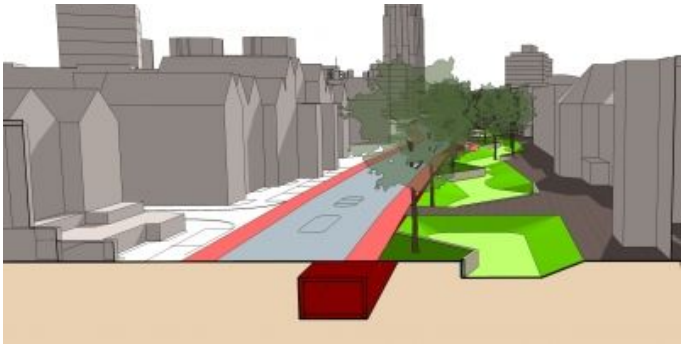

fig.2.4 Groene Linie under Oldenzaalsestraat

2.2.1.3 Green Roofs / “Ecopan”

In collaboration with the Vechtstromen district waterboard, the Pioneering Foundation, and STOWA research institute, the effectiveness of the water buffering “ecopan” has been investigated by the municipality of Enschede. It is holding water during heavy rainfall, and drained on a later stage. The pans are fitted onto already existing roof tiles, with a maximum

angle of fifty degrees, layered with water reservoirs, a substrate layer, and a layer of sedum. Tests have proven the effectiveness of green roofs in Transburg, however the amount of water drainage is dependent on the orientation of the roofs and the yearly season (Ruimtelijke Adaptatie, https://ruimtelijkeadaptatie.nl/).

fig.2.5 Green Roofs in Transburg

2.2.1.4 Brooks

Groundwater is controlled by reconstructing streams in order to decrease groundwater excess. Examples are the Roombeek, Beek t 'Zwering, and the Stadsbeek (Municipality of Enschede, https://www.enschede.nl/).

fig.2.6 Brooks in Enschede

2.2.1.5 De Regentoren

“De Regentoren” project, acting as a network of Smart Rainwater Buffers and their XXL version, is aiming to fight against flooding by preparing for upcoming showers and monitoring of water collection throughout the city. (Ruimtelijke Adaptatie, https://ruimtelijkeadaptatie.nl/) Initiated by the Municipality of Enschede, Waterschap Vechtstromen, and the University of Twente, it aims to improve rainwater management and harvesting, and has been a project for multiple graduates of the University of Twente since 2017.

Fig.2.7 Smart Rainwater Buffer

As the SRB XXL originates from the SRB, the principle behind it will be elaborated further on. The infographic in *fig.2.8* explains the functionalities of the Smart Rainwater Buffer visually.

On the top right you can see that the SRB has already collected water from a former rainshower, which results in less burden on the sewage system, and therefore leads to the prevention of flooding. The water then can be used by the owner if the SRB.

In the bottom right, it is visible that the SRB empties itself two hours before an upcoming shower. Sensors that can monitor the water levels inside are implemented, and empty the buffer just enough for it to be ready to collect the imminent water, as it is visible in the bottom left. Sensors check if rain is forecasted, in order to maximize its capacity for the upcoming rainfall. This leads it to being remote controlled, having for instance the water automatically drained.

Lastly, on the top left, the performance of the SRB can be checked on the official website, that lets residents and also the municipality monitor its status.

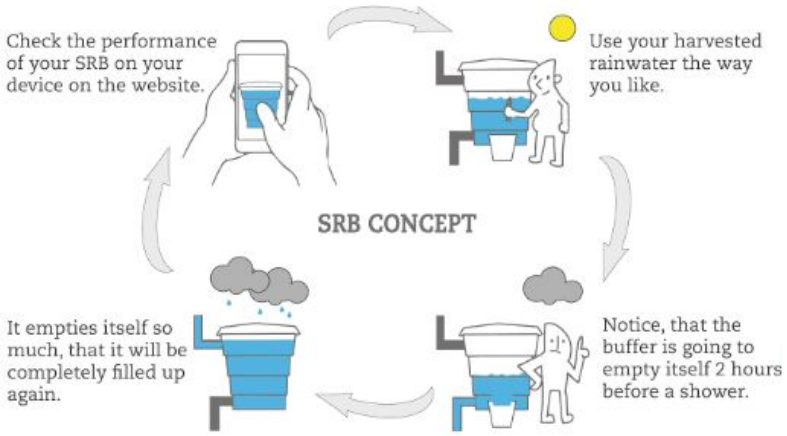

Fig.2.8 Smart Rainwater Buffer Function Cycle (Tunc, 2018, p.66)

Concluding, “de Regentoren” project with its Smart Rainwater Buffer does differ from alternative

rainwater management solutions, as it requires the inhabitants to actively support preventing flooding. However, since the impact and success of the SRB cannot be foreseen yet, it is intended to add additional buffering capacity with the SRB XXL. Comparing the SRB XXL to other large rainwater management projects, it can be concluded that rather than integrating it into the environment, like Wadis or brooks, it is supposed to be a statement raising awareness and promoting rainwater management projects in Enschede. Therefore, the design has to be approached in such a way, that inhabitants understand the message of awareness it is supposed to convey, since it will be eye-catching and interactive, rather than subtle.

2.2.2 State of The Art

2.2.2.1 Slimme Regenton “Diamant”

The “slimme regenton” created by Studio Bas Sala (Sala, https://www.slimmeregenton.nl/), is a tank that collects rainwater, and buffers it, in order to avoid flooding in Rotterdam region. It has similar functions as a “de Regentoren” Smart Rainwater Buffer, with the sole difference that it has a specifically designed diamond shape, instead of a regular “tank-shape”. This leads the residents of the area to believe that it is not “just” a tank, but art in their area, which is why it is accepted in the neighborhoods. There are different versions of the “slimme regenton”. One being a static one, that is placed in an area for good, and the other one is a “mobile regenton”, that will be replaced in different neighborhoods throughout the years. The design is said to be “eye catching” in order to make its design enjoyable for residents.

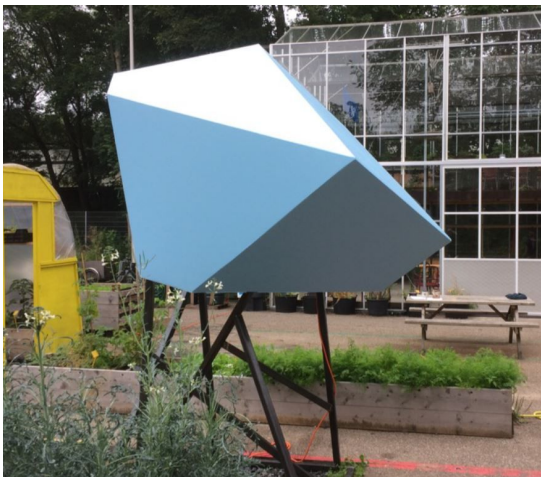

fig. 2.9 Slimme Regenton “Diamant” (Sala, https://www.slimmeregenton.nl/)

2.2.2.2 Slimme Regenton “Zoho” Zomerhofkwartier

A second project of the “slimme regenton” created by Studio Bas Sala (Sala, https://www.slimmeregenton.nl/) is also a tank that collects water and buffers it. However, it differs from the previous project in such a way, that it does not offer a special, and unique design in order to add something artistic to the region, but concentrates on creating a landmark for the area instead. The area in which this specific tank is placed is called Zomerhofkwartier, abbreviated “Zoho”.

The residents accept this kind of tank in their area, since it is representative to them, and also offers the buffering functionality, that helps reduce flooding in the area. The connection to the neighborhood and its function balance why the residents appreciate it and like having this tank in their area.

fig. 2.10 Slimme Regenton “Zomerhofkwartier” (Sala, https://www.slimmeregenton.nl/)

2.2.2.3 Rainproof Amsterdam: Circl

The next project is an example by: Rainproof: Amsterdam. It is called “Circl” (van Dijk, https://www.rainproof.nl/) and is an example of a re-designed public space. Characteristic for the “Circl” is that not only a public space was re-designed, but that the welfare of residents was considered when designing it. It was researched that people feel mentally and physically better around the color “green”(van Dijk, https://www.rainproof.nl/), which is why this space was designed to carry as much green nature as possible. Since the research has proven to be true, residents do indeed feel better and have accepted this spatial design.

Additionally, the greenery helps against heat stress, drought, and flooding, as the soil stores water during rainfall. Overall, it proves to have positive effects on the climate.

fig. 2.11 Amsterdam Rainproof “Circl” (van Dijk, https://www.rainproof.nl/)

2.2.2.4 Rainproof Amsterdam: “XL Gevelborder”

Another project of Rainproof Amsterdam, is the so-called “XL Gevelborder” (Snoek, https://www.rainproof.nl/). Regular facade borders have 30cm deep soil, and are followed by sand, which lets rainwater sink quicker into the ground. However, the size of this facade border is three times as broad and two times as deep. It contains 60cm soil; carries significantly more water, and does not let it subside into the groundwater as quickly.

Apart from that, being also part of the aesthetic design, is that many different plants are planted throughout the year and offer a special view, whenever people walk past. This results from the fact that rather than native plants, exotic ones are used These are considered interesting to look at, and therefore accepted by the public. Despite offering less space to walk on, due to its bigger size, residents appreciate its design.

fig. 2.12 Amsterdam Rainproof “XL Gevelborder” (Snoek, https://www.rainproof.nl/)

2.2.2.5 Loxone Rainwater Harvesting

This state of the art example is solely focused on its functionality, which is the “Loxone” rainwater harvesting tank (Schuster, https://www.loxone.com/). Reason why this is part as state of the art is due to its similar functionality to the Smart Rainwater Buffer, since it is also made for private household use. The picture shows its “Cistern”, which is a tank that also stores water. It has a sensor that can measure the water levels of the tank, and a miniature server that can be reached from any smart device, to check its water levels. The stored water can be used for different things, such as toilet flushing, car washing, cleansing of the driveway, lawn watering, animal drinking water, and dishwasher and washing machine water. The goal of the SRB XXL is, to also harvest water and make it useful for its residents.

fig. 2.13 “Loxone” Rainwater Harvesting Cistern (Schuster, https://www.loxone.com/)

2.2.2.6 Singapore Rainwater Harvesting

As earlier mentioned, one of the goals of the SRB XXL to harvest rainwater and to provide it for further use by the residents, therefore water harvesting techniques are important to consider. The rainwater harvesting techniques in Singapore (Appan, https://www.downtoearth.org.in) include water being collected from rooftops and dividing it into quality water, and wastewater. The water that passes the quality test of its filters is used in order to supply water to the buildings it is attached to, like being used for toilet flushing, or cleaning. The water will be stored in underground tanks and used when needed while contaminated water gets removed.

These kinds of techniques for rainwater harvesting can be applied to the SRB XXL in order to supply more water for the residents of Enschede.

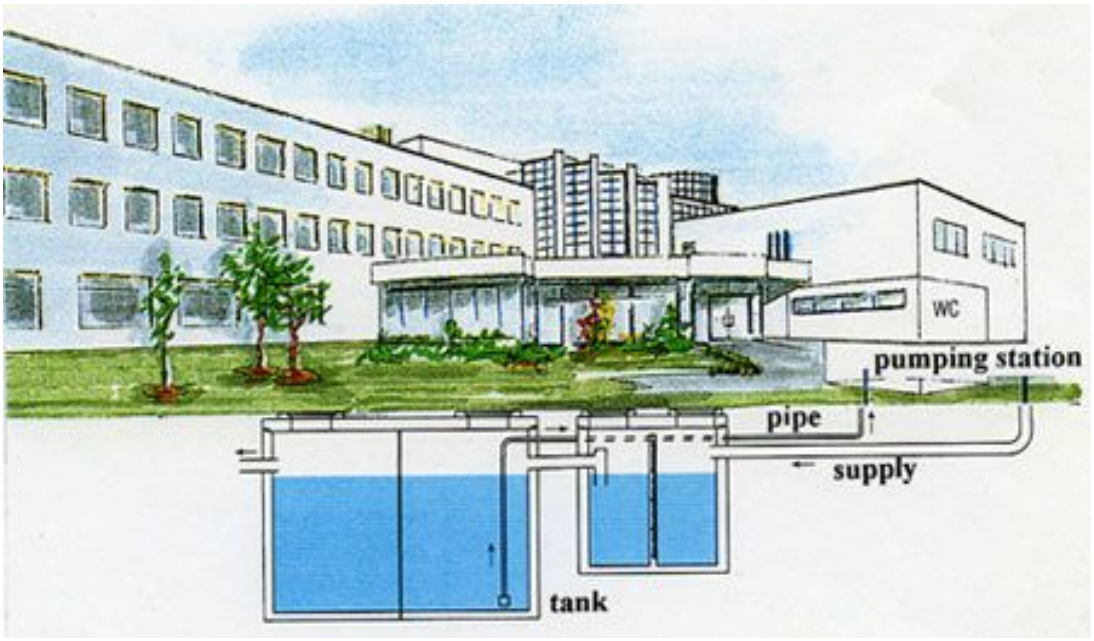

fig. 2.14 Singapore Rainwater Harvesting (Appan, https://www.downtoearth.org.in/)

2.3 State of The Art Conclusion

Concluding from prior research and the state of the art examples, several rainwater management projects rely on hiding functionalities behind aesthetic and meaningful designs in order to make the placement in public spaces accepted by residents of the city.

Projects that are entirely hidden (e.g. Loxone cistern, and the Singapore Rainwater Harvesting Tanks) do not focus on superficial designs, while other projects that are shown publicly to the residents do have focus placed on aesthetics (Bas Sala's "Diamant", and "ZOHO Regenletters"). This leads to believe that residents of the city will not be satisfied with projects being placed visibly in the city, as long as thought has been put into aesthetic designs. In order to satisfy residents of the city of Enschede, they will be included into the design process via Co-Creation sessions and user interviews.

3 Methodology

This chapter describes the methodology to reach the design iterations of the Smart Rainwater Buffer XXL. To understand the process this project will undergo, methods for ideation, specification, realization, and evaluation are outlined respectively.

The main design and ideation method of this project is user involvement, prepared on the basis of a stakeholder analysis. Developed ideas, that were given from these users will be generated into designs in the ideation phase. Experience specifications and detailed descriptions of the ideated design are portrayed in the specification. The final design distills from the given feedback and will be built as a scaled model during the realization phase. Finally, an evaluation will have users assess the design for a last time, before this project is concluded.

3.1 Ideation

The ideation phase mainly focuses on generation of ideas, in this case in cooperation with the stakeholders of the project. However, before focus is put on ideas, stakeholders were firstly identified and analyzed to incorporate them well into the ideation process. The user involvement assists the designer to generate ideas that were translated into designs with aid of the double diamond approach, which is also outlined in this section.

3.1.1 Stakeholder Analysis

In order to develop a successful design, the designer needs to pay attention to the stakeholders of the project. These are able to influence a project significantly based on their status of power and interest in the project. While powerful stakeholders, such as the client, can decide on whether a project will be executed or not, users decide whether a project becomes successful, depending on their response towards the design. This illustrates how every stakeholder plays an important role in the process of the design. As quoted in Mendelow (1981):

On the basis that stakeholders are "those who depend on the organization for the realization of some [of] their goals, and in turn, the organization depends on them in some way for the full realization of its goals" (Mitroff & Mason,1980), it is clear that it is the organization’s stakeholders who judge its effectiveness (p.408).

This leads to believe that stakeholders hold the power in what direction the project will go. While it is essential to identify each stakeholder, their role and contribution must also be analyzed. This allows to understand what importance they hold and how to incorporate them into the process. Overall,the stakeholders can be categorized into four categories (Sharp, Finkelstein, & Galal, 1999), mainly regarding their power and interest on the project. The higher the power, the more focus is placed on keeping these people satisfied, in order to not have them sabotage the project with apathetic decisions. Stakeholders with high power and high interest, should be worked very closely with, in order to fulfill their expectations, since these people are in most cases the ones hiring an organization.

These categories can be viewed in *fig. 3.1*, in the stakeholder matrix by Bryson (2004).

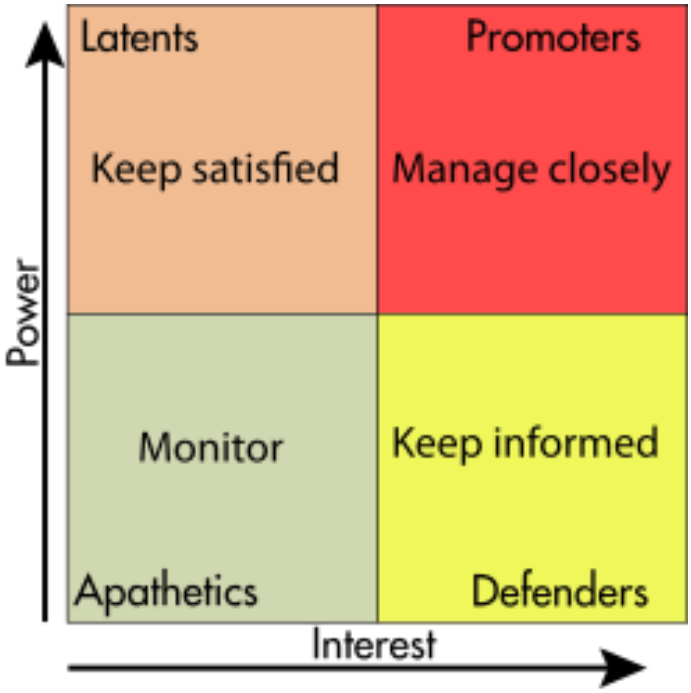

fig.3.1 Stakeholder Matrix by Bryson (2004)

The stakeholders will be divided by whether they are being a decision-making instance or a user, and placed accordingly in the stakeholder matrix. Motivation and interest will be analyzed and the relation to the designer explained subsequently; each representative of the stakeholder group must be identified and introduced in the analysis.

3.1.2 Empathic Design

To be able to incorporate meaningful interaction into the design, designers must consider the concept of empathic design (Koskinen, Battarbee, & Mattelmäki, 2003). This so-called "empathic design" is an approach that requires designers to draw closer to experiences and lives of users, to understand them and increase the possibilities of the product suiting the users' needs (Kouprie & Sleeswijk Visser, 2009). It is important that the designer orients himself along a framework that explains how empathy can support the designing process; this will make the designer try to "'step into the users shoes' and 'walk the user's walk' in order to design products that fit the user's life" (Kouprie & Sleeswijk Visser, 2009).

This also accounts for the design of the Smart Rainwater Buffer, especially since there is no specific target group that can be analyzed regarding their demographics, but only their geographic location. Families, students, elderly, and children fall into the target group of this design. These cannot be collectively considered as a single user target group.

Facing such a challenge, one can speak of the term "empathic horizon" (McDonagh-Philp & Denton 1999), which "is used to indicate the limits on a designer's individual ability to empathise beyond certain characteristics of his or her group, such as nationality, background, age, gender, culture, experience and education" (p.439) (Kouprie & Sleeswijk Visser, 2009).

As empathy is supposed to understand user's needs, it also offers inspiration to create such products, given the new information a designer gets exposed to, while researching their users (Kouprie & Sleeswijk Visser, 2009). It heavily supports moving from "rational and practical issues to personal experiences and private contexts" (Mattelmäki & Battarbee, 2002). The designer will not only realise a design with his own experiences and opinions anymore, but focus on the users instead. "They merge with the users" (p.438) (Kouprie & Sleeswijk Visser, 2009). This empathy that designers need to focus on during the designing process can change, as the horizon can be extended over time, with the help of training and further experience (Baron-Cohen & Wheelwright, 2004).

In this project, empathic design was used in order to understand what the affected users expect from the SRB XXL and in which ways it can prove to be advantageous. The entire focus was placed on how to make the design attractive to the residents of “de Bothoven” area and exploit the potential of the SRB XXL’s usefulness. The designer therefore made inclusion of users the biggest priority due to the nature of this design approach, followed by user-centered and participatory design.

3.1.3 User Involvement

User involvement is essential when utilizing a participatory design research or a user-centered design approach. Since in this case both approaches are utilized, the type of involvement will differ regarding the stage the project is currently in. This also supports the previously discussed empathic design approach.

As the first idea generation step includes brainstorming and prototyping with users, these will be implemented in a co-creation session (see appendix A), that results from the participatory design research approach. Subsequently, users will be interviewed for further insights, following the user-centered design approach (see appendix C, D, & E).

Co-creation sessions offer different possibilities in their execution; focus in this case must be placed on figuring out the emotional values the co-designers expressed during the session and understand these in addition with the given wishes and ideas. These will be used in order to translate the ideas into the first design iteration, as soon as the session will be finished.

To make the inclusion of participants of Enschede successful, a few criteria of the “Conditions for Successful Citizen Participation” (The Hague Academy for Local Governance, https://thehagueacademy.com, 2018) will be considered in order to select these for the co-creation session. The conditions that will be mainly focused on are as follows:

- **Empowered Citizens**: Citizens who have the skills, knowledge, and attitudes to participate, including the ability to organize themselves
- **Commitment** to genuine, inclusive participation: Willingness to incorporate citizens’ needs and suggestions in policy
- Identification, understanding, and involvement of all relevant **stakeholders**
- A **well-planned process** with clear objectives; the plan should be understood by all stakeholders

Three tools were used during the co-creation session. Following that, interviews were conducted in order to specify the design further.

3.1.2.1 Collaging

The first exercise the participants of the co-creation session will perform is a collaging session. Purpose was stimulation of the co-designer's creativity and forming an image of the other participating members. According to several researchers, collaging is a technique to evoke memories and emotional reactions, and is therefore suitable to be applied in early stages of the co-creation session (Stappers & Sanders, 2003, Sleeswijk Visser, Stappers, Van der Lugt, & Sanders, 2005).

The exact exercise is to connect given pictures to personal emotional values that the participants want the municipality and people in positions of power to consider. These values represent the needs that would satisfy residents of the city.

Instead of conducting interviews and asking participants what they considered important, this exercise aids participants that might have trouble expressing their thoughts in words. Therefore, a selection of images will be presented that can be chosen from during the exercise. Additionally, a stimulation to leave the usual thought-vicinity will be provided, in order to come up with new ideas and connections that would usually not be made. It offers a wider range of ideas and expressions a single participant could make, and holds onto the rest of the co-creation session as well.

The simplicity of this exercise (connection of images and thoughts) will give the participants confidence in early stages, and eases the introduction into the co-creation session. Misunderstandings of what to do will be avoided, and this unconstrained exercise might lead the participants in many different directions emotionally, as well.

To conduct this exercise, the entire group will be supplied with sixty images that could be immediately discussed. The images range from natural images to animals, expressed emotions, weather conditions, people from different ages, genders, and races, and random objects. Importance is placed on the participants being able to relate to these images, therefore a range of differing demographics expressing many emotions was chosen.

Additionally, markers, paper (A2), and glue will be given to the participants. The leader of the session guides the participants with questions, stimulations towards certain topics, and ideas, in case not enough creativity will be sparked on its own.

3.1.2.2 Scenarios

After having the co-designers eased into the co-creation session, open-ended scenarios will be introduced to the group. The participants will be divided into groups of two, and three different scenarios will be handed to them. These scenarios are open-ended and show problem simulations of residents, which the co-designers will have to find a solution for.

This also acts as a preparation to the third and final exercise; it raises awareness to current problems that are experienced by residents of Enschede regarding current rainwater problems. Consequently, the participant's empathy will also be stimulated, which aids them in the remainder of the co-design session.

These scenarios were developed from prior conducted interviews with different residents of the city, and based on real problems that these are facing (see appendix A).

Compared to the previous exercise, the current task required more understanding from the co-designers. This understanding calls for empathy towards the personas depicted in the scenarios, and also imagination in what ways it could be solved. The personas portrayed in the storyboards vary from young to old, are female or male, and have differing occupations. The desperate situation they are illustrated in needs the co-designers to find proper solutions, and therefore empathize with these; it is triggered through compassion, and relatable problems that the residents of Enschede face regularly.

Unforeseen problems or solutions that the designer did not come up with, due to lack of empathy or creativity, could be found by the co-designers and therefore give valuable ideas for a design. For the next phase (brainstorming & prototyping) these scenarios will also offer guidance in order to better understand in what circumstances the inhabitants of Enschede currently reside and what solutions they seek.

Given that the scenarios were already prepared prior to the session, it might limit the creativity of the co-designers, as they cannot come up with unforeseen scenarios the designer did not come up with. However, as the designer had already determined the given scenarios, more

focus will be placed on solving these problems, and less time will have to be spent on figuring out what kinds of problems the residents are coming across.

Stakeholders that might be uncomfortable with finishing the storyboards in sketches will be offered an alternative to write down their ideas.

3.1.2.3 Brainstorming & Prototyping

As the co-designers will now be more aware of current rainwater management problems, and also thought of solutions regarding this problem, a prototyping exercise will be introduced. This exercise focuses on concept and design ideas purely for the Smart Rainwater Buffer XXL. The prior introduced scenarios could be projected onto this exercise, and offer a supporting hand for the co-designers to imagine under what conditions the SRB XXL would be placed in a neighborhood. To conduct a co-creation session, it was advised to use brainstorming sessions to gain first insights for the upcoming design (Grufberg & Holmquist, 2011). While it is aimed to find out what priorities the users have by indicating that there are no technical limitations, scenarios as input to stimulate the thought process will be used in order to gain this kind of imaginary freedom (Grufberg & Holmquist, 2011).

This method gives deeper insights into the values and wishes of the co-designers, as the residents of Enschede and also prospective users. Focus will not only be placed on the needs of the stakeholders (and co-designers in this case), but also the ideas and concepts they will come up with, as it offers inspiration to the designer. These ideas could be used as a solid foundation in order to motivate design decisions the designer made in the upcoming iterations of the design.

This last exercise will be divided into a brainstorming session, and also a prototyping session. The participants will be divided into two groups and offered paper (A2) and markers, in order to sketch their ideas. There will be no limitations to this exercise; no refined ideas are expected, solely wishes and input of the co-designers.

Questions to stimulate the creative thought process included:

- What concepts do come to mind? (e.g. parallels to animals, shapes, objects)
- What shape do you want the tank to be?
- What secondary function can the SRB XXL have?
- How do you want residents to interact with the SRB XXL?

3.1.2.4 Interview

Now that the stakeholders are identified and the participants will have conducted the co-design session, these will be included into the designing process via user interviews. These are insightful in such ways, that the interviewing instance is in a position to evaluate the respondent's validity upon answering. Barriball and While (1994) list advantages that personal user interviews offer:

- It is well suited to the exploration of attitudes, values, beliefs and motives (Richardson, Dohrenwend, & Klein, 1965)
- It provides the opportunity to evaluate the validity of the respondent's answers by observing non-verbal indicators, which is particularly useful when discussing sensitive issues (Gordon, 1975)
- It can facilitate comparability by ensuring that all questions are answered by each respondent (Bailey, 1987)
- It ensures that the respondent is unable to receive assistance from others while formulating a response (Bailey, 1987) (p.329).

Including the stakeholders frequently in user interviews, interest and confidence increases as familiarity with the project grows (Barriball & While, 1994). Especially in semi-structured interviews (Preece et al., 1994), the interviewer has a possibility to explore a participant's perceptions and opinions. While it is argued that questions in interviews shall be the same for each interviewee in order to "be sure that differences in the answers are due to differences among the respondents, rather than the questions asked" (Gordon, 1975), "not every word has the same meaning to every respondent and not every respondent uses the same vocabulary" (Treece & Treece, as quoted in Barribal & While, 1994). Therefore, it distills that the reliability of the interview does not depend on whether or not similar words are used, but whether or not the correct meaning is conveyed to the interviewee.

To prepare for such interviews, one must also consider the possibility of "good versus poor respondents".

[Good informants are defined as people who] appear comfortable and unstrained in interactions with the researcher; they are generally open and truthful although they may have certain areas about which they will not speak or where they will cover up; they provide solid

answers with good detail; they stay on the topic or related important issues; they are thoughtful and willing to reflect on what they say (Dobbert, as cited in Barriball & While, 1994, p.331).

As not every interviewee might respond to answers truthfully, in detail, or openly, the interviewer must be able to identify their wishes and expectations, and try to overcome this problem regardless. If the interest in the project is not high, the motivation of giving detailed and truthful answers may be low (Gordon 1975, Moser, & Kalton, 1986).

For this project, a semi-structured interview will be used, in order to gain more insights on opinions and perceptions of the stakeholders, and include these into the designing process. Priority will be placed on including stakeholders' wishes and their expectations of this project. Therefore, emphasis will be placed on personal research that revolved around identifying these wishes and expectations.

3.1.4 Double Diamond Model

In the specification phase of the design, the collected ideas from the prior idea generation wil be used and converged into more specific designs. The double-diamond model (Design Council, https://www.designcouncil.org) will be used to do so. Additionally, the interviews conducted in the idea generation will also contribute to specify the design after each iteration, making use of the requirements that were collected.

Four phases are depicted in *fig. 3.2*, in order to follow the approach of the double diamond model: discover, define, develop, and deliver. The process of diverging ideas and converging these into a more specific design happens twice in this model; "once to confirm the problem definition and once to create the solution." (British Design Council, 2005).

The double diamond approach will be used multiple times in this project. Different solutions will be presented repeatedly, in order to gain feedback from stakeholders, which become more specific after each cycle.

This model is suitable for this project due to the two phases of converging and diverging. Compared to the "Design process for Creative Technology" (Mader & Eggink, 2014), which consists of ideation, specification, and realization respectively, the double diamond focuses on discovering unknown information to the designer by research, and define the problem statement in the first diverging and converging phase.

This research will be conducted via the aforementioned user interviews and the co-creation session. However, as this process will be followed multiple times, research needs to be conducted as many times as well; therefore the process of the double diamond model will be followed repetitively, while conducting research and identifying the problem statement before creating a new design in each iteration.

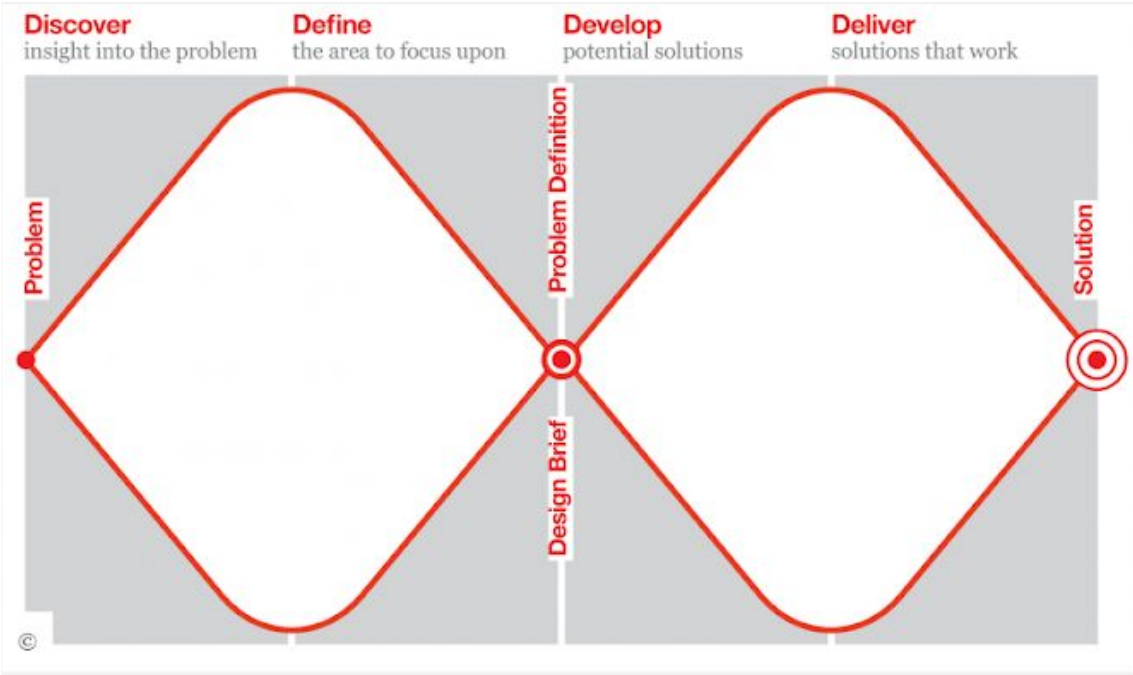

fig.3.2 The Double Diamond Design Approach by the British Design Council (2005) (Design Council, https://www.designcouncil.org)

3.1.5 Requirement Analysis

After insights will be collected in the stakeholder analysis, co-design session, and user interviews, these will be turned into a list of technical and emotional requirements. The collected requirements will be used to fulfill the stakeholder's expectations, and divided into priorities; which requirements must, should, and could be implemented (Achimugu, Selamat, Ibrahim, & Mahrin, 2014).

3.2 Specification

As soon as the ideation is finished, specifications of the SRB XXL will be analyzed. These include not only a detailed description of the tank, but also an experience and context specification, which will be illustrated by personas and scenarios.

3.2.1 Detail Description of SRB XXL

After deciding on the final design during the ideation, details of the SRB XXL and their functionality will be analyzed and visualized in the detailed description. This description does not only specify on what materials will be used for the design, but also on measurements and different details, such as the water scale facts represented on its design.

3.2.2 Experience Specification

In order to be able to specify experiences, more personas and scenarios have to be created. As these will be used in the co-design session during the ideation phase already, it shows that these properly illustrate possible situations a person interacting with the SRB XXL can find themselves in. While it is paid attention to not create distracting and impersonal personas (Matthews, Judge, & Whittaker, 2012), these can act as a first stepping stone before immersion into user experiences, especially since the SRB XXL is not an instance that has been built yet.

These scenarios and personas will be illustrated in storyboards.

3.2.3 SRB XXL Context

The final part of the specification phase focuses on the direct context of the SRB XXL. This includes the physical context, as it is placed in “de Bothoven” area, and the social context, that was prior illustrated in the experience specification. In this section, deeper insights are added to the social specification, however.

3.3 Realization

After finalizing the design, a prototype will be built during the realization phase. As the true scale design cannot be built at this early stage of the project, the end product consists of the scaled

model, representing the 5m Height x 3m Diameter design the SRB XXL represents. The scaled model will have a proper size in order to be exhibited on a tabletop.

3.4 Evaluation

As this project will have already undergone many repeated evaluations during the ideation and specification phase, the final evaluation requires the stakeholders' opinions once more. The evaluation takes place after the scaled model will be finished and presented to the interviewees, asking the following questions, described in section 3.4.1.

3.4.1 Questionnaire

For the last evaluation, the co-designers and representatives of "de Bothoven" area will fill out a questionnaire, stating whether these will be satisfied with the end result and whether their expectations have been fulfilled. This final evaluation includes pictures of the final design being sent to the stakeholders, together with photos and a description of the scaled model. The script can be viewed under appendix F.

The following questions were asked in order to evaluate this project:

- Does this design fulfill your expectations of the SRB XXL?
- Do you see your opinions reflected in this design?
- How could this design have been translated better?
- What interactions / additions are you missing?
- What should I do differently in the next design iteration?
- What questions should I have asked you during our past interviews?
- Any additional comments?

4 Ideation

This chapter reflects on the ideation phase of which the methodology was outlined in the previous chapter. The results of the stakeholder analysis, co-creation session, and user interviews are depicted below, together with the three respective design iterations. Concluding, a requirement list resulting from the findings in this phase is outlined, and checked on its fulfillment.

4.1 Stakeholder Analysis

The main stakeholders of this project “Smart Rainwater Buffer XXL - Design for Public Spaces” are divided into the roles of decision-makers and users, and can be viewed under *tab. 4.1*. For this project the identified stakeholders are:

Stakeholder	**Role**
Municipality of Enschede	Decision-Maker
Waterboard Vechtstromen	Decision-Maker
University of Twente	Decision-Maker; Supportive
Supervisor Wouter Eggink	Decision-Maker; Supportive
Inhabitants of “de Bothoven”	Users
Inhabitants of Enschede	Users

tab.4.1 Stakeholder Role Division

Representing the power-interest ratio of each stakeholder, the created stakeholder matrix can be viewed under *fig. 4.1*. People in high power positions and high interest are located in the top right, while low power and interest are depicted in the bottom left. The positioning of the name describes their current status most accurately.

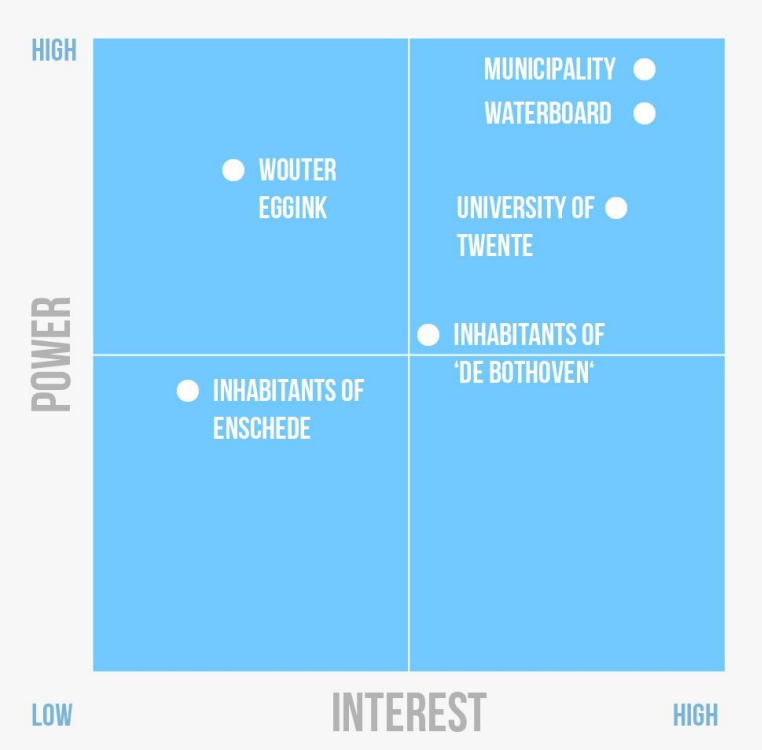

fig.4.1 Stakeholder Matrix as proposed by Bryson (2004) Indicating Stakeholder Power & Interest Levels

4.1.1 Municipality of Enschede: Hendrijkan Teekens

The main stakeholder of this project is the municipality of Enschede; being the client they can be considered the biggest decision-making instance and are positioned high in power and interest in the stakeholder matrix.

Represented by water landscape designer, Hendrikjan Teekens, the motivation of pursuing this project is high, as the municipality is responsible for decreasing high-cost damage induced by floods and heavy rainfall. The implementation of the Smart Rainwater Buffer XXL can lead to the desired results of decreasing damage and raise the inhabitants' satisfaction, while also stimulating them to actively participate in this process, by buying the predecessor project: The Smart Rainwater Buffer.

4.1.2 Waterboard Vechtstromen: Jeroen Buitenweg

As another client of this project, the Waterboard Vechtstromen counts also as a main stakeholder and a decision-making instance. What falls under the responsibility of the waterboard is the functionality of the sewerage system instead of the residents' satisfaction and

safety. As the sewerage system plays a role in decreasing flooding in Enschede, both instances (municipality & waterboard) cooperate in order to find a solution for this issue.

The Smart Rainwater Buffer XXL connects these two problems, and can pose as a solution for relieving the stress on the sewerage system. Representing the waterboard in this project is Jeroen Buitenweg, the Senior Policy Maker, responsible for climate in Enschede.

4.1.3 University of Twente: Richard Bults

As another decision-maker, the University of Twente is represented by project leader Richard Bults and acts as a connector between designer and client. Being the critical observer of this project and having also worked on predecessor projects of the SRB XXL, his involvement is crucial as he can provide proper judgement in this field. He is also a decision-making instance as he shows high enthusiasm to make “de regentoren” project successful.

He is considered a supporter of the project, having great interest in building the SRB XXL also on the grounds of the University of Twente.

4.1.4 Supervisor: Wouter Eggink

In contrast to the prior stakeholders, the supervisor of this project, Wouter Eggink, is neither a client, nor involved in predecessor projects of the Smart Rainwater Buffer XXL. As an experienced designer, however, his opinions and expertise offer a supporting hand to this project and ensure that it follows a proper designing process.

As the supervisor, he is also a decision-making instance, in whether the project is considered successful or not, since his judgement on design is more refined than the clients’.

4.1.5 Inhabitants of “de Bothoven” Area

The residents of “de Bothoven” area are the user group most affected by the Smart Rainwater Buffer XXL, as it will be placed in their neighborhood. While the residents do not hold power on whether the project will be accepted by the client, they have the chance to alter the outcome during user interviews. Additionally, the designer focused on this user group most while trying an empathic design approach, as these users are the deciding instance in whether it is accepted in their neighborhood or not.

This stakeholder group does not have an official representative and can be divided into multiple stakeholder groups within the geographic border of the neighborhood. With differing

demographics, some of the identified user groups are for instance: students, elderly, young families, foreign students, and elementary school children. However, their opinion was represented by one male (age 27) and two females (age 26, age 23) inhabitants of de Bothoven that were willing to assist in the design process through the co-design session and interviews.

4.1.6 Inhabitants of Enschede

With “de Bothoven” area being located within the city of Enschede, the remaining residents of the city are also considered stakeholders. These are not as affected by the SRB XXL, still, there is a chance of interaction when entering the neighborhood, due to other attractions like the “Performance Factory” (see: List of Abbreviations & Information).

The entire city of Enschede offers a bigger audience for the stimulation of buying a private Smart Rainwater Buffer, and therefore must also be kept satisfied by the solution. Similarly to the residents of “de Bothoven”, different user groups can be identified and therefore not summarized into a single user group. Such target groups are: students, foreign students, workers, elderly, families, and children. These were represented by the co-designers of the participatory design session, including two males (age 21, age 22) and one female (age 25).

4.2 Participatory Design Session Realization

The results of the participatory design session are discussed in this section. Including four participants that were residents of Enschede, the age of the co-designers ranged between 21 and 25. Two males and females engaged in the session, while one of the co-designers was a resident of the target area “de Bothoven”. These participants were chosen under the consideration of the “conditions of successful citizen participation”. (The Hague Academy for Local Governance, https://thehagueacademy.com, 2018)

To realize this session, preparation to create meaningful tasks for the co-designers was necessary. Research was conducted (see chapter 3.1.3: User Involvement) that determined the structure of the co-design session. Part of this structure included scenarios the co-designers had to work with.

In order to be able to create realistic scenarios, based on real experiences of inhabitants of Enschede (Van der Bijl-Brouwer & van der Voort, 2009), prior interviews with residents of the city were necessary. These are considered expert opinions that help gaining insights on actual

problems residents are facing in red zone areas of the city. The problems concluded from the interviews were translated into open-end storyboard scenarios with which the participants of the co-creation session worked with.

The conclusions made from the interview provided insight regarding some of the residents' stances towards changes made in the city. While an interviewee stated to not really care about his environment, given his neighborhood is not really known for being beautiful, it is not to be excluded that different neighborhoods are treasuring their beauty. These residents hope that nothing will be placed that might interfere with that. (see appendix A). The supposed improvement of floods is very likely not able to change the residents' view towards that.

However, other insights of residents also included, since "as long as it does not make any sounds or blocks the light or anything" (see appendix A), there is no reason, as of why to be against the Smart Rainwater Buffer XXL. This includes the neighbors of the interviewee, as she stated that its usefulness will trump the expected dislike towards it.

Concluding, both interviewees did not show any signs against the Smart Rainwater Buffer XXL being placed in their neighborhood, however one of them was concerned about the opinions of other neighborhoods.

These insights were used in order to create meaningful and realistic scenarios (see appendix A) and acted as refinement of the co-design session. The results of the entire session can be viewed in the following paragraphs.

4.2.1 First Round: Collaging

Introducing the collaging exercise in the beginning of the co-design session served the purpose to stimulate the participant's creativity and form an image of the other participating members. The exercise was to connect given pictures to personal emotional values that the participants wanted the municipality and people in positions of power to consider.

The co-designers quickly united as a group and were comfortably talking to each other while discussing their ideas. Firstly, they chose a few pictures and made connections with them that were later sorted out into different categories. Such categories included nature, environment,

architecture, beauty, demographics, and collaboration between people. The pictures were clustered onto an A0 sheet of paper. Given that most pictures were connected to more than one single category, the group decided to create a venn-diagram out of the entire sheet of paper.

Climate change and changes in the environment that can affect people severely were mentioned frequently. An example would be to embed the SRB XXL into nature, or to use nature in order to help against floods (including the SRB XXL was not necessary in this exercise, but mentioned regardless). Inclusion of people, not only of all age groups, but gender, and also regarding important decisions in the city were highlighted often. The municipality would either act as a connector of the residents, or split these up.

The end result can be seen under *fig. 4.2*. Focus was placed on which changes could pose as a source of conflict, especially regarding discrepancies between the municipality and the residents. Desired solutions regarding such discrepancies were discussed, which were connected to the left side of the figure. Collaboration, consideration of residents, balance, and respect towards nature were the most important emotional values the group settled on during discussion in order to avoid disagreements between municipality and residents as much as possible. Importance was placed on proper communication between the municipality and the residents of Enschede; if the residents are properly included into a decision-making process, conflicts were less prone to happen. A city with only satisfied people did not seem realistic, but if the opinions are at least considered, residents might feel more comfortable already (see appendix B).

fig. 4.2 round 1: collaging co-creation session result

4.2.2 Second Round: Scenarios

After the collaging round had ended, open-ended scenarios were introduced to the co-designers. In this round the four participants were split into groups of two and received three different scenarios, which can be viewed under *fig. 4.3* and *4.4*. Although the problems depicted in the scenarios were identical, differences in personas were introduced to view the cases from various perspectives. This exercise asks the co-designers figure out how the residents portrayed in the scenarios will react to the situation they are placed in and motivate their answers by adding specifications to their persona.

All the results stated below can be found in appendix B. The storyboard templates of each scenario can be found in appendix A.

fig. 4.3 & 4.4 round 2: group 1 & 2 completing open-end scenarios

4.2.2.1 Scenario 1: Edgar / Michael

The problem description of the first scenario illustrates a male (age 35 / age 21) dealing with decisions made by the municipality of Enschede; an SRB XXL is supposed to be placed in his neighborhood, even though that area is not prone to be affected by floods.

Persona	**Persona Specifications**	**Possible Reactions to the scenario**
Group 1 Edgar (35)	• prestigious environment & beautiful exterior (make him care about his neighborhood) • has children • SRB XXL is placed outside	• does not want the SRB XXL take away space his children are playing on in the neighborhood • SRB XXL obstructs light getting into his house or the view when looking outside the

	his window • positive stance towards changes made to the city	window → dissatisfaction • happy about positive changes made to the city; positive reaction to the municipality working on problems regarding suffering residents
Group 2 Michael (21)	• young person → asks questions, cares about sustainability • interested in such projects and open to involve himself • student of the University of Twente	• add something to the aesthetic of the SRB XXL • voice opinions and concerns regarding new installation, since it does not affect him positively directly • more inclined to accept the solution if his area was prone to flooding

tab.4.2 Scenario 1 Solutions Group 1&2

It is difficult to determine what opinion he could have, but since it is placed there with a positive reasoning, there is not too much to complain about.

4.2.2.2 Scenario 2: Seuren / Dieter

The second scenario revolves around a male (age 21 / age 47) severely affected by floods in his area. His basement is regularly flooded and he is clearly dissatisfied by the way how things are handled in Enschede. While being aware of the progress regarding water management in the city, he has not been affected by the perks yet, which explains his deep dissatisfaction.

Persona	**Persona Specifications**	**Possible Reactions to the scenario**
Group 1 Seuren (21)	• student studying in Enschede • aware of changes made in the city • lives together with his friends in the affected apartment • his and his friends' furniture and other stored things are damaged	• very dissatisfied by not being affected by the solutions the municipality offers • voices his opinions to the municipality • make a change on his own since the municipality clearly does not help anyway • mad, will leave the city after his studies are finished
Group 2 Dieter (47)	• has complained to his neighbors a lot already • his neighbors share the same problem • contacting the municipality has already happened	• start a petition to finally focus on his neighborhood • will feel ignored until he sees a change happen • contrary to the previous scenario, he would definitely accept the SRB XXL

tab.4.3 Scenario 2 Solutions Group 1&2

4.2.2.3 Scenario 3: Margarita / Sara

The last scenario is about a woman (age 68 / age 27) living in an apartment building in Enschede. Even though she knows that her area is affected by floods regularly, she does not experience any setbacks due to living on the second floor. While the municipality decided that changes should be made, the lady does not approve of them, since she is not affected by any of the problems that appear frequently in her environment.

Persona	**Persona Specifications**	**Possible Reactions to the scenario**
Group 1 Margarita (68)	• person that is prone to complain • in an apartment building inhabited by elderly there is a committee taking care of their problems	• in order to overcome such selfishness, the municipality must educate people against such projects • the committee might contact the municipality on behalf of the elderly • they might not be educated or ignored, however they want their opinion be heard, regardless of whether a change will be made or not
Group 2 Sara (27)	• prioritizes her own desires over others • ignorant about the problem, since she is not affected • impose her opinion on other people	• through contacting her neighbors she might realize the importance of this solution • might change her mind and not complain about it anymore • or voice her problems online, like on twitter • will very likely accept the solutions, especially if the neighbors affected by the problem will convince her of that

tab.4.4 Scenario 3 Solutions Group 1&2

4.2.3 Third Round: Brainstorming & Prototyping

After completing the second round, the third and final exercise was introduced. The co-designers were asked to make up concepts and come up with ideas revolving on how to design a Smart Rainwater Buffer XXL in a public setting. The results can be viewed under *fig. 4.5* and *4.6*, which depict the notes of both groups of the exercise.

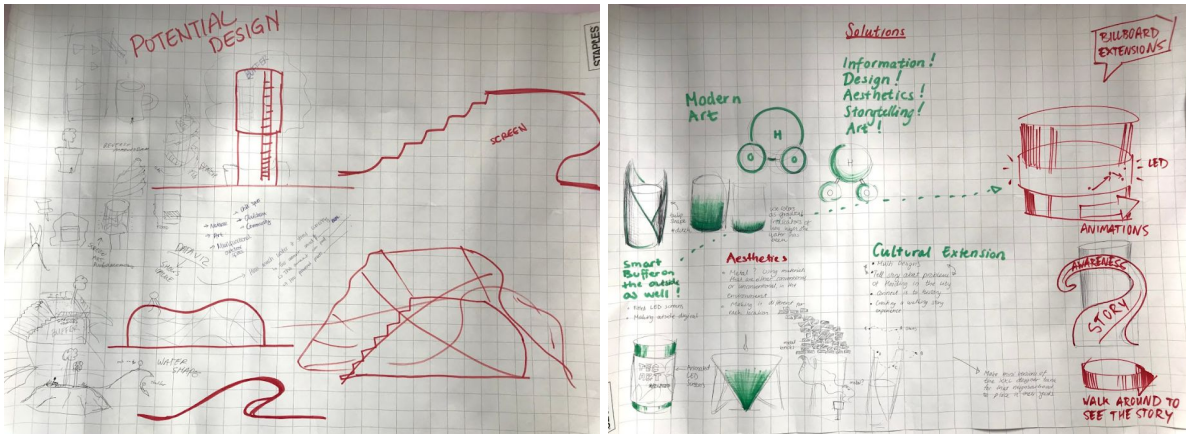

Fig.4.5 & 4.6 round 3: Prototyping Group A & B Results

Both groups mainly focused on how to make interaction with the Smart Rainwater Buffer XXL meaningful and how to raise its value for the people affected by it.

Instead of making floods less noticeable, adding something that makes the SRB XXL more remarkable and therefore useful for the neighboring residents was suggested frequently. Data visualization on how much water was collected already, how many floods were prevented, what the water can be used for were some examples proposed as a possible solution as well. Other ideas included designs that lead the user around the SRB XXL, telling the story of the city of Enschede, or how these floods affected the city in the first place. Making the Smart Rainwater Buffer XXL location dependent while telling a story also came up in the discussion; combining art and storytelling, and thus creating a connection to nature as well as Enschede. Art could be for example expressed via a screen that would be used by local artists to exhibit their works.

An aspect that was highlighted multiple times was to create a place that can be visited easily by the residents of Enschede. A place where people can rest, posing the simplest interaction between human and space. The co-designers stressed that Enschede was lacking an area in which people could just visit and have a good time with their friends and family and that also did not include having to pay money to sit in a café or restaurant.

In figures *4.7* and *4.8*, both groups present the results of their brainstorming and prototyping session. Here, the focus is placed on what kinds of concepts, shapes, and interactions both groups came up with.

Examples of these concepts are to create landmarks that could be bigger versions of everyday objects (like a huge cup, a large plant or a big vase). Others described for instance a “wave”, giving residents the possibility to sit beneath and on top of it. Additionally, ideas

including connecting the SRB XXL to a more industrial look were proposed, alongside more natural suggestions, such as inserting leaves or wood into the design.


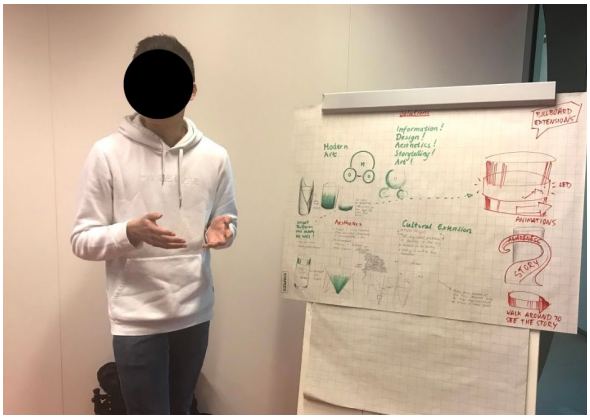

Fig.4.7 & 4.8 round 3: prototyping group A & B presentations

4.2.4 Conclusion

Considering the solutions of the co-design session, it was very apparent how the co-designers focused on aesthetic features that would raise the value of the SRB XXL. The appearance of it was something that would make the design of it more appealing to the general public. Additionally, many comments about possible interactions were made, which would also raise the design's value, not only for the SRB XXL, but also the area in which it would be placed in. Only rough concepts were mentioned in which these characteristics could be applied to.

4.3 First Design Iteration

Concluding from the conducted co-design session, a first design iteration was developed by the designer. Ideas and concepts of the co-design session were considered and translated into possible designs for the Smart Rainwater Buffer XXL. The proposed designs were still in very early stages, and therefore not refined and suitable for a possible prototype. However, these were a big stepping stone in understanding what users expected from the designer regarding the vision of the SRB XXL. Three options were created rooting from the co-creation session and the comments made. These can be viewed in the following paragraphs.

4.3.1 Design 1: Ribbon

The first design can be viewed under *fig. 4.9*. Depicted is a tall, transparent cylindrical tank surrounded by a thin metal frame that spirals up to the top. The frame is divided into two parts, encircling the tank from two different sides, consisting of a shiny bright metal colored in white. The concept of this design is called “ribbon” due to the shape of the frame.

The Smart Rainwater Buffer XXL in this design does not only serve as a tank collecting water, but also offers an aesthetic feature and acts as a sculpture, blending into the industrial environment that is known in “de Bothoven” area. The spiraling metal frame serves a functional purpose as well; it invites audiences to walk around it and observe the tank from all sides. Interesting to note is that the SRB XXL looks different, depending on what angle it is looked at, due to the second spiral surrounding the cylinder. The transparency serves as an informing feature for the residents to see how much water has been collected already, and to be able to get insight on the current water levels of the tank.

Feedback that was focused on from the co-design session was the wish to turn the SRB XXL into an artistic model that would add aesthetic to “de Bothoven” area. The metal strip connects to the industrial history Enschede has and additionally offers a leading design around the tank.

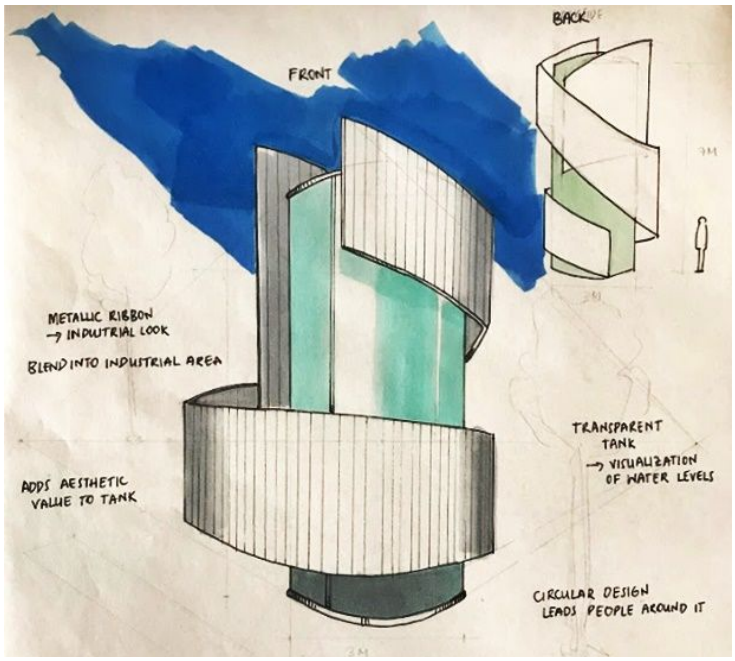

fig.4.9 Design Iteration 1: Ribbon Design

4.3.2 Design 2: Tap

The second design of the first iteration can be seen under *fig. 4.10*, consisting again of a tall, transparent cylindrical tank, surrounded by a big metal strip curving around it. A wooden band is attached to the middle of the tank, depicting a picture of a tap (hence, the name of the design). The water jet in the picture of the tap is in this case transparent, offering the residents to see water levels, even if the height is currently hidden behind the wooden band. The backside of the band also offers a big window to see its water levels. This is added with the same motivation as in the design earlier, serving as an informing instance for the residents to check how high the water levels currently are. Additionally, the design is connected to a bike cleaning station which is supplied with water by the SRB XXL.

The metal frame around the SRB XXL is also serving as a sculptural feature; depending on what kind of sculpture stakeholders prefer, either the first or the second design can be applied. The addition of the wooden band adds more diversity to the design, making three different materials clash: glass, metal, and wood.

This design was based on the natural aspects that should be implemented (wood), and again add to the industrial history of Enschede. Due to its modern look, it suits “de Bothoven” area and its attractions, embedding it properly into its environment. The wish of adding more aesthetic to the area is picked up again in this design, creating an interesting sculpture that can be viewed when visiting “de Bothoven”, or commuting to school or work.

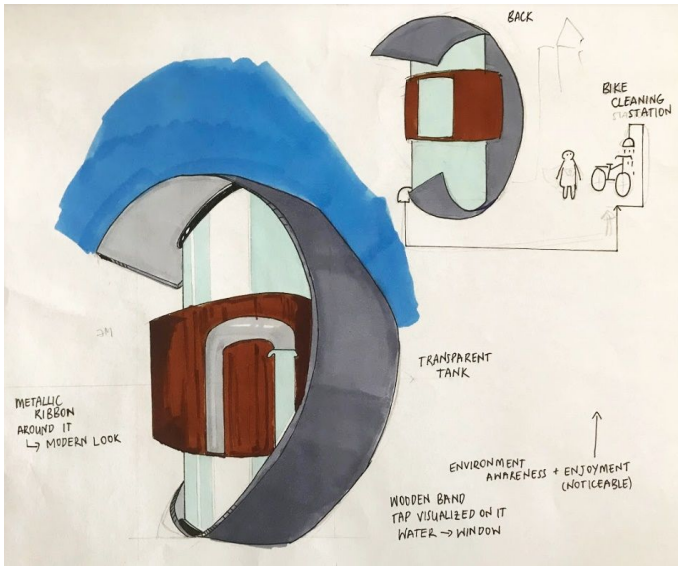

fig.4.10 Design Iteration 1: Tap Design

4.3.3 Design 3: Pavilion

The last design of the first design iteration is visible under *fig. 4.11*. Depicted are two big transparent tanks detached from each other. These create a cylinder shape viewed from the outside, but construct a hollow space on the inside. Places to sit are offered in that space, which can be accessed by entering two entrances these two shapes build.

The design is called “pavilion”, due to it offering a resting place for visitors of the SRB XXL. It incorporates architectural elements, like a roof and seating places for the interacting instance to rest; this does offer the desired interaction mentioned in the co-creation session. Interesting about this design is that groups of people can meet up inside the created space, while being circled entirely by water. The privacy offered and the beautiful sensation of being surrounded by water, similarly to an aquarium tunnel, create an interesting view that will be visited often by people, adding a further attraction to “de Bothoven” area close to the “performance factory”.

The roof that is added to this design does also protect the users from rain, giving it a secondary protecting instance: being sheltered from rainwater regarding floods and also in case of rain showers while visiting the SRB XXL.

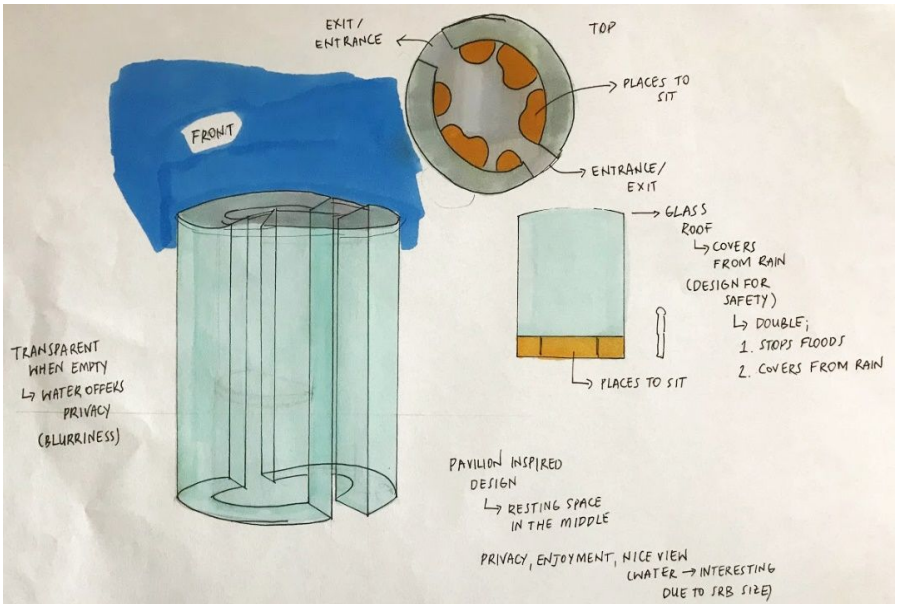

fig.4.11 Design Iteration 1: Pavilion Design

4.4 First Round Stakeholder Interviews

After completion of the three options of the first design iteration, these were taken to user interviews, following a user-centered design approach. Conducted with the participants of the co-design session and additionally two residents of “de Bothoven” area, the results of the interviews are outlined in this section.

In total, six interviews were conducted; three interviewees representing the co-designers, and three interviewees (one of these also as a participant of the co-design session) representing the residents of “de Bothoven” neighborhood. The earlier described design iterations were evaluated by them, and first thoughts and feedback in what ways these could be improved were given. All interviews can be viewed in appendix C and appendix D.

4.4.1 Co-Designer Interviews

The participants of the co-designing session shared similar opinions regarding the first design iteration of the Smart Rainwater Buffer XXL. The materials given were considered modern, neutral, and suitable for “de Bothoven” area. As the materials, the designs were recognized as well embedded into the environment, but misunderstood regarding their functionality. Additionally, lack of interaction with the SRB was noted, which lead the “pavilion” design to be preferred; visually, the other designs were picked.

What was criticized was the lack of conveyed message expected from these designs. The motivations behind the decisions were not clearly expressed and did not make proper use of the aspects the SRB XXL is offering. The design leading around the SRB XXL is for naught, if there is nothing to see that would make the interacting instance interested in the design. The organic shapes of the design were liked, however did not utilize the characteristics the SRB XXL was offering either. Adding features isolated from the design did not add much meaning, as it is seen in the “tap” design, therefore incorporating such additions would be more meaningful. The tap drawing on that design was also misleading to the interviewees.

Visually, the “ribbon” design was preferred most, while the functionality of the “pavilion” design was praised. Features that the interviewees recommended to add, were digital solutions, like lights (LED) or screens, and also to experiment with shapes and formations of the designs a little more. Minimalistic features that were picked up in the “pavilion” design were either

appreciated, or called “too basic” (see appendix C). Entertaining features should be added. Ideas of how to change the shape of the tank were also given; for instance making it really wide and giving visitors the change to sit on top of it. Adding greenery in order to enrich the environment with more nature was also an option that was strongly recommended.

4.4.2 “De Bothoven” Resident Interviews

The representatives of “de Bothoven” area reacted similarly to the co-designers that were interviewed beforehand. The designs were considered simplistic, with a few dynamic aspects, but meaningless regarding the design decisions and the interactions. Given the designs looked like that, the SRB XXL would not be visited intentionally, at least not on a regular basis. The interviewees recommended to be more conscious about what should be conveyed with the design decisions made and add more interaction to it. Something that would make the residents of the area want to visit the SRB XXL and enjoy its presence. Special focus was placed on the theme of water, and to translate that properly into the design; make it feel more natural.

The materials of the designs were liked, especially the combination of glass, metal, and wood, however the glass should be tinted in a color, preferably blue. The functionality of the “pavilion” is preferred in these interviews as well. The positioning of the two halves in that design should be experimented with, depending on what mood the design is supposed to convey; a more private space, a more public and open space - it depends on how the SRB XXL is positioned.

Changes regarding the “pavilion” design were also proposed; turning the seats transparent, for example, or a change of color was suggested. Glass or wood materials would be preferred over an orange tone. Educational aspects should also be added, which might include facts about the amount of water that is collected.

4.4.3 Conclusion

After the first stakeholder interview, the inadequate design of the first iteration became apparent. What was mostly mentioned was the lacking message these designs were sending; they were adding an aesthetic feature to the area and were considered more suitable than solely a tank, however it did not offer the visitor anything, as stated by the interviewees (see appendix D).

Addition of natural aspects like water a water theme, or more suitable addition of wood materials was wished for. Especially in terms of conveying properly what the SRB XXL stands for, such natural aspects would add to the design.

4.5 Second Design Iteration

Rooting from the first design iterations, the second iterations focused on implementing as much feedback as possible collected from the stakeholder interviews. Importance was placed on the implementation of natural aspects and a more interesting and meaningful design that conveys a message that was missing in the earlier iteration. More interaction was added, combined with many more details that were not visible in the previous designs.

4.5.1 Design 1: Umbrella

The first design of the second design iteration can be viewed under *fig. 4.12*. The image depicts a big cylindrical tank, tinted in two different colors. Attached to the middle of the design is an umbrella shaped roof, protecting the visitors of the SRB XXL from upcoming rain. Also visible are seats that are either extruded from the tank, or carved in, in a drop shape (as visible in the bottom right of the image).

This design focuses strongly on the water theme that was proposed by the representatives of “de Bothoven” area, which also connects strongly to the purpose of the SRB XXL. The concept that was visible in the “pavilion” design of the previous chapter was picked up again in two different translations: the resting place is reintroduced into this design, additionally, the idea of sheltering the residents from rain with the aid of a roof is implemented as well. These two implementations were reused due to positive feedback from the residents and co-designers.

The chosen colors of the design carry a meaning as well; the dark blue tint in the top of the tank has raindrops drawn on it, illustrating a stormy environment that the residents are protected from, as long as these stand under the shelter that the umbrella-roof offers. This justifies the choice of light blue color in the bottom the design; representing a calm and serene area in which the residents can relax. This design conveys the message of the SRB XXL being a protecting instance, sheltering from the rain in two senses.

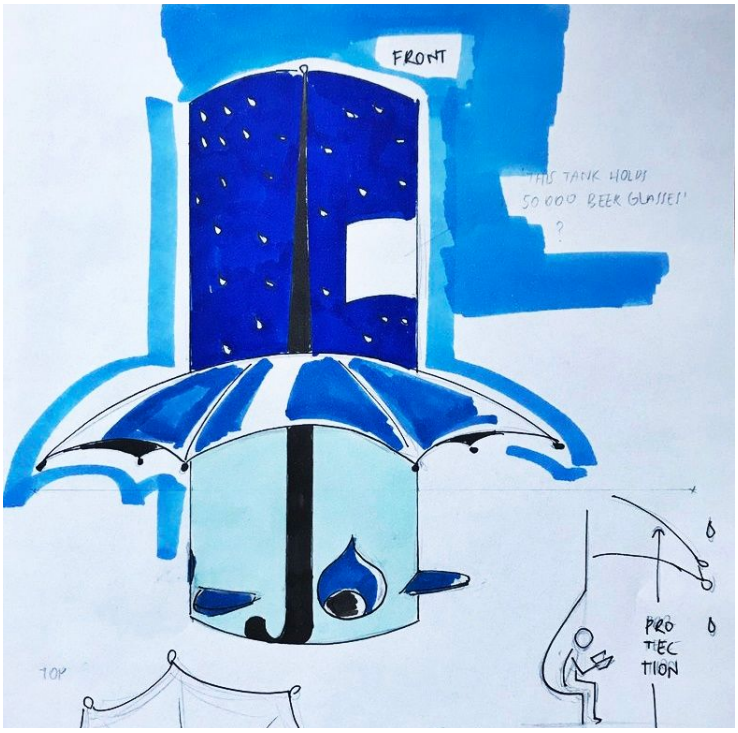

fig.4.12 Design Iteration 2: Umbrella Design

4.5.2 Design 2: Garden

The second design can be viewed under *fig. 4.13*. Illustrated is once again a big cylindrical tank, tinted in a light blue color. Attached to it on the top is a platform, operating as a garden. On the bottom of the tank, a ramp is provided, offering a lookout place for visitors of the SRB XXL.

The motivation behind these design decisions is connected to the prior feedback that was given by the interviewees; more interaction was requested that would make the design meaningful for the visitors of the SRB XXL. As the metal frame around the tank was preferred visually, that element was picked up again and applied to the ramp spiraling around the bottom of the tank. This ramp makes the SRB also accessible to disabled visitors and adds the industrial look to the design that was liked in the earlier versions.

The feature that stands out most in this design is the self-sustaining garden on the top of the design. The plants and trees will be watered by the tank itself during phases of drought, offering a demonstration of what the private Smart Rainwater Buffer can offer the residents. This functionality serves as an advertisement and showcase for the visitors of the SRB XXL. Additionally, it offers the residents a possibility to actively participate in saving the environment, if they were to buy their own SRB, compared to the other rainwater management solutions in

Enschede. As the SRB XXL is located closely to a park, visitors that usually do not live in that area are attracted and a wider range of possible customers is reached.

Combining the Heat Stress and Rainwater Management projects that are developed in Enschede, the garden design of the SRB XXL does not only help reduce floods, but also adds more nature into the city of Enschede in order to fight the heat stress. Especially in the center of the city not much nature is to be found, making this addition very valuable.

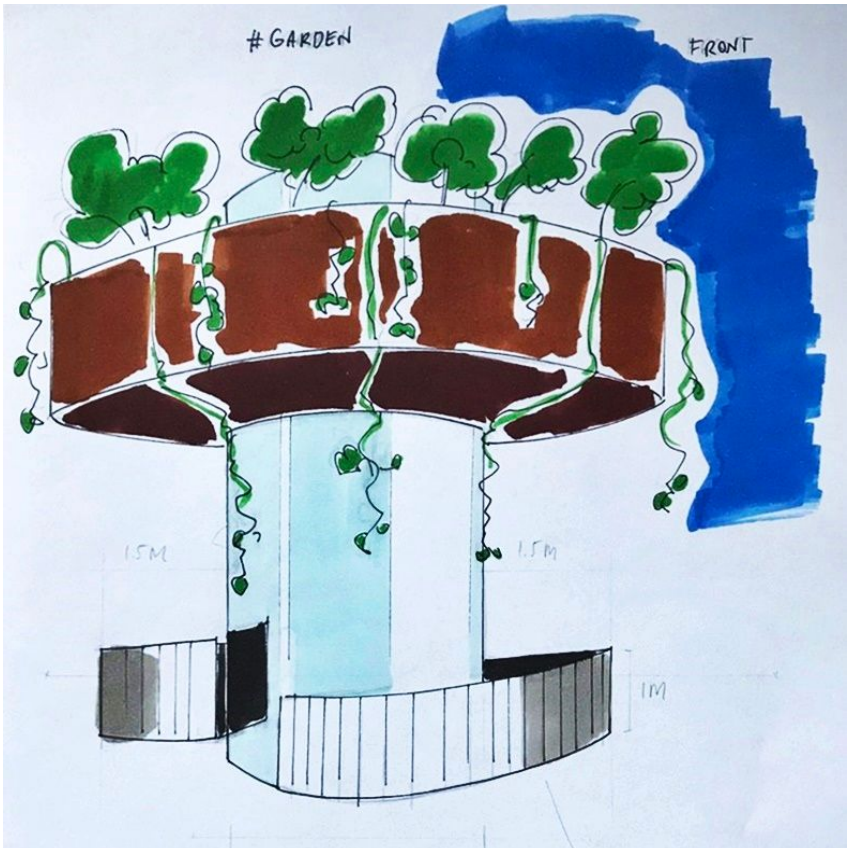

fig.4.13 Design Iteration 2: Garden Design

4.5.3 Design 3: Light Bulb

The last design of the second design iteration can be viewed under *fig. 4.14*. The concept revolving around this design is called “light bulb”, prominently highlighting the light aspect this design is offering. Compared to each design before that offered a cylindrical shape, this design has a narrow bottom and an expanding, circular shape in the top. Its shape is also similar to a light bulb.

The water is stored in the circular tank in the top of the design, being tinted in light blue. Sticking slightly out from the bottom part, lights are attached to the tank that light up the area as it gets darker. The motivation behind this lighting are the artworks that are exhibited on the bottom of the SRB XXL, offering local artists to show off their work in public. Compared to the other designs, this one has a very unique shape that offers a very modern look in Enschede. Instead of embedding it into its environment, it much rather stands out and attracts people to look at it and the artwork exhibited. Seating opportunities are also offered, turning the visitor's attention to the facts about the SRB XXL written on the ground.

Having combined the feedback of turning the SRB XXL into an artwork, while exhibiting artworks, makes this concept very interesting and definitely adds to the cultural treasures of Enschede.

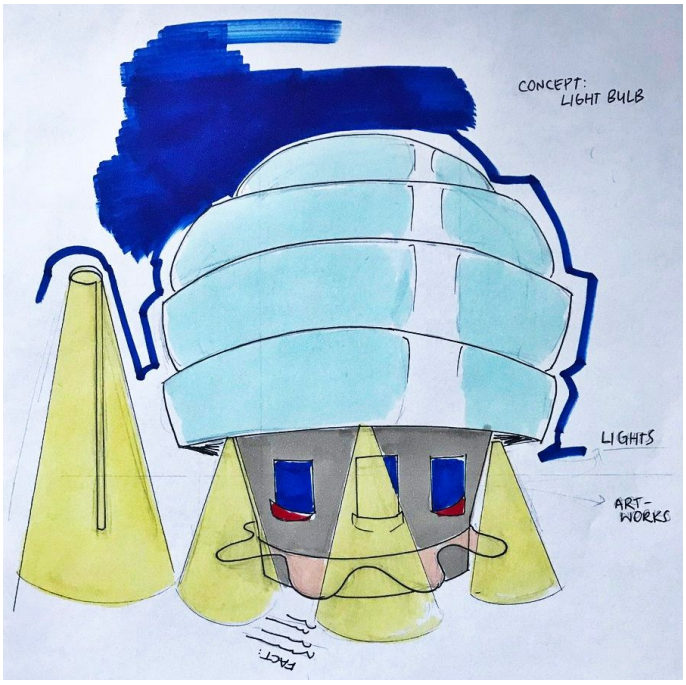

fig.4.14 Design Iteration 2: Lightbulb Design

4.6 Second Round Stakeholder Interview

After completing the three options of the second design iteration, these were taken to a second round of user interviews, following the process of the double diamond model. In order to find and define new problems, feedback of the stakeholders is necessary. One representative of the Municipality of Enschede was interviewed (female, age 42), voicing her opinions as the client of

this project. Additionally, these design iterations together with the third (visible under 4.7) were taken to supervisor Wouter Eggink, in order to discuss the designs emerging from the user feedback.

4.6.1 Municipality of Enschede Client Interview

Showing the representative of the municipality the designs of the second iteration, many questions were asked regarding the motivations and highlights of each design. A lot of feedback was given, especially focusing on the “umbrella” and “garden” design, as these were preferred.

The visuals of the designs were especially liked, however in each design an educational factor was missing. Additionally, little attention has been paid to the drought and heat phases Enschede also has to deal with, prominently in the “umbrella” design. Something adding a sun would be interesting, and very much support the concept of drought and heat.

A wish of implementing the logo of “de regentoren” project was expressed. Turning the tank into a tower would be a possibility or creating a shape close to the usual water towers that are known in Enschede. In terms of attracting people to spend time around the SRB XXL. seating arrangements would be preferred.

Concluding, no design was mentioned that was preferred most. However, she wished for the most prominent features of each design to be translated into one, while adding an educational factor and putting emphasis on drought. Additionally, the interviewee insisted on making the SRB XXL usable for the companies and institutions around it, in order for it to gain importance and usability.

4.6.2 Supervisor Discussion

At a later date, the insights assembled from the client interview and both the second and third design iteration were presented to the supervisor of this project. The third design iteration was developed right after the client interview implementing the entire feedback collected.

Discussing the results from the interview, it became obvious that integrating all given requirements was not a wise decision. Too many demands were made that would turn the design into chaos and cease from becoming consistent. Interesting comments were made by the client that proved to be useful in the final design, however not all requirements that were

asked could be fulfilled. The direct translation of concept onto the design (e.g. the “umbrella” design) were not viewed as sophisticated designs, just as the third design iteration was not.

Choosing certain characteristics that would lead to a refined design was considered a better approach to this problem. Relevant functionalities and interactions that offer a pleasant experience to the visitors were discussed with the supervisor.

List of relevant characteristics:

- Cylindrical Tank
- Garden & Greenery
- Seating Arrangement
- Advertising Instance
- Shelter from Rain

These characteristics can be found in the final design of the SRB XXL, described in 4.8.

4.7 Third Design Iteration

After having conducted the interview, the feedback of the client was integrated into the next design of the SRB XXL. Focus was placed on the direct statements made from the client, explicitly mentioning the requirement of inclusion of drought into the design. The sun-shaped addition was applied to the design quite literally, having a yellow tinted sphere added on top of the cylindrical tank. Thin pipes extrude from the sphere, representing sun rays; the drawing is visible under *fig. 4.15*.

The concept of this design is called “drought + flood”, having a contradictory element implemented. Interesting about this design is the integration of a watering mechanism again; however this time the sun rays do water the garden that is placed on the ground, adding a serene atmosphere to the area around the SRB XXL. Seating arrangements are also visible, having drop-shaped indentations on the tank, attracting visitors to stay longer around, which also helps advertising the private SRB.

As an educational factor, a scale is added from the bottom of the tank, extended to the very top of the cylinder. Visible on the image is a black stripe representing this scale, having added

divisions that showcase how much water has been collected. A fact is written next to this division, having the visitors understand the scale of how much water is collected, and also how much water is wasted; being exposed to such information, the residents will understand the importance of water harvesting and are more inclined to buy the SRB offered by “de regentoren”.

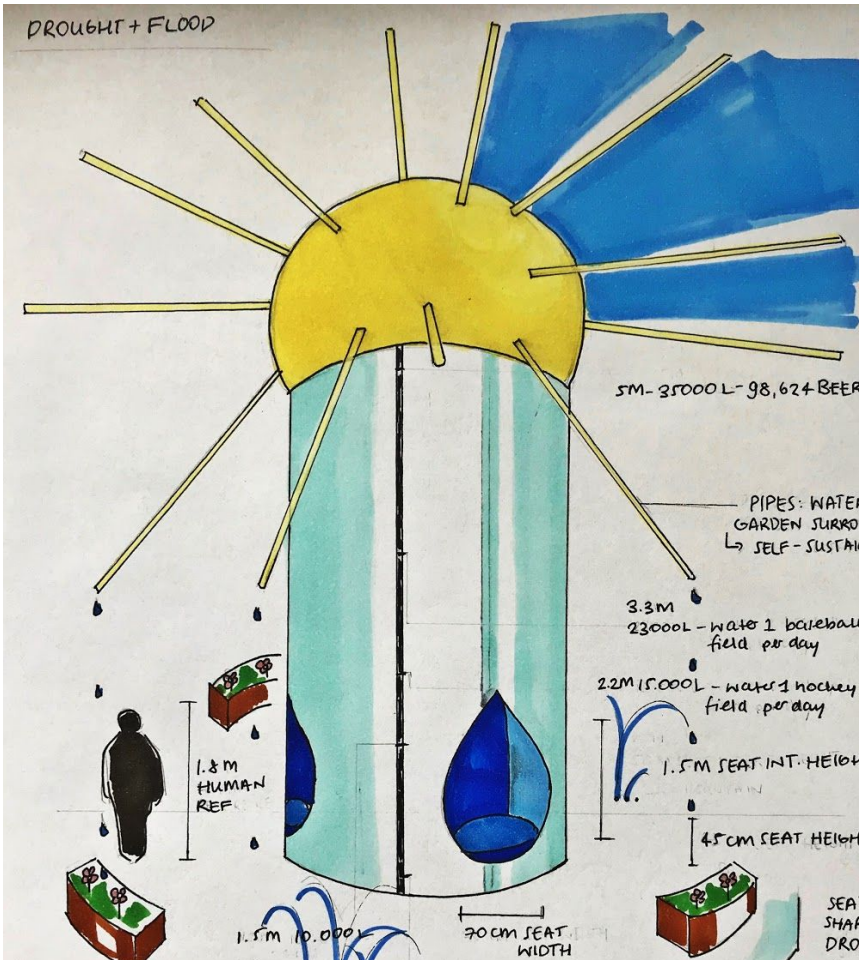

fig.4.15 Design Iteration 3: Drought + Flood Design

4.8 Final Design Iteration

Having finally reached the final design iteration, visible under *fig. 4.16*, it shows many similarities evident in prior design iterations. Prominent characteristics have been merged into the final design, which were discussed with the supervisor of this project, focusing on making this design refined and sophisticated.

A cylindrical tank was chosen again, based on the feasibility of this project. Choosing a generic shape that has elements added to it is easier to realize than a shape that must be custom made. Added to this tank is greenery and nature, in the top, similar to the “garden” design introduced in the second design iteration. Having greenery added to the design combines solutions for heat stress in Enschede, additionally to the advertising instance it offers. Showing off the possibility that the SRB XXL can water itself, it inclines the visitors to buy their own SRB, especially after being exposed to the educational facts the SRB XXL is offering regarding the scale of the water collection and its waste.

Seating arrangements are offered also, being extruded from the bottom of the tank. The wooden benches having a similar shape to the garden platform adding to the desired coherency. Creating a look as if these benches were sliced from the platform, downscaled, and added to the bottom of the SRB are part of the consistency of the design.

Having the garden lifted up does not only create an interesting look that includes greenery smartly in the centre of the city, but also offers a second functionality, which is picked up from prior designs. The platform being extruded over the seats like that offers shelter from rainfall for visitors of the tank. These can sit on the benches and stay dry, while it rains.

Concluding, the final design is based on many characteristics that have been mentioned and worked our prior to this iteration. No new additions have been made, merely decisions on which characteristics of the SRB XXL to implement, and which ones to toss.

A few ideas from the very first design iteration have stuck, for example the resting place as introduced in the “pavilion” design, and its transparent cylindrical shape. The combination of wood and glass was also picked up again, while the most prominent idea from the second design iteration was chosen. The “garden” design was very popular, given its functionality and being visually preferred. Its usefulness has proven to be very suitable for this project.

fig.4.16 Finalized Design

4.9 Stakeholder Requirements

Given from the user interviews and prior meetings with the clients, many requirements that can be divided into technical and non-technical ones distilled from the replies of each stakeholder over the course of the project. Not all requirements and proposals were considered, as these do not suit the coherency of the design or are not feasible. The given conditions can be seen under *tab. 4.5*, which do not only illustrate what requirements are demanded but also their respective priorities. The goal was to fulfill as many demands as possible during the development of this project. Focus was placed on the most attractive and popular characteristics that the stakeholders had described, which suited the area of Enschede and were feasible options in the creation of the final design.

While the designer can distinguish himself whether a technical requirement is fulfilled, the non-technical ones can only be accepted by the stakeholders themselves. These requirements are depicted below, divided into must, should, and could priorities.

Technical	**Non-Technical**
Must	
Hold 20-30 000 L	Attract residents to the area
Be placed in “de Bothoven”	Act as an advertisement for “de Regentoren”
Have seating arrangements	Have a coherent design
Be above ground	
Include greenery / natural aspects	
Should	
Be mobile	Include educational aspects
Have a screen	Be a relaxing and attracting area
Could	
	Be artistic
	Visually connect to “de Regentoren” logo
	Be a landmark for Enschede
	Include a sun-related design decision

tab.4.5 Requirement List Must/Should/Could Division

5 Specification

This chapter revolves around the specification of the final design that was introduced in the ideation phase. The details of the design are outlined, together with the specification on what experience is desired. This will be elaborated with the use of personas and scenarios, presented in the form of storyboards. Also, the context of the SRB XXL and its social background are portrayed in this chapter, concluded with a requirement checklist.

5.1 Detail Description of SRB XXL

In this section, additional details that were not highlighted in the ideation phase of the final design are illustrated. Such details include the measurements of the SRB and additional insights on other design decisions as well.

5.1.1 Detail Description

The final design of the SRB XXL, which was ideated in the previous chapter, consists mainly of a cylindrical tank, alongside external design features. These are the main elements of the final design, and carry the interactional and additional functional features of the Smart Rainwater Buffer XXL.

These features do not only provide natural additions in the center of Enschede, but also interactional features that will be implemented in “de Bothoven” area alongside the further attractions of the neighborhood. Consisting of a raised platform, which is attached to the cylindrical tank, a garden element was brought to the area, which is not only visible from heightened places, but also acts as a shelter for the people standing under it. Benches are placed there as well, in order for visitors to be attracted to the tank and stay there longer. This leads to the visitors being aware of the educational aspect the design offers, and therefore become more aware of the current water situation in Enschede, and how much water the SRB XXL collects, as well.

The glass material of the tank is tinted in blue, in order to cover the color of the rainwater, which is expected to not be entirely clear. Until a solution was found in order to filter the water, the tank will stay tinted.

Fig 5.1 offers a detailed visualization of the SRB XXL's exterior components, providing measurements, exact shapes, and exact placements of these segments.

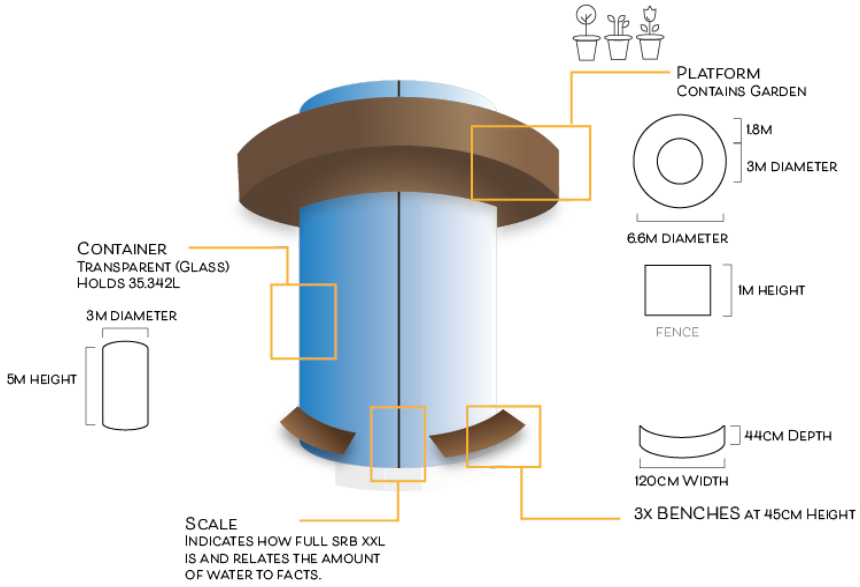

fig.5.1 SRB XXL Details

The exact measurements can be found in *tab. 5.1*. These outline the general size of the SRB XXL and its additional components.

SRB XXL Component	Material	Measurements in m
Tank	Tinted Glass (blue)	5 Height
		3 Diameter
Platform	Wood (Cherry)	3.2 Height (attached to tank)
		6.3 Diameter (+ Tank)
Garden Fence	Wood (Oak)	1.2 Height
Seat	Wood (Oak)	0.45 Height (attached to tank)
		0.4 Length
		0.2 Thickness
Water Scale	Dark Metal (shiny)	5 Height
		0.1 Thickness

tab.5.2 SRB XXL Materials & Measurements

5.1.2 Water Scale Educational Facts

In order to fulfill the requirement of integrating educational aspects into the design as requested by the municipality of Enschede, a water scale with educational facts has been introduced. These are supposed to inform the visitors of the SRB XXL with facts that are connected to the water levels of the tank and make them aware of water usage and waste. This information can stimulate them to take action and buy their own private SRB. *Tab. 5.1* illustrates the given facts corresponding to the amount of water that was collected and the according height on the scale of the tank.

Water in L	**Height in m**	**Fact**
150	0.2	Water waste of washing machine per use.
10 000	1.5	One month of water use per person.
15 000	2.2	Water one hockey field per day.
23 000	3.3	Amount an elephant drinks in two weeks.
35 000	5.0	Corresponds to 98 624 beer glasses.

tab.5.2 Water Scale Facts

5.2 Experience Specification

In order to specify the desired outcomes the placement of the SRB XXL will bring in “de Bothoven” area, this section portrays personas and scenarios, illustrated in storyboards. Having illustrated these, the intentions of the SRB XXL and possible outcomes can be used for future research on this project.

5.2.1 Personas

This section introduces three personas that were created based on what interactions and scenarios are expected in connection with the SRB XXL. These are based on possible inhabitants of “de Bothoven” area and what interactions might happen in terms of approaching the SRB XXL. Integration of details like a biography, goals, frustrations, and motivations, make

personas more believable, as these show similarities to real peoples' lives. Therefore, such personas are considered suitable to use in scenarios and prove to be valuable.

5.2.1.1 Persona 1: Dieter Hendriks

The first persona describes a 53 year old Dutch businessman living in "de Bothoven" area, together with his wife and two children that are currently attending high school. The exact details about this persona can be viewed under *fig. 5.2*, illustrating Dieter's personal background. Additionally, his demographics and a few characteristics are also added to his personification.

The reason why this persona was created in such a way, is due to the location of "de Bothoven" area being close to an elementary school, park, and other attractive venues that are neighboring the centre of Enschede. Dieter, as a man that has a steady income and uses it to make his and his family's life very comfortable, would choose such a family-friendly location, in order to let his children grow up peacefully.

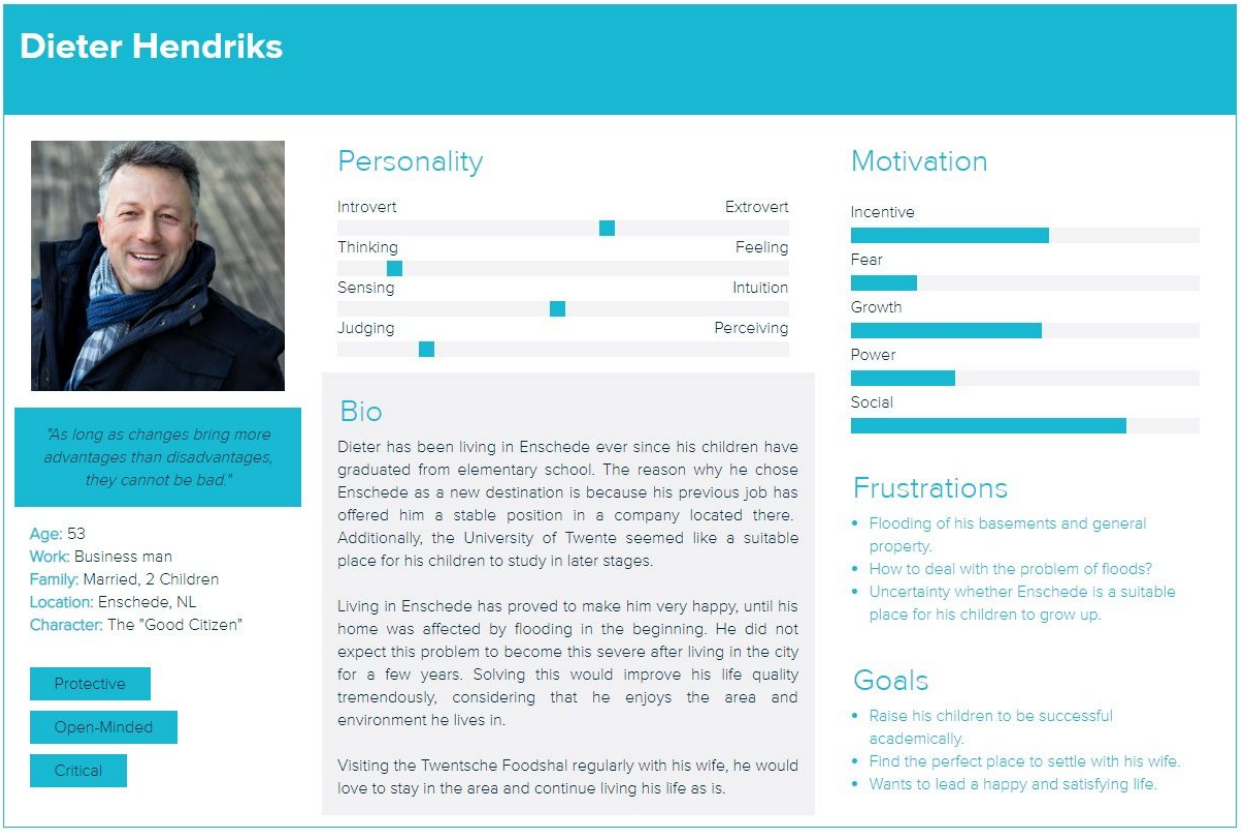

fig. 5.2 Persona Introduction: Dieter Hendriks

5.2.1.2 Persona 2: Sujang Park

The second persona illustrates a 23 year old student from South Korea that moved to Enschede in order to follow her studies. Further information about Sujang can be found under *fig. 5.3*, elaborating on her personality and background.

The reason why such a persona was chosen is due to “de Bothoven” neighborhood offering multiple apartment buildings that rent single rooms to students. There is a waiting list for such apartments, which are very attractive to foreign students, like Sujang is.

Her living in “de Bothoven”, close to attractions like the “Performance Factory” that offer foreign food and interesting events, add to a realistic setting of a character and make her suitable for inclusion in scenarios.

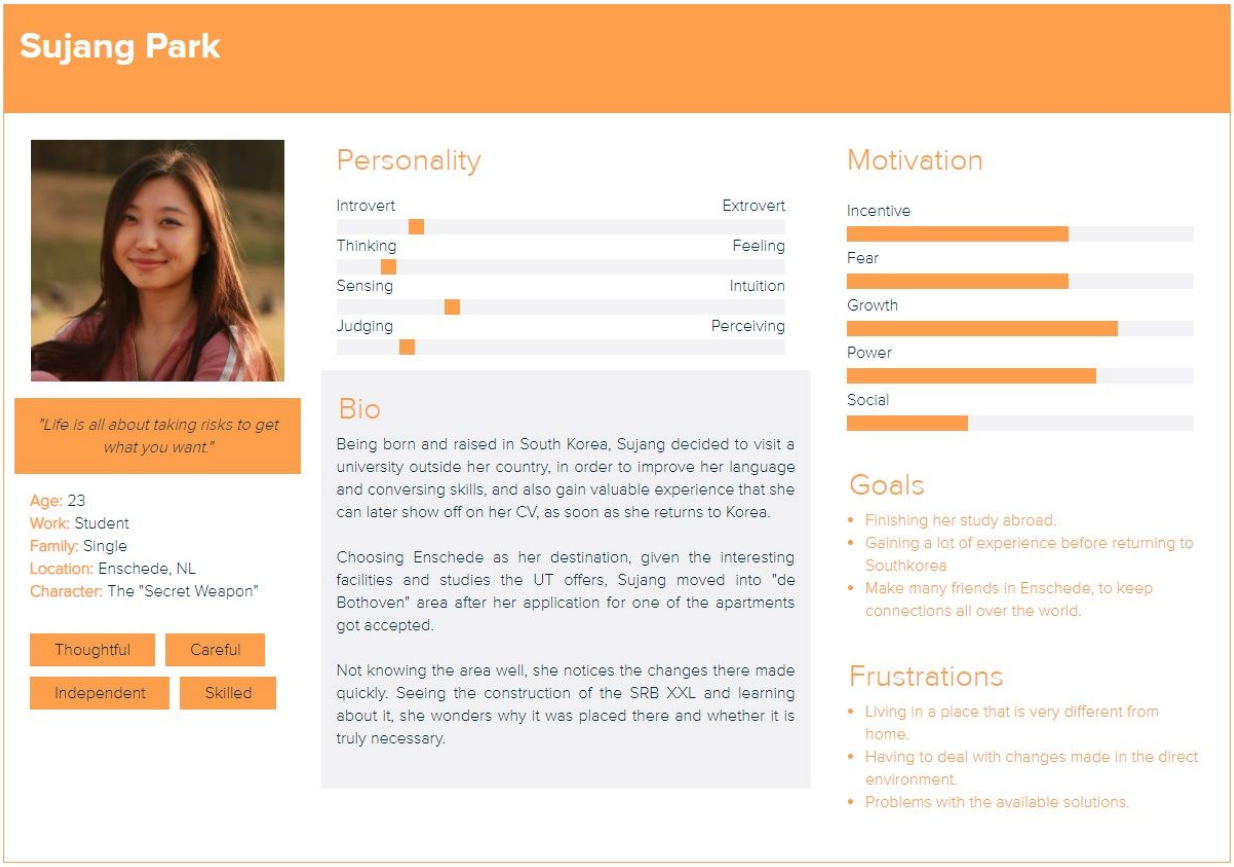

fig. 5.3 Persona Introduction: Sujang Park

5.2.1.3 Persona 3: Sara Hoekstra

The last persona portrays a 28 year old PhD student, studying at the university of Twente. More details about Sara's life can be found under *fig. 5.4*, adding information to her personality, goals, frustrations, and background.

Sara decided to move to Enschede, in order to study her master's and become a PhD student at the University of Twente. Due to "de Bothoven" being close to the centre of the city, and also close to the University, Sara decided to move into that neighborhood. Close to it is a park she uses for her routinely run, while she is also interested in events taking place in the "Performance Factory". That neighborhood suited her tastes mostly.

Such factors add realism to this persona and make her a reasonable persona, which can be used well in scenarios.

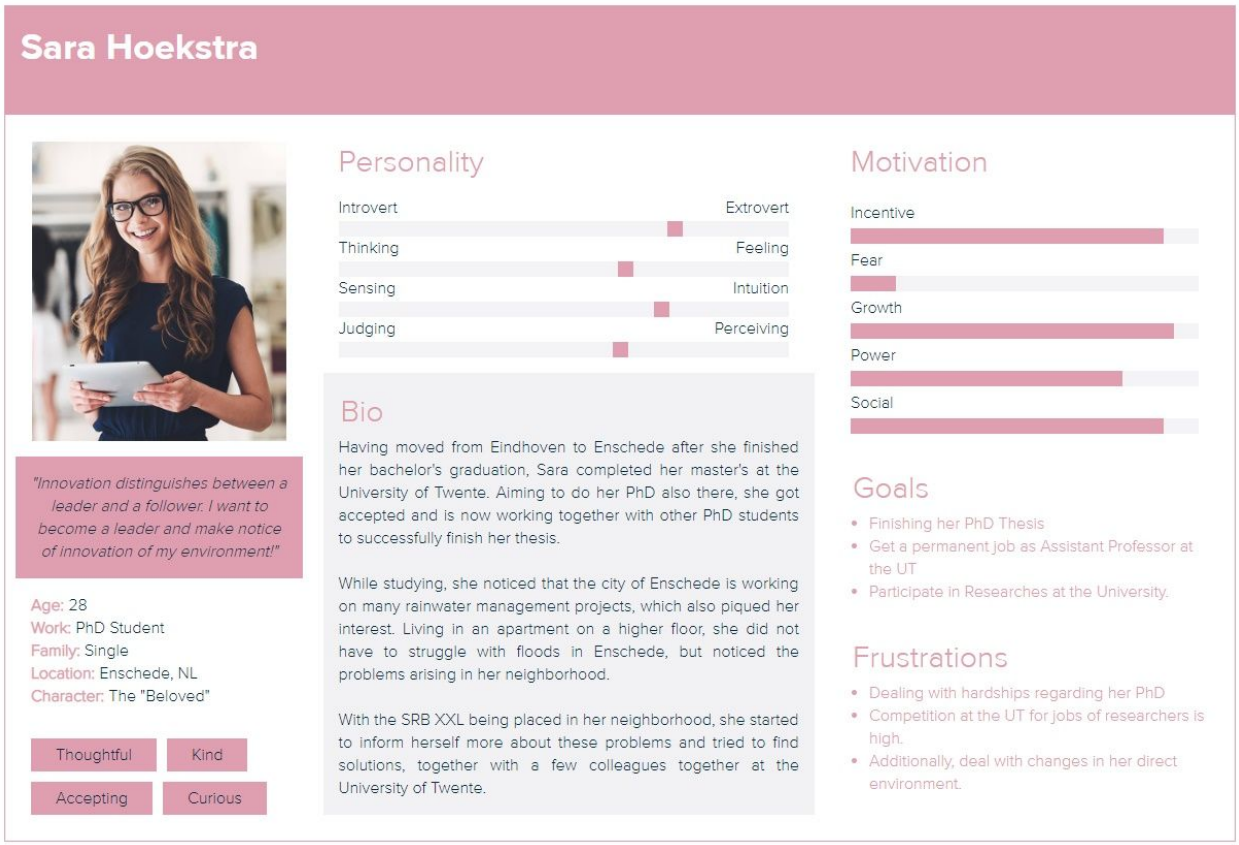

fig. 5.4 Persona Introduction: Sara Hoekstra

5.2.2 Scenarios

As aforementioned, scenarios are introduced in order to properly get across the true intentions and desired interactions of the SRB XXL. The following scenarios integrate the already introduced personas from the previous section. Everyday situations including interactions with the SRB XXL are illustrated and specify the user experience once the SRB XXL is built in its designated location.

These scenarios also include the earlier introduced personas and illustrate in what relationship these stand to the SRB XXL. Real situations are simulated in the following scenarios, which are illustrated in storyboards, and offer an estimation of how real interactions with the SRB XXL could take place as soon as it is placed in “de Bothoven” area.

The scenarios are based on the background information of the personas and therefore unique. For instance, Sara does not look for online events to find friends in the area, since she is already familiar with her environment; Sujang does not go to the food hall with her family, since her family still lives in South-Korea.

5.2.2.1 Scenario 1: Rainy Day

Since Sara moved to Enschede, she always looked for nice running routes she could use for her morning runs. After finally finding the perfect route, leading her along the train rails, she used that track to run past almost every morning. Since the SRB XXL was placed in her neighborhood, she ran past it without ever paying a lot of attention to it.

However, one morning it began to rain heavily, while she was on the way back of her run. Sara could not find a proper place to find shelter to await the rain to lighten. Passing the SRB XXL, though, she realized that the area around the tank was dry. Looking up, she noticed that the garden platform sheltered the space beneath it, which is why she decided to sit on one of the benches and wait. Enjoying the view of the rain, while resting and staying dry made her change he mind of the tank standing in her neighborhood. She was interested in its use, but never really in the physical version of it, which now has changed.

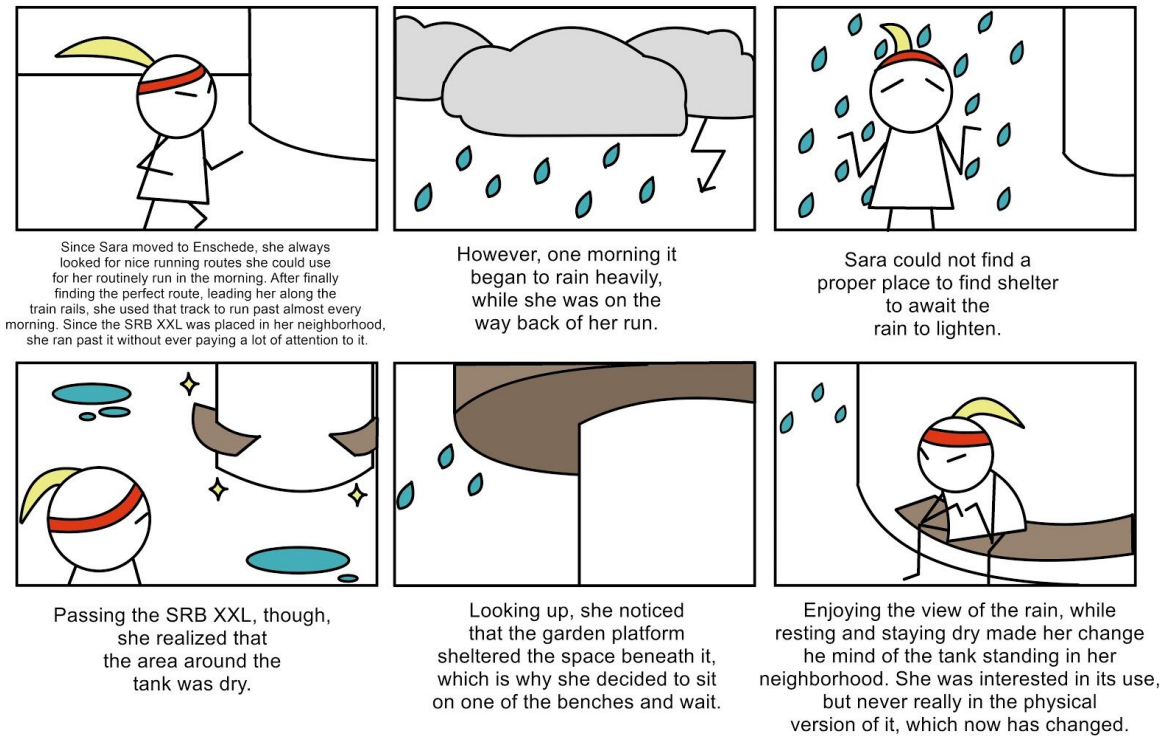

fig. 5.5 Storyboard 1: Sara Hoekstra; Rainy Day

5.2.2.2 Scenario 2: Awareness

Dieter has never been truly aware of water waste and promotion of environmental friendly behavior. He lives his life unbothered by such claims, and has never really put much thought into it. Visiting the food hall with his family on weekends, since the SRB XXL has been placed in his neighborhood however, has made him change his mind a little.

Sitting outside while watching his children use their new airplane toy, his wife made him aware of the SRB XXL in short distance of them. Becoming aware of what kinds of facts were written on them, Dieter was seriously surprised how much water is wasted for the tiniest things. Having this on his mind, while his wife was chuckling about the 98 624 beers at 35 000L, he would make sure to save a little more water from now on, and at least inform himself about different solutions he could support in Enschede.

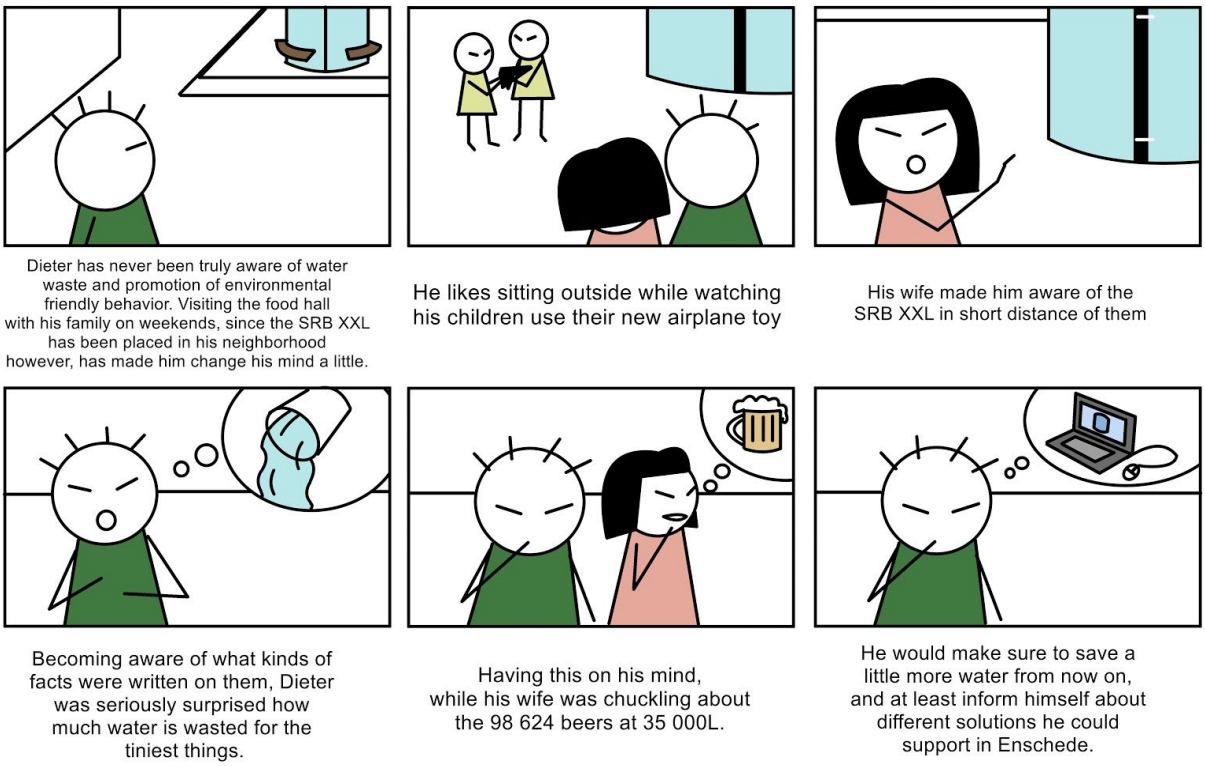

fig. 5.6 Storyboard 2: Dieter Hendriks; Awareness

5.2.2.3 Scenario 3: Window-View

Since moving from Seoul to Enschede, Sujang has felt lonely in her new environment. As a new student in the small city she has not made many friends yet. Therefore, she decided to participate in a few events that the performance factory is offering, in order to get to know new people and make a few new friends.

During the event, she noticed a group of people her age collecting around a window and speaking about the view. She joined them in the conversation, seeing the top view of the SRB XXL that was placed in their neighborhood not too long ago. Sujang noticed all the beautiful flowers and nature that was not visible from the bottom, giving her the courage to talk to the other participants of the event about it, and finally making new friends she could meet up with.

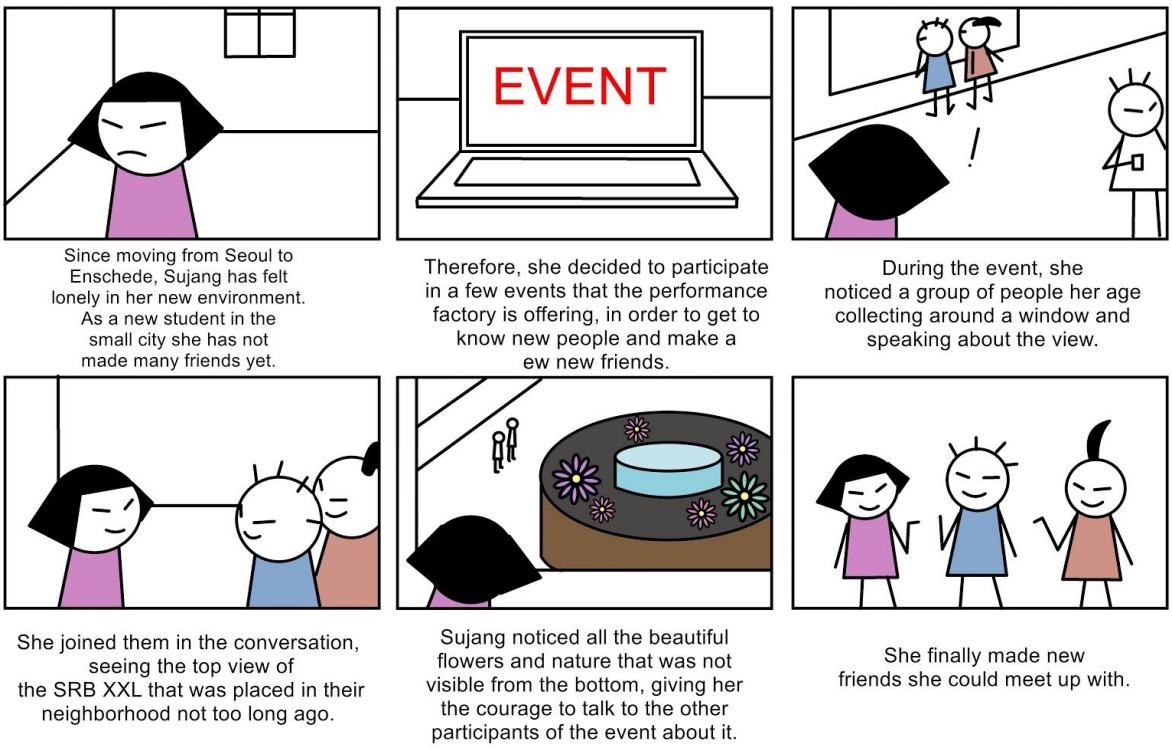

fig. 5.7 Storyboard 3: Sujang Park; Window-View

5.3 SRB XXL Context

This section elaborates on the physical and social context the SRB XXL will be placed in. Given that the SRB XXL offers possibilities of interaction, the area surrounding it changes socially, providing more opportunities for communication. The changes and effects are illustrated below, together with the exact location.

5.3.1 Physical Context

As it was mentioned repeatedly, the SRB XXL will be placed in “de Bothoven” area in the city of Enschede, which is a neighborhood East of the centre. The exact position, however, is illustrated in *fig. 5.8*, showing a top view of the area in which the “Performance Factory” is located. The red circle illustrates the placement of the SRB XXL, which lies slightly East of the “Polaroid” and “Performance Factory”. Being placed in between these two areas, it does not stand in the way of any entrances and makes use of empty space.

fig. 5.8 Location of the SRB XXL in “de Bothoven” Area

After having determined the exact location of the SRB XXL, the perks of the placement can be viewed under *fig. 5.9*. As the SRB XXL relies mainly on roof areas to catch water, being placed near two large buildings offers a very suitable place to collect rainwater. The image has highlighted the roof areas in a red color, showing the appropriateness of its placement.

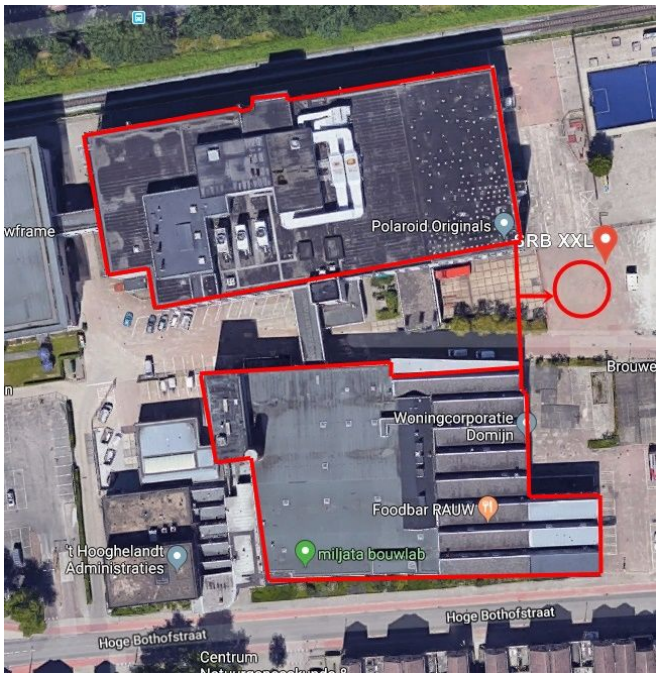

fig. 5.9 Roof Water Collection Area

5.3.2 Social Context

What can be understood from the social context is the possibility of interaction the SRB XXL offers, and what changes this brings to the physical context. A few examples can already be seen in the scenarios and storyboards that were previously introduced.

The SRB XXL is not only placed in such a location to collect water conveniently, but also aims to attract people to the area, in order for these to interact with it. Providing the opportunity to sit while being sheltered from the rain, and also offer educational hints in order to raise awareness are its most prominent highlights, which make a valuable addition to the already modern environment.

Having the SRB XXL placed close to the “performance factory” also allows people to take a look at the view from above, to be able to admire its entire beauty, apart from solely looking at it from below.

Concluding, the social context mostly offers simple interaction; be it admiration, awareness, or resting opportunities. It will surely have an impact on most people in its direct environment, while offering a simple relaxing place for people to hang out, without being forced to choose a restaurant. Especially interesting is its availability at night, as well.

6 Realization of the Scaled Model

Chapter six revolves around the realization of the SRB XXL's scaled model. As the Smart Rainwater Buffer XXL is considered a big scale project, a prototype must be created before one can build the real-scale design. The creation of this model is described in the following sections, together with its technical details.

6.1 Technical Details and Tools

This section elaborates the technical details and tools the creation of this scaled model requires. This includes the materials used for the scaled model, as well as the dimensions, measures, and what scale this model is built in.

6.1.1 Technical Details

The SRB XXL scaled model will be built at a 1:17 scale. In *tab. 6.1*, the true measurements versus the scaled measurements can be viewed, for each part of the model respectively.

SRB XXL Part / Context	True Measurements	Scaled Measurements 1:17
Tank Height	5m	29.4cm
Tank Diameter	3m	17.6cm
Platform Height	3.2m	18.8cm
Garden Height	1.2m	7cm
Garden (+ Tank) Diameter	6.3m	37cm
Seat Height	0.45m	2.6cm
Seat Length	0.4m	2.4cm
Seat Thickness	0.2m	1.2cm
Human Height	1.8m	10.6cm
Performance Factory Height	8m (estimated)	47.1cm

tab.6.1 SRB XXL True Measurements vs Scaled Measurements

After determining the measurements of the scaled model, the materials were chosen in order to construct the prototype. The components necessary for the scaled model and what purpose they served is further elaborated in *tab. 6.2*.

Material	**Purpose**
Laser Cut Wood	Garden Platform, Benches, Human Scaled Models, Performance Factory Context
Acrylic Glass	Performance Factory Context Windows
Coffee Stirrer Wood Pieces	Fence of Garden Platform
Glass Vase	SRB XXL Tank
Soil & Artificial Greenery	Garden Fillings
Decoration Gravel	Context Gravel
Foam Board (50x100x10)	Environment Context
Texture Prints	Environment Context Texture

tab.6.2 SRB XXL Scaled Model Materials & Purpose

6.1.2 Tools

The tools used in order to build this scaled model can be found in the following table, combined with the purpose these served during construction.

Tool	**Purpose**
Laser Cutter	Cut Garden Platform, Benches, Performance Factory Context, Human Scaled Models
Glue	Glue Garden Platform Fence, Env. Texture, Benches, Performance Factory Context
Hot Glue	Attachment of Garden Platform to Tank
Scissors	Cutting of Texture Prints, Artificial Plants
Cutter Knife	Cutting of Garden Fence Pieces, Texture Prints, Foam Board, Artificial Plants

tab.6.3 SRB XXL Scaled Model Tools & Purpose

6.2 Construction of Final Model

After determining the dimensions, materials, and tools, the scaled model is in position to be built. The progress of the construction is protocoled in this section and will be explained together with process pictures.

Firstly, the garden platform must be laser-cut and prepared for the connection of the upcoming fence. A second attachment is placed on top of the platform, offering space for the fence to be glued on, as it is visible in *fig. 6.1*. The wood sticks must all be glued to the platform, in order to get a result as it is visible in *fig. 6.2*. Then the garden can be glued to the tank.

fig.6.1 & 6.2 Construction of Garden Platform

The second step consists of glueing the platform to the glass vase, representing the SRB XXL's tank. This can be done in different ways, however hot glue has proved to be a quick and stable solution. After the base of the tank is finished, it can be filled with soil. The progress of this is presented in *fig. 6.3*.

Having the platform properly attached to the tank, it can be filled with soil, gravel, and greenery, representing the nature in the original model. The flowers are represented by artificial plants, while gravel consists of decorative stones; both are placed on top of the soil. The platform holding the soil is also padded with newspaper, in order to avoid exceeding the weight limit. The result can be seen under *fig. 6.4*.

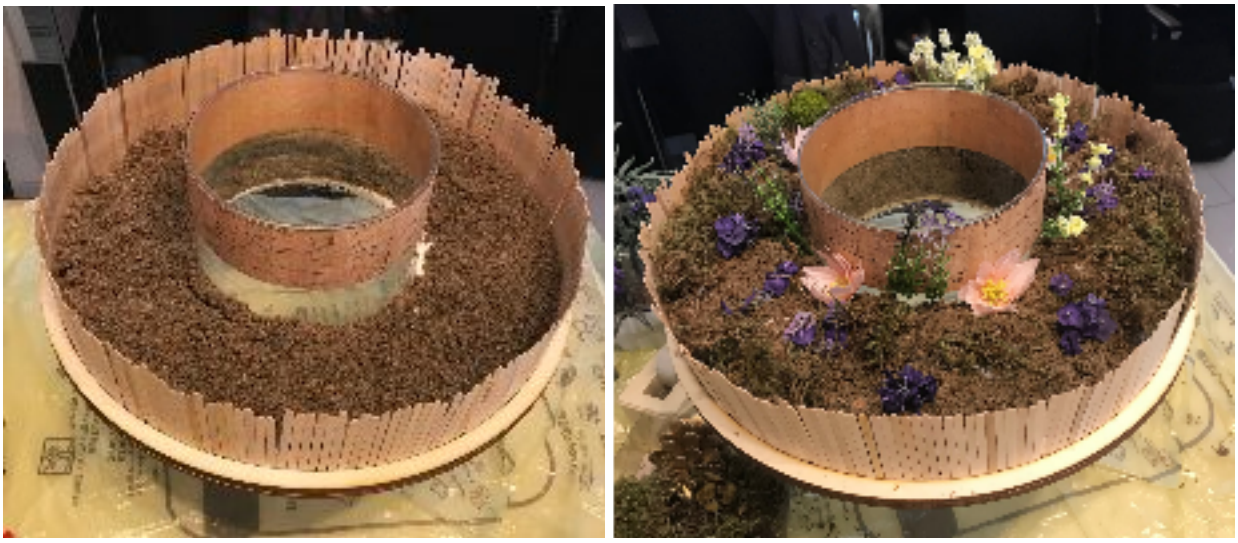

fig.6.3 & 6.4 Filling of Garden with Soil and Greenery

Continuing from this step, the environment of the model must be prepared. This includes the context of the SRB XXL, which can be defined as the place it will be located at. In this case, “de Bothoven” is the target area, neighboring the “Performance Factory”. Therefore, models of it and its texture have been cut and printed. These can be viewed under *fig. 6.7*.

Additionally, the texture has been glued to the ground, together with a 35x40cm grass field, which was later also replaced by a printed grass texture.

Fig.6.6 & 6.7 Preparation of Environment Platform

Having glued the context to the environment platform, the SRB XXL scaled model can be placed on its designated location. The two finished versions can be seen under *fig. 6.8* and *fig. 6.9*. Depending on what version is preferred, it will serve as the finished scaled-model. In this case, the second version is preferred due to the coherency of the ground texture and the interactions of the scaled human models.


Fig.6.8 & 6.9 Finished Scaled Model (Ver.1&2)

Under *fig. 6.10* and *6.11* details of the garden and a filled water tank are visible. The human interactions are also highlighted.


Fig.6.10 & 6.11 Finished Scaled Model

7 Evaluation

The seventh chapter reflects one last time on the final design of the Smart Rainwater Buffer XXL and its scaled model. To conduct this evaluation, the co-designers and representatives of “de Bothoven” area have filled out questionnaires, after being supplied with images of the design, the scaled model, and its description.

Below the two views are discussed and concluded, which leads to the completion of this research. The interview results can be viewed in appendix G.

7.1 Co-Designers Evaluation

Upon showing the co-designers the end result, these reacted with many critical comments regarding its aesthetic. The questions asked revolved around whether their expectations and opinions are reflected in the design, and what differences should be made in further iterations, if any. Additionally, feedback on the user interviews that were conducted was requested. These questions were answered with many views that were not considered before, especially regarding the design’s appearance.

Overall, the design was well received and its interaction was greatly appreciated. The educational factors and its function as a resting space and shelter were well liked, however many critical comments were made regarding the elevated garden.

As the general passerby cannot see the nature on the raised platform, one major factor of the SRB XXL is not accessible by the general public, which is its aesthetic. This leads to a big part of the design getting lost in everyday interactions, which one co-designer mentioned. Earlier designs did not have this problem, especially mentioned was the “ribbon” in the first design iteration. A comparison between the drawing and the scaled model was drawn, implying that tendrils on the drawing did not make it into the scaled model, which would have been more appreciated.

The imbalance of the design was mentioned frequently as well. As the elevated garden puts focus on the top of the design, the bottom does not offer a design that is as interesting and therefore seems bland. More implementation ideas were offered, for instance adding a design element to the bottom of the platform that people can view when sitting beneath it. Giving

people a reason to look up and instill curiosity for instance, or adding more practical aspects to it that might be helpful for the citizens of Enschede. In this case no specific examples were mentioned. Lastly, the aspect of storytelling and creating a network of individual SRB XXLs has been pointed out again, while the feasibility was questioned; that concept left a lasting impact on the co-designers however.

Concluding, the co-designers were satisfied with the implementation of their ideas and concepts and did feel that their input has influenced the design greatly. The design was appreciated, which did fulfill the requirement of the research question.

7.2 “De Bothoven” Representatives Evaluation

In contrast to the co-designers, the representatives of “de Bothoven” area have accepted the design more easily and made less critical comments regarding its exterior. The questions asked to the representatives were the same the co-designers received, reflecting once again on the manifestation of the given opinions, concepts, and ideas.

The residents were very satisfied with the presented design, especially regarding the materials chosen and praised the concept and its possible interactions. One comment offered a solution for the invisibility of the elevated garden, as this was considered the only problem. Turning greenery into a vertical garden was proposed, in order to provide a solution for the plants that are not visible from below.

The opinions of the residents especially reflected in the educational aspect that the SRB XXL is offering, and the provided resting area. One of the representatives mentioned to add something meaningful to the cylindrical tank, which was in her evaluation successful, and therefore very accepted.

Concluding, the representatives of the residents of “de Bothoven” area were very satisfied with the design and did not make many critical comments. The SRB XXL’s design was perceived very positively, and showed great enthusiasm towards. Lastly, the residents also felt as if their opinions did influence the design and were implemented properly, fulfilling the requirements that were asked of.

7.3 Conclusion

Concluding from the feedback given, the SRB XXL was considered designed well, generally. The co-designers and also representatives of “de Bothoven” area did make many positive comments regarding its concept, interaction, and general construction. However, criticism in order to make the design more suitable for the interacting instances, and even more practical for the city of Enschede was given.

These were directed mostly towards the elevated garden and the inability to see the nature held by it, also mentioning the imbalance between top and bottom. Otherwise, the opinions and inputs given by all the users and co-designers were visible in the design and appreciated greatly.

Finally, the requirement list has been updated and a list of the fulfilled requirements was created. *Tab. 7.1* presents the finalized requirement list, divided into technical and non-technical requirements, showcasing only fulfilled requirements. This is the final list, determining whether the project has been successfully considering the stakeholder’s demands and executed these.

Stakeholder	**Requirement**
Technical	
Municipality of Enschede	Holds 20 - 30 000 L
	Placed in “de Bothoven”
	Seating Arrangements
Waterboard Vechtstromen	Above Ground
	Mobile
Co-Designers	Garden / Plants / Nature
Non-Technical	
Municipality of Enschede	Educational Aspects
	Attraction of Residents
	Focus on Drought Phases

University of Twente	Advertisement for “de Regentroren”
	Coherent Design
Co-Designers	Landmark of Enschede
	Relaxing Area

tab.7.1 Fulfilled Requirement List

This assessment will be used in order to help further research in the future regarding the design of the Smart Rainwater Buffer XXL.

8 Conclusion

The last chapter of this protocol revolves around the closure of this project and reflects on the answer to the initial research question and its sub questions. Finally, further recommendations comprised of the feedback of stakeholders and the opinion of the leading designer are outlined to conclude this project fully.

8.1 Reflection on Research Question

In order to check if the research question was answered properly, this section summarizes the findings of this project in context with the asked questions.

» How to design the appearance of a Smart Rainwater Buffer XXL, placed in "de Bothoven" area, which residents of the affected neighborhood accept, and appreciate, represented by a scaled model?

The main research question revolves around how to design the SRB XXL that will be appreciated by the affected residents of "de Bothoven area". Having conducted several design cycles, the approach was found out early in the process, following a participatory and user-centered design research that included the affected people in the development of the design. In order to be able to reflect on this question more extensively, the sub questions of this project must be firstly reflected on.

» What design approach is most suitable in order to design the SRB XXL?

As it was already discussed in the state of the art and the theoretical framework, user-centered and participatory design were used in order to develop a design for the SRB XXL. These two approaches were utilized in combination with the double diamond model, creating multiple design cycles to refine the composition of the SRB XXL after each cycle. The design was finalized after the third cycle, creating a sophisticated design, suitable for the affected area.

» What research methods should be used in order to gain the best user input?

In order to get the best user input, these were involved following the design theory of participatory and user-centered design. Included in co-design sessions and user interviews, the foundation of the research was created on which the design decisions were based on. The user input is reflected in the finalized design and was also evaluated as such by the users themselves.

» How can meaningful interaction be achieved in order to make the SRB XXL more desirable?

This question was answered by the users themselves during the research phase. Most attention was given to very basic interaction possibilities, especially making the SRB XXL act as a resting place. This provides social opportunities, attracting more users to the environment and the installation itself. This interaction was stressed, as the users claimed that Enschede was missing a social place to relax. Secondly, an educational factor in order to raise awareness was added, making people understand the scale of how much water is collected in the SRB XXL. This also includes informing the users on how much water is wasted daily and raise awareness.

8.2 Further Recommendations

Concluding this project, this section elaborates more on concepts and ideas that could be included into the design, and makes recommendations for future research.

Given that this project may cause obstacles in order to create a design that is liked and appreciated by the residents of “de Bothoven” area and the general public of Enschede, this section will offer recommendations on how to proceed with the research, in order to overcome these in the future.

8.2.1 Further User Involvement

In order to find a design that is liked and appreciated by the residents of “de Bothoven” area, this research has included three representatives of the neighborhood, in order to collect ideas and opinions regarding how these wanted the design of the SRB XXL to look like. As this project

has undergone multiple design iteration cycles and included various stakeholders, however, the representatives of the affected neighborhood could be considered as single cases in this study. They have been included twice in the design cycle that was repeated thrice.

For future proceedings of this project, it is advised to interview more representatives of “de Bothoven” area, which also include stakeholders with different demographics. The current representatives are people who moved to Enschede for their studies, rather than having grown up in the city. Research on whether these stakeholders are suitable representatives should be conducted, while also including a bigger user group.

Additional recommendations for user involvement, which the designer could not act on due to lack of response, would be inclusion of stakeholders directly affected by the SRB XXL. As it is placed in between different companies, including the director of the “performance” or “polaroid factory” would be useful for researching on how to make the SRB XXL most useful to these. The elementary school located in “de Bothoven” also offers room to work with.

8.2.2 Design Recommendations

Considering the feedback given by the co-designers and representatives of “de Bothoven” area, there are many different design approaches that can be tested out. Especially the pointed out flaws of the current designs should be corrected.

These flaws include the inaccessibility of the current garden design’s aesthetic. Since the SRB XXL is combining the heat stress and rainwater management problem with the added garden, the solution including greenery should not be changed, but refined instead. The co-designers wished it was more visible to the general public, and not only from heights that can be seen from the upper floors of the “Performance Factory”.

Further recommendations would include paying more attention to the imbalance of the design. Giving the bottom of the design more meaning, in order to balance out the heaviness of the top, as it was mentioned by a co-designer. Adding more practicalities that would benefit the surrounding companies are also a solution that should be further considered, especially when considering the inclusion of related users.

Concluding the recommendations, if a following designer were to take over this project one step further, there is much room for differing design choices. However, experimentation with the shape and structure of the garden are heavily recommended, in order to exploit the entire potential this solution has to offer.

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Appendix A: Co-Creation Session Preparation

Interviews Prior to Co-Design-Session

Interviewee A

Interviewee Demographics: 21 year old, male, resident of Enschede, Boswinkel

N: Have you ever had flooding problems in your area?

M: There were a few problems regarding floodings, but not recently. I can recall a few times, in which the apartment I lived in was suffering from heavy rainfall, and floods, but otherwise it is a good place to live, since that does not happen often. Especially not in the past few years.

N: Since you mentioned problems with flooding do now show up frequently, would you mind a Smart Rainwater Buffer being placed in your neighborhood? [With an additional Explanation of what the SRB is.]

M: I do not mind. In general I am not be bothered by my environment, since I do not consider my neighborhood to be beautiful. As long as it gets the job done, I am fine with it, and happy that it very likely will solve the problems.

N: Do you think your neighbors would be bothered by it, even though you are not?

M: I do not think so, but it depends where it will exactly placed. My neighborhood might be considered a ghetto, but a little further away, there is a richer neighborhood that looks very clean and neat. The residents there might consider it as disruptive, however my neighbors and me would very likely not care. A little further it might make a difference.

N: Might the SRB add quality to your neighborhood?

M: People might not really pay attention to it, but they probably know that it is placed there for a purpose. People would very likely not look too much into it.

Interviewee B

Interviewee Demographics: 22 year old, female, resident of Enschede, Centrum

N: Did you ever have flooding problems in your area? And were you severely affected by it?

S: I do not live in Enschede for that long, only since I entered the university to study. I do not remember any kinds of problems regarding flooding.

N: Even though they are not frequent, would you mind an SRB being placed in your neighborhood? [With an additional Explanation of what the SRB is.]

S: If it is supposed to help the environment and against flooding, I do not see a single reason why not. I do not care at all.

N: Do you think your neighbors would be bothered?

S: I do not know, I have never talked to them before. But as long as it is not really big and really annoying in sight, they might not be bothered.

N: Annoying in what sense?

S: I said before, if the Buffer would for example hinder the sun to shine into the apartments, that would be annoying. Or if it makes really loud noises, or something of the sort. Then I would not like it either, but as long as it would not do that, it should be fine. There can also be other factor that I did not think of, but otherwise it sounds like a really good idea. After all, floods are annoying as well. And one might have to put up with either or the other.

Session Structure

Time schedule

May 2nd, 9:45 - 12:45

1.	Introduction	(15 minutes)
2.	First round: warming up	(20 minutes + 10 minutes discussion)
3.	Break	(10 minutes)
4.	Second round: scenarios	(30 minutes + 15 minutes discussion)
5.	Break	(15 minutes)
6.	Third round: ideation & concepting	(30 minutes + 20 minutes discussion)
7.	Words of thanks	(5 minutes)
8.	End	= roughly 3h

Introduction

(15 minutes)

Before the session starts, everyone will be asked to introduce themselves. I will also introduce myself and my note-taker, before continuing to introduce the subject. The subject (design of the SRB in public spaces) will be addressed, however its problem statement will be kept hidden, in order to not lead the participants into a negative first impression (e.g. statements like: The inhabitants of Enschede do not like to have it in their neighborhood ... , etc. should be avoided. Instead, it is asked to make it more attractive).

After the introduction of the subject is done, I will explain what I hope to achieve from this session, and what my purpose of researching is. Also, questions to the audience will be asked, in order to spark a conversation and have them already thinking about the topic properly.

My Expectations

1. I hope to gain better insights in wishes of the residents, in order to create a coherent design, that will be liked by those that are affected by it.
2. I am interested in what kinds of ideas and concepts you will come up with for its realization.

Questions

1. Are you familiar with the topic of flooding in Enschede and what is done against it?
2. Are you actively trying to make changes in the city, together with the municipality of Twente or the stadshuis?
3. What are you expecting from this session?

First Round: Warming up

(20 minutes + 15 minutes discussion)

This phase of the co-creation session requires the participants to get warmed up in order to properly start the creative process in the following rounds. The exercise asks of the entire group to connect given pictures (entirely randomly chosen pictures of people, nature, weather, objects, …) to their values of what they expect from the municipality regarding fighting flooding. The exercise can do in different directions, as in “in which way should resident and municipality work together” or “this is what is expected of the municipality without my input” or “this is what I feel regarding the problem and this is what I want to be solved”. The participants are then asked to create collages from the given pictures (stick the chosen ones to a piece of paper, entirely random or with a certain division).

The discussion round will ask of one participant to present their findings, and spark a discussion in the group. The discussion round can be lead by the question why these problems are not solved yet.

Second Round: Scenarios

(30 minutes + 15 minutes discussion)

In the second round, each group of participants receives **three** open end scenarios, that they will be asked to finish. These scenarios will be presented in storyboards; the participants can decide whether they want to finish the scenarios as drawings, or just write the endings instead.

What the storyboards offer are scenarios of problems that might occur with the placement of the SRB in the neighborhood, or flooding of the area. The overall satisfaction of the characters in the scenarios will be low, and the participants are asked to come up with solutions, in order to show what the given residents would do in the situation (different personas require different solutions). Solutions are not necessarily asked, as it is also interesting to know what a resident would do instead of finding a solution. The scenarios will have to do with the municipality, SRB, or basic problems that can occur with or without an SRB being placed there.

The differences between the scenarios that each group will get, are also the characters that are depicted in it. While one group receives a scenario with a young person as the main character, another group will deal with the same problem, but a different character demographics-wise instead. (e.g. a worker, a mother, an old person, etc.)

The discussion round will show how each group dealt with the different personas, and scenarios. It is expected that similar solutions will be presented, however what is important to note, is how the difference of personas influenced the solutions, and in what way they differ from each other as well. This will show in what ways it is important to consider different residents with different demographics.

Pro	Con
- actual / future scenarios will be created - helps create validated scenarios - gives participants guidance in which direction to brainstorm - can come up with unforeseen solutions / problems - helps focusing on the main problem without losing focus	- limitation in creativity - practices / scenarios are given, so new / undetected scenarios cannot be detected by participants - uncomfortable with drawing (solution: can write instead!)

tab. appdxA1 pros and cons of round 2: scenarios

Third Round: Ideation & Concepting

(30 minutes + 15 minutes discussion)

The last round of the co-creation session revolves around ideas and concepts the participants can come up with, in order to find solutions for instance for the aforementioned scenarios. The solutions do not have to be in direct connection with them, as they are encouraged to come up with ideas that will make neighborhoods more appealing, or concepts that can be translated onto the SRB, that was introduced in the beginning of the session. How can the SRB improve the neighborhood in other ways, than just remove the flooding?

There are no other limitations, in order for the participants to follow their own creative workflow.

The discussion round will be the participants presenting their findings, and also add comments or more ideas to refine the current findings. If the findings are similar, the discussion round can help the participants think about more specific solutions or proper translations onto the SRB.

Pro	Con
- gain deeper insights into the needs and wishes of the participants - collection of valuable ideas for future design	- limitation by earlier exercises (thoughts get steered by scenarios) - no useful ideas - misinterpretation of exercise (lose focus)

tab.appdxA2 pros and cons of round 3: ideation & concepting

Words of Thanks

The participants will be thanked for joining the co-creation session, and a summary of the session will be made. Depending on the results, the participants might be asked for a future interview, in order to perhaps pursue one of the given solutions.

This is the end of the Co-Creation session.

Scenarios

Scenario 1

Dieter is a 47 year old man that lives in Enschede, since he moved there in order to teach lessons at the university of Twente. The professor's basement was recently flooded by heavy rainfall, and this is not the first time it happened, since he moved to Enschede. He is clearly dissatisfied with the way things are handled in Enschede, since it seems that the municipality does put in effort in order to fight flooding, but he is not affected by any of the perks that came with the solutions over the years.

Seuren is a 21 year old student that lives in Enschede, since he moved there in order to study at the university of Twente. The student's basement was recently flooded by heavy rainfall, and this is not the first time it happened, since he moved to Enschede. He is clearly dissatisfied with the way things are handled in Enschede, since it seems that the municipality does put in effort in order to fight flooding, but he is not affected by any of the perks that came with the solutions over the years.

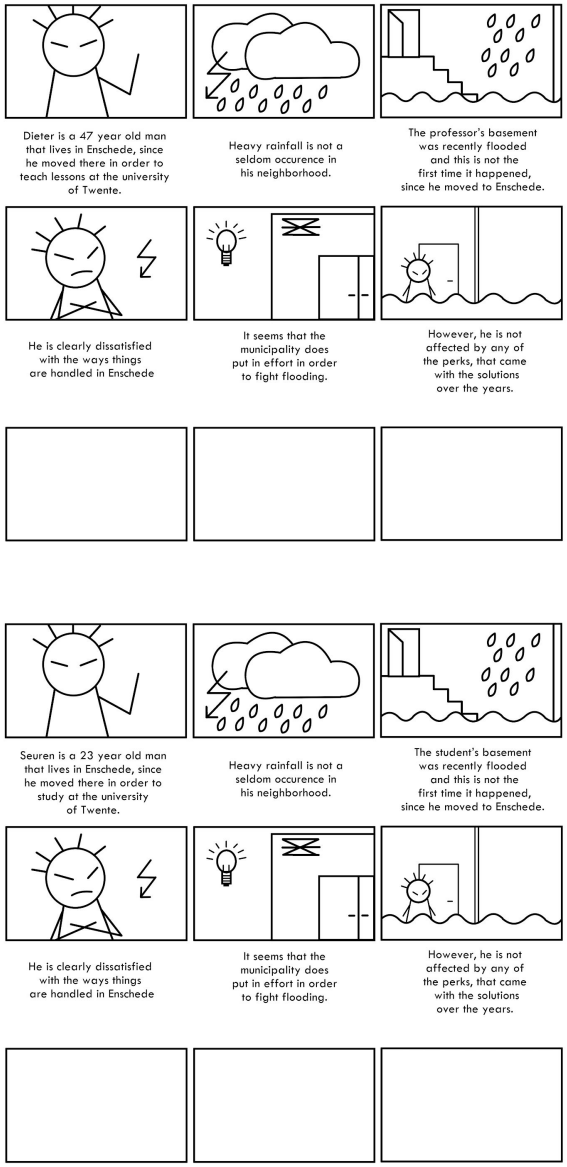

fig.appdxA1 scenario storyboard 1A&1B

Scenario 2

Sara is a 27 year old secretary living in an apartment building in Enschede. She knows that her area has been suffering from flooding, however she is not directly affected by any of it, since she lives in the second floor. The municipality has decided to act against this flooding by putting an SRB into the neighborhood, which Sara does not like. Since she is not affected by the flooding, she does not approve of the change that is made in her neighborhood.

Margarita is a 68 year old retired living in an apartment building in Enschede. She knows that her area has been suffering from flooding, however she is not directly affected by any of it, since she lives in the second floor. The municipality has decided to act against this flooding by putting an SRB into the neighborhood, which Margarita does not like. Since she is not affected by the flooding, she does not approve of the change that is made in her neighborhood.

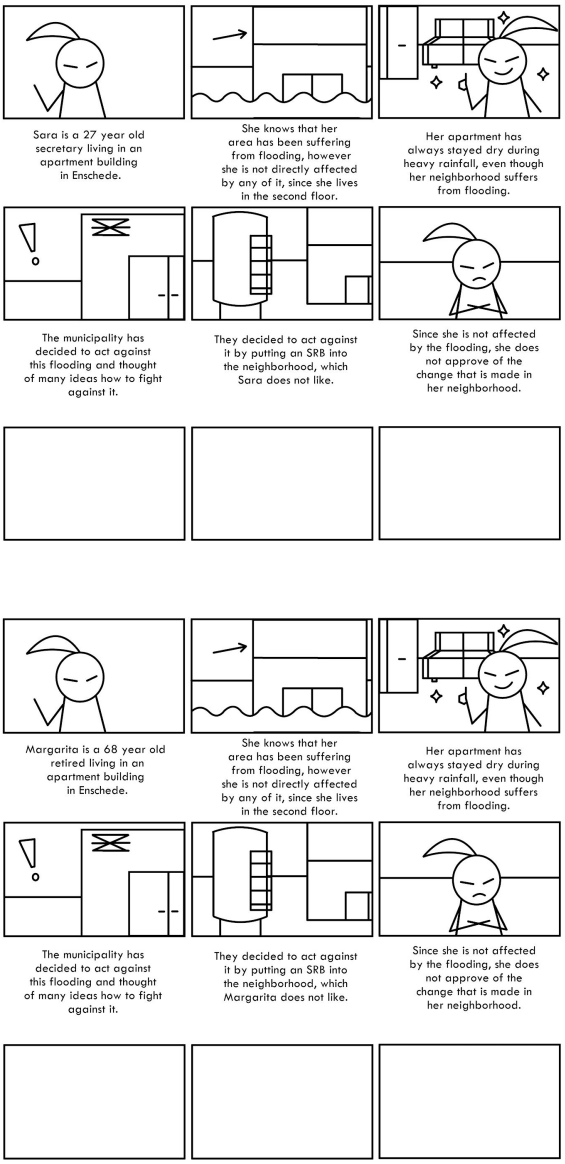

fig.appdxA2 scenario storyboard 2A&2B

Scenario 3

Edgar is a 35 year old man who has been living in Enschede all his life. He is familiar with the fact that floods occur in Enschede, however he hasn't been victim of any recently, and his neighborhood is also not prone to be affected by any. However, he heard that the municipality planned on placing a big Smart Rainwater Buffer in the area, even though his neighborhood does not suffer from floods. How will he react to it, and what might his neighbors think?

Michael is a 21 year old man who has been living in Enschede all his life. He is familiar with the fact that floods occur in Enschede, however he hasn't been victim of any recently, and his neighborhood is also not prone to be affected by any. However, he heard that the municipality planned on placing a big Smart Rainwater Buffer in the area, even though his neighborhood does not suffer from floods. How will he react to it, and what might his neighbors think?

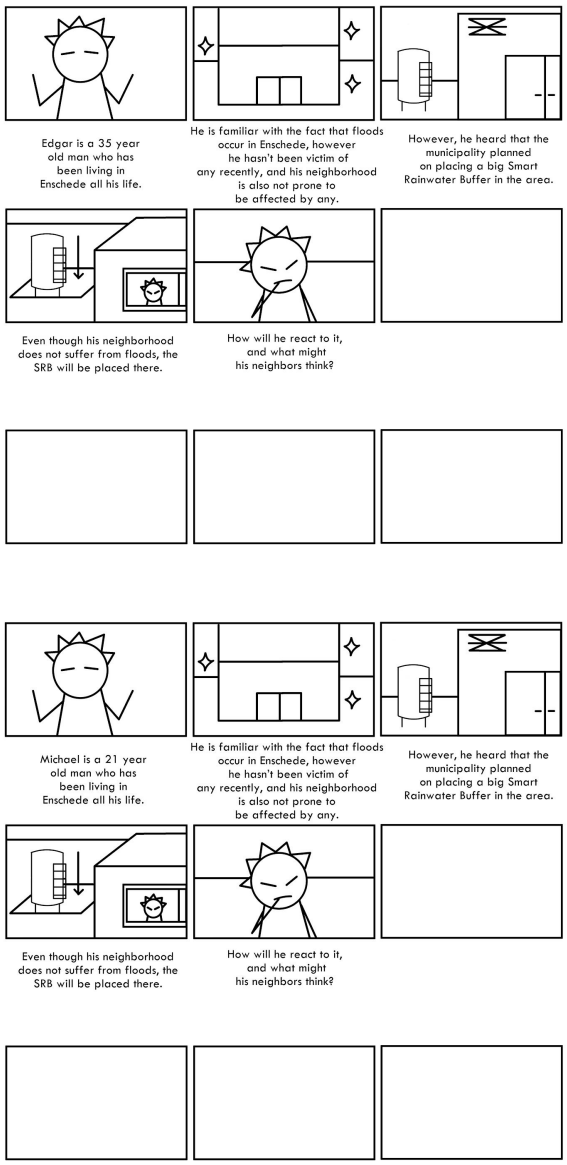

fig.appdxA3 scenario storyboard 3A&3B

Appendix B: Co-Creation Session Results

Amount of participants: 4

Demographics of participants:
- Residents of Enschede (Centrum, de Bothoven, Boswinkel)
- Between 20 and 25 years old
- 2 designers, 2 non-designers
- 2 male, 2 female

Duration of Session: 2.5 h (10:00 AM - 12:30 PM)

Location of Session: RA 5148

Notetaker A

Round 1: Collaging

- Work life balance
- Generational differences
- Monument and things in the environment
- Beauty
- Source of conflict, whatever it will be
- Municipality can either keep the people together or make them fight, depending on what they decide for in the city // different statuses of society
- Nature → architecture embedded
    - → beauty environment, water
    - → wadis help against flooding
- Collaboration
- Affecting the environment by putting something there
- Important to consider everybody
- Nature, environment, and architecture = city

Desired:
- Collaboration
- Consideration
- Beauty
- Respect towards nature

- Beautiful city to live in → paying attention to detail
- No conflicts
- Balance of people
- Do not make a city entirely industrial / efficient, since people live in it

Collaboration, Architecture, City, Demographics, Beauty & Nature, Environment

Round 2: Open End Scenario

- Do not know much about the persona
- Do they care about the environment?

Scenario 1: Michael

- Wouldn't he want to spray paint?
- Realistically, why would he? If somebody would explain to him why they place it there it would make sense. There are also a few other questions, like: is it sustainable? How would it look like? Questions young people would ask.
- Does it fulfill its purpose?
- Would he want to involve himself? No? He wants to voice his opinion, he wants to be heard
- How can I contribute? Can I make my opinion heard? (Michael)
- How often has somebody said to put art on their building? It is not very realistic.
- What about his neighbors? Will they like it? There is nothing he can do about it.
- There would be more acceptance, if the are would actually suffer from flooding.

Scenario 2: Dieter

- Complains to his neighbors a lot / in general; maybe there is a collective group that complains about it to the municipality
- Start a petition / signature list to help his neighborhood
- Contact Enschede, mailing a lot of people to complain about the situation
- Feels ignored, until he sees a change
- Definitely acceptance of the SRB, since it would help the neighborhood actively.

Scenario 3: Sara

- She must realize she is a spoiled brat
- She will very likely complain a lot but not do anything about it
    - Too ignorant / might talk to the neighbors
    - Maybe makes friends with the neighbors
    - Realizes that they need help
- Might be vocal about it online
- Tries to impose her opinion on other people
- She might be shamed into accepting the SRB

- She interacts with downstairs neighbors and sees their opinions
    - They say it is good, she might change her opinion or just become less vocal about it
    - E.g., only complain to her friends, but not be vocal online anymore to fight against it

Round 3: Prototyping

- Residents are either not affected by it, or they are
    - They might think the municipality does not do anything
- Municipality can deal with people who are not informed
- They also must deal with people who are ignorant
- They must see the value of the SRB (it can be intrusive to have suddenly a big thing placed in their environment)
- Informing people is very important
- Tell a story, make it like an artwork
- One design or multiple, depending on the location?
- If different locations, connect the different parts to make an entire story
- History can be a trademark, for example the history of flooding in the area
- Each SRB can have a different story (locations on a map)
- Different levels of storytelling
- Shape the thing like a carbon molecule or something?
- Really embodies the city, cultural extension
    - Will be more accepted by the city then, especially if it is aesthetically pleasing
- Materials all that are present in Enschede (industrial city, industrial materials like metal, steampunk style? Any specified style at all?)
    - Blend in or stand out?
    - Want to use materials?
    - Conventional?
- Different depending on the area, e.g. foodhal area, stand out; regular neighborhood, blend in
    - Make a smaller version of the XXL design to replace the SRB / create communities around the SRB
- Storytelling: water / clouds / environmental issues
    - Billboard kind of extension?
    - Functionality of billboard → LED screen / art / advertisement?
- Smart buffer on the outside as well?
- A lot is hidden, but it can also be displayed

- Shiny metal + Sturdy metal
- Add a sign about the history, sign about the project

- Embed story on something that flows around the srb, make people walk around it, look at it properly
- Modern art
- What kind of story?
    - Informative, place in the concept of water
    - Environmental touch, awareness
- Educational kinds of monuments (molecules, Enschede is a student city)
- Show cultural partnerships (with China e.g.)
- Diversity represented
- Tiles that represent the city, looking futuristic?
    - Hide the tank, hide the functionality and make a monument out of it

Prototyping Group Presentations

Group 1

- Value of the SRB is directly clear instead of indirectly (meaning: instead of people noticing less floods, which makes it indirectly clear, give a noticeable impact)
- Add a screen, which shows the art of local artists, or data visualization of water, what the SRB has done to the area so far, etc.
- Shape: how can it impact people, bring people together, organic shape, people can find their own spot, use it, climb on it, …
- Park on top, screen idea

- Huge everyday objects (landmark, fun)
    - Landmark for people who are not living in the area
- Can be a huge cup / plant pot / something of the sort
- Movable food stand?
- Slide around it?
- Concept: wave; how is water shaped?
- Sit on top, sit below

Group 2

- On the ground, you can guide people around it with the design decisions
- Maybe leaves around that go up?
- Multiple personal SRBs, have a story
- Hiding functional aspects
- Combine storytelling and art
- Read about flooding
- Different ways to connect Enschede’s story
- Connect to industrial design

Notetaker B

Pre-Questions

Comments:

J: You should make it artsy.

Are you guys familiar with the topic of flooding in Enschede?

M: Yes familiar, but no examples.

L: Yes familiar, but does not know exact examples.

F: Yes, we know about the SRB.

J: Yes but I only found out via other projects.

Are you actively trying to change something?

L: Once I was cycling on the road on the Molenstraat. The paint is really worn out. I did not know it is a Zebra. I reported this on the website of the municipality.

M: I participated in a co-design session for a participation tool.

F: We are not involved but we participated in Create Tomorrow.

J: In a few years the Netherlands should be under water.

What do you expect from this co-design session?

M: You will use this session as foundation for your research.

L: Agree.

F: I expect it to be collaborative and a good opportunity to give input for a local icon. A real problem to look at or something you enjoy to look at. I really look at architectural things, so if something is not nice it is a real problem.

Collaging

F: I like work-life balance.

L: The world and climate change.

M: Monuments in the environment.

F + L: All age groups.

F: Beauty.

M: We do not know if everyone agrees with what we do here.

F: True, it can be a source of conflict.

L: The municipality can connect or split up the people.

J: Equality.

F: Beauty, nature and environment.

J: Why don't we go for positive vibes.

F: This reminds me about architecture and nature and that it looks nice in the city. I think that the buffer should be embedded in nature.

J: Yes, architecture should be embedded in nature.

F: Grass areas help protect from flooding. Nature can help too.

L: If you have grass, the animals will be happier.

They start sorting their images.

F: Here we have all generations and cultures.

J: We also have family.

F: We don't want conflict.

L: We want a balance.

F: Here we have work-life balance and equality. Generations and genders. It should not be too industrial nor not at all.

M: You affect the environment with a monument, so you put something big in there.

J: Should we remove the anger?

L: I think we should consider everybody.

F: It represents collaborations and different opinions.

They start making notes on the paper while the others glue it onto it.

L: Maybe we can put a Venn-Diagram, so that they overlap. This is all about nature.

They draw

L: And the city pays for everything. In the end we pay everything together. We pay the taxes.

J: I like how big it is. It can be everything.

Nora repeats the question.

F: Our key-words are putting that out. We want collaboration, everyone should be included, beauty & nature, it should be integrated in the architecture.

Open End Scenario

Nora explains the second part and the groups splits in two pairs. L & M, J & F.

F: Are we supposed to draw on it?

N: You can, you don't have to.

First scenario: Edgar

L: We do not anything about him. It depends on the type of guy he is.

M: And where he lives. Let us give him information so we can better put us in his shoes.

L: What kind of person stays all their life in Enschede?

M: Me. Let us put him in a decent neighbourhood. Not too fancy. If he lives in a decent neighbourhood, he does care about what he is happening there.

M: We can give him multiple personalities and give many answers. 1. He does not like changes. If it is not practical, it could change the ambience of the neighbourhood. Why does he not like it?

L: Maybe he lives in a green neighbourhood and all of a sudden this is placed there. Or he has children.

M: Yes and he doesn't want it to take the space of his children where they play. This is the first case.

L: 2. Maybe it obstructs his view.

M: Like, I look outside the window and all I see is this buffer.

L: Imagine he has a flirty relationship with the neighbor across the street. And now it obstructs his view.

M: It could also be nice. He could also have a positive opinion. So basically it helps all of them, so he is happy.

L: If it has an extra positive aspect, since not everyone is affected by flooding, it could be better accepted.

M: Also, the affordances. If it has a ladder, people will climb it.

Second scenario: **Seuren**

M: They make changes and it does not affect him.

L: He minds. So, he probably contacts the municipality and says he is angry. He is a student, so he would do it with his friends.

M: I would complain to other people and spread the news but not contact them because I am uncomfortable. But give them a negative reputation.

M: I don't think he wants to make a change because he does not believe in the municipality. "They do not help me anyway". He's mad.

L: After he is finished, he just leaves Enschede.

M: Oh yeah, he is just a student, so he can leave when he is done. Anything else to add? No.

Third scenario: Margarita

L: She is one of those old people. They complain.

M: Yes, I have that vibe too.

L: We have an SRB and then we have Margarita and her neighbor. And they are all collectively shouting. So, they complain. My grandma also lives in an apartment building with older people and they have a comity that solves those issues. Do they go to the city?

M: It would not surprise me. I think it is kind of selfish, but she does not want it. So it is the municipality's responsibility to educate them that it is a good initiative.

L: Anything to add?

M: I do not think it is so easy to reach the municipality. So how will they reach them in the end? Will they be ignored?

Prototyping

J: I was thinking that we could make the SRB a media-hub. You can use it for anything. For advertisements or events. I am against advertisements but if the art schools could display their art on it. So you can always change it.

L: Yes you can always change it, that's cool.

J starts drawing and L checks the problems of the scenarios.

J: The SRB is elevated from the ground. Then you have a ladder towards it. That's how a traditional looks like and that's ugly.

L: I think it is really important that the design gives value to the people that live there. So it must have a real visible value. The long-term value is that it helps the city. But it could invade the children's play-space. The affordance is not the best. So it is important how can we put extra value and not make it look ugly.

J: What do you suggest?
L: I like the idea to do something with nature or art. Make a tree around it. Or put a vertical garden, so at least it would be green. What would you like to have in your neighborhood?

J: If we have this screen, it is so dynamic, we can do anything. So if you want to use it as something else, you can do something else. You could involve the community, with art contest or design contest. It leads to more acceptance. I am really really imagining NY Time Square with all the screens.

L: Announcements or emergencies.

J: Or also just inspirational stuff.

L: I would like if people could put street art on it and it gets painted over every month or something to make it more appealing. But we can also change the form. For example make it more functional and put a bench around it.

J: Yes, that could be. We could also make it look really funky.

L: It could have different cavities where you can sit, lay, you can climb on it.

J: Yes, children could play on it. So this is our shape now?

L: We don't have to come up with one idea. We can just put all our thoughts. In the Bothove there is also this problem, you have this tower on this elevated park. We could make this also an elevated park. You could just sit on the stairs.

J: Oooooh, I really like this idea. So this whole thing is the buffer.

L: Yes, its inside. And there could be like an architecture to make it more attractive. And this could be a screen or canvas, like I mentioned earlier.

J: I have an idea.

L: We could also make something that looks like a volcano. Really steep, so it is easy to climb on.

J: I prefer the previous one. Since it looks like an installation and not out of nature, like you propose here.

L: I like an organic shape that is steep and not too dangerous.

J: In other words, we make the buffer a more shared space.

L: Yeah, it is like a multi-functional design space.

J: I would love if this would be a screen.

L: Lets get rid of all limitations in our head and design a super multifunctional future thing.

J: For example a screen, show how much water is currently stored and what you can do with it. So it shows how many lives it has saved, how much flooding it has prevented.

L: It could be a wave shape.

J: If it is a wave, it could be a shelter from rain as well!

L: Uuuhh, I like this. You can also sit on top of it. We can also put a screen here.

J: It is really good to be transparent with the people to show how effective the SRB XXL is. So show how much it saved like money. Nora should think about it. I really like these ideas combined (wave and park). I think we are done.

Nora: You can also just make concepts.

J: We can make a huge cup. Like a normal cup.

L: Yes, people like this kind of stuff!

J: How does it collect water?

Nora: It is connected to the roof.

L: Then I guess we can make an installation on the roof as well. Also, we could make a big plant pot.

J: Yes, that's great. It could be landmarks.

L: It depends on where it is placed. If it is placed in the foodhal area, ok. But if it is around our area, I would be annoyed. I would like to have a hang-out places where we can sit with my friends. It is not for one group of people. It is a place where people communicate. They are not a lot in the Netherlands. (Refers to the first ideas)

J: I would love to have these in my neighborhood. Imagine that there is a world-cup and you can watch it on the screen. (Refers to the first ideas)s

L: You can make these pieces much more valuable than a buffer. You just need the volume and can put anything around it.

Group Presentations

M: We want to make it more acceptable and location dependent. Each part of Enschede could tell their own story. At the same time, you could have tour, if there are multiple buffers. Instead of the functionality, we want to make it a monument, A cultural extension. We want to make it art.

F: We have different ways of expression. We can keep the regular space and a screen. Or make the people go around the buffer and make them read the story. Here is an image of tiles in front of metals, so the tiles hide the industrial part of Enschede.

L: We look both on the functional and aesthetics side. We thought if the value of the buffer is immediately clear, so more than it is only less flooding. First thing we thought is to add a screen

to the buffer. So artists could express themselves or data visualization, so it shows its impact. Then we thought of changing its shape and we thought like, we could make organic shapes where people could sit on it or climb on it. Another way is that it could have a park. Or putting a dynamic canvas on it, so artists can express themselves. Then we thought about huge everyday objects. It would be a landmark and invite people to come there. But this is not suitable for regular neighborhoods. It is more for industrial areas. Another example is a giant plant pot. If it is movable, it could be a movable food truck. Then we thought about water and we used a wave. So it can be used as a shelter, where people can sit below and on top of it.

Further Results

Round 2: Scenario Results

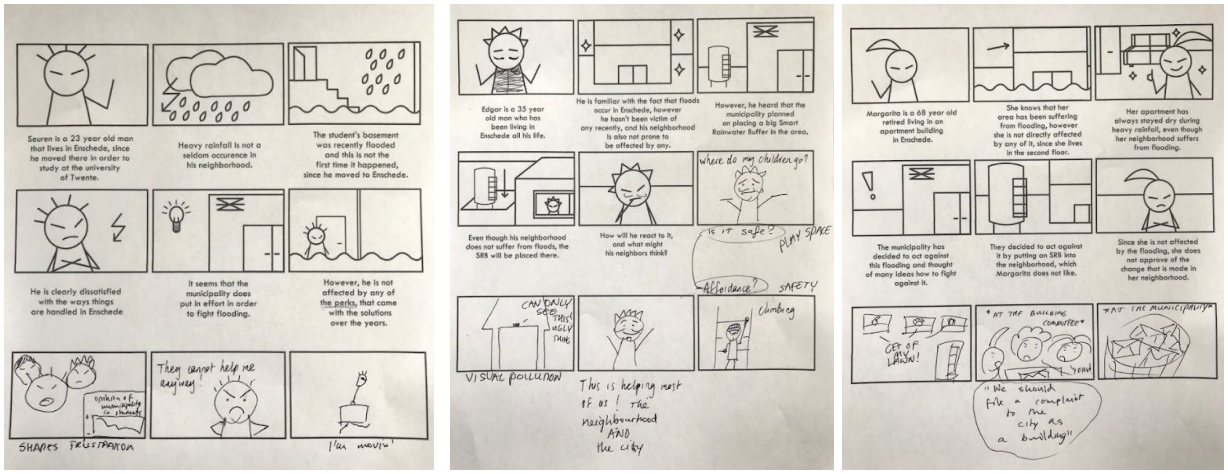

fig.appdxB2 - 4 round 2 open end scenario result group 1 [M & L] scenario Seuren, Edgar, Margarita

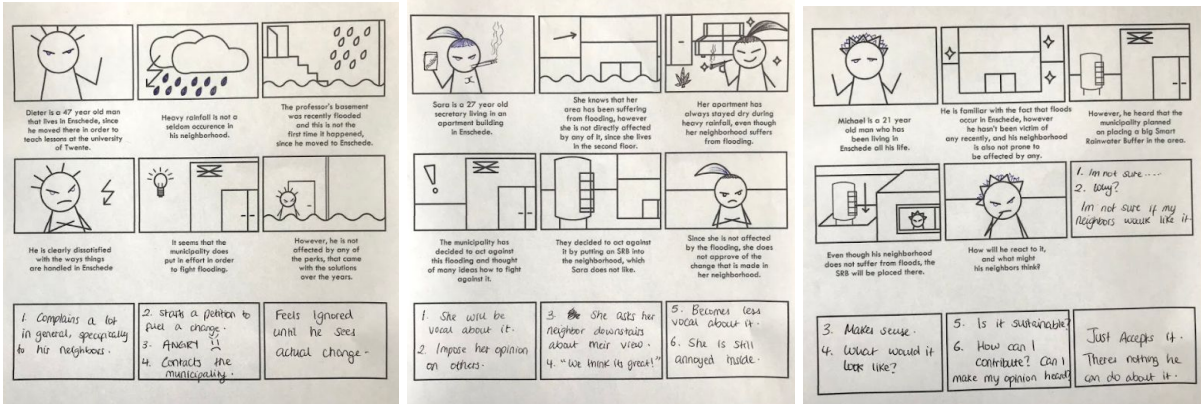

fig.appdxB5 - 7 round 2 open end scenario result group 2 [J & F] scenario Sara, Michael

Appendix C: Co-Creation Session Participant Interviews

Interviews have been conducted on the first iteration of the designs.

Participant 1: M B; 21 years old, male
Interview Duration: 31 minutes

N: Do you remember what happened during the Co-Design Session and its results?
M: Yes

N: In what way do you think the designs were translated; as in, what was put focus on while translating the results into designs?
M: Storytelling, making it appealing to the people of Enschede, and also artistic.

N: What do you hope for was put focus on?
M: Mostly Storytelling and Art.

Now the three different designs are introduced.

Design #1: RIBBON

N: What are your first thoughts?
- Modern
- Cold colors, neutral, flow

N: What is your opinion on the materials?
- Suits the area, is not too obtrusive
- No disturbance
- Modern enough to fit with the foodshal area

N: What do you think of the interactional features?
- Being lead to walk around it (as mentioned in the session)
- It does not show its entire aesthetic from only one side

N: Any improvements you have in mind?
- The spiral is just a way to make it look better.
- It does not really convey a message.
- The design is not making use of the aspects that the SRB offers.

- Why would somebody walk around it if there is nothing to see?
- How does it embody the city of Enschede?
- No message can be changed to e.g. text; something that makes it worth being walked around.
- It suits the area style-wise though.

Design #2: TAP

N: What are your first thoughts?

- Modern, organic, covering/shelter, tap water, circulation, cycle (the shape around it)
- Water is reused

N: What is your opinion on the materials?

- Similar as the previous one
- No different opinion. No meaningful motivation behind using wood, apart from aesthetic purposes.

N: Any improvements you have in mind?

- Do not see a message
- Adding a functionality on top of the message does not show the message on its own
- Neutral, the previous design was more elegant personally, I would not speak on behalf of everyone
- For safety-purpose, extend the upper part to protect people from the rain
- Translate the functionality also into the design
- Communicate bike-cleaning station more explicitly
- Neutral colors, don't clash or anything, works in most settings
- Meaningful purpose, but nobody does clean their bikes

N: Would you like it in your neighborhood?

- Would look weird in my neighborhood
- Misplaced if something so nice is placed in a bad environment; why invest into something so much but not the rest of the neighborhood?
- Do not mind having it in the neighborhood

Design #3: PAVILION

N: What are your first thoughts?

- Nice to give functionality (protection from the rain in two senses)
- Think about the spacing, it might be uncomfortable to sit with strangers
- Minimalistic, depends on the story you want to tell but also less is more
- Visually, the other designs are preferred

N: Thoughts on the materials?

- Suppose it is transparent; unwanted emittance of light might disturb people
- Minimal shape, it does not stand out
- Texture inside changes the view

N: What about the composition of the pieces?

- The circle makes more sense as it looks more like a tank, which it really is
- The offset shifting does look visually more interesting and might guide people to walk through it
- The composition does affect the way people would interact with it
- Circle is more private and would be nice with friends; is also more private

End of Design Presentation

N: Which one did you prefer most?

M: I preferred the pavilion functionality-wise, however visually I liked the ribbon design most.

Participant 2: G S K; 22 years old, male
Interview Duration: 25 minutes

N: Do you remember what happened during the Co-Design Session and its results?
G: Yes

N: In what ways do you think the designs were translated; as in, what was the Co-Design session used for?
G: To collect different views, and also to let the participants do whatever they want to do; let them some freedom during the working space.

N: What do you hope for was put focus on?
G: Focus on aesthetics, interaction, and a big screen.

Now the three different designs are introduced.

Design #1: RIBBON

N: What are your first thoughts?
- Looks like a walking path - is it? (No)
- Looks like a sair also, or a slide

N: What is your opinion on the materials?
- Might have a wood-metal combination
- Each stripe could have a different color
- The ribbon could be a screen

N: What do you think of the interactional features?
- Looks inviting
- It does not really offer anything to do though, so it is just a sculpture?
- Maybe you can implement something more digital

N: Any improvements you have in mind?
- Mostly regarding interaction, as aforementioned
- More digital things
- Make it multipurpose
- Maybe something with lighting?

Design #2: TAP

N: What are your first thoughts?
- Love it
- Eye-catching

- Drawing is misleading
- Like the design, but it is a little random
- Dirty water might turn people off, regarding transparency

N: What is your opinion on the materials?
- How about tinted glass for illusion?
- The wood and metal need to suit each other

N: Any improvements you have in mind?
- Like the shape, maybe you should experiment with the shape a little
- Different compositions might lead to different results, regarding the shape around it
- People might react differently regarding the shape you will choose

N: Would you like it in your neighborhood?
- Would look really cool!

Design #3: PAVILION

N: What are your first thoughts?
- People might pee there at night
- Like the idea with the sitting
- Maybe too basic

N: Thoughts on the materials?
- Like earlier mentioned, it is a little too basic
- Maybe add a screen or any other kind of information people could be entertained with while being there

N: What about the composition of the pieces?
- Instead of making the tanks high, you can make them really wide
- People can sit on top of the tank
- There is a place in Enschede with plants being lined up in a certain order; it is behind the “oude markt”, and it does not look bad, but it has not really any purpose at all, which is why people usually ignore it. Maybe pay attention to something that would make it more interesting for outsiders!

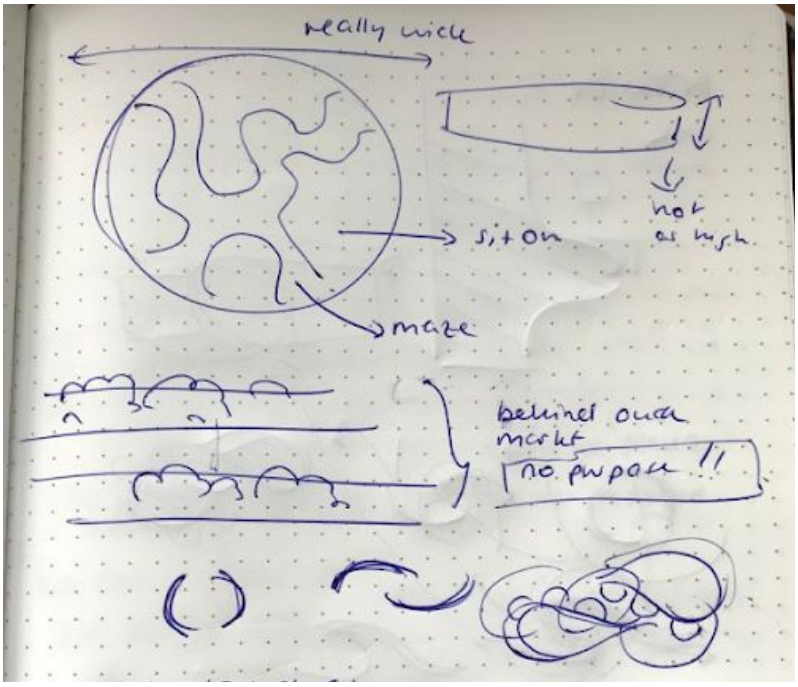

fig.appdxC1 drawings for participant 2

End of Design Presentation

N: Which one did you prefer most?
G: The one with the spiral around it, if you would make it multi-purpose!

Participant 3: F A; 25 years old, female
Interview Duration: 33 minutes

N: Do you remember what happened during the Co-Design Session and its results?
F: Yes

N: In what way do you think the designs were translated; as in, what was the Co-Design session used for?
F: It seemed very open-ended, and it could be taken anywhere during the session; it was a lot of fun! I mostly think it was to consider ideas that people would be interested to see, and would like to interact with. Also something to catch the characteristic of the city.

N: What do you hope for was put focus on?
F: Focus on lots of interaction, including the community, and especially something artistic.

Now the three different designs are introduced.

Design #1: RIBBON

N: What are your first thoughts?
- It has some fridge vibes
- The metal around it makes it look like a fridge to me
- Especially the shiny metal, white color
- It really looks like stairs or a lookout place

N: What is your opinion on the materials?
- Metal and glass is very straightforward
- It wouldn't look bad, but it should have something added to it
- It looks bland the way it is

N: What do you think of the interactional features?
- There are not really any interactional features
- It could, instead of making people do anything with it, offer a second purpose, than to just buffer the water
- You could add greenery, make a vertical garden
- It would look more beautiful and add to the artistic sculpture it is already
- Also a screen would be nice, place a screen on the ribbon

N: Any improvements you have in mind?
- As I said, another function rather than just look at it
- Look at it, but make it more interesting, as the garden idea
- Could also be a walking path, or a lookout place
- Make it look a little organic, like greenery hanging over the ribbon

- Dutch nature is very organized, if you can integrate nature into the architecture and let it go wild a little, that would make a great addition to the city
- It misses a purpose, so adding more features would be nice

Design #2: TAP

N: What are your first thoughts?

- It looks like a letter, a C or a D
- Why did you choose for a bike-cleaning station?
- The tap is not really clearly seen, at least until it is mentioned
- It looks really interesting, and definitely special
- Why did you choose that shape?

N: What is your opinion on the materials?

- Consider what types of metal and wood you would use together
- You could instead of making it transparent, use something opaque to change the color of the water.
- Color could also be changed with lights placed below.

N: Any improvements you have in mind?

- Maybe make the shape less of a D or a C
- You could do something with the elevated band in the middle
- About the design of the bike cleaning station; it does not seem that a sole shower would make it cleaner so I would not use it
- The design could lean more towards something that shows that it will be cleaner, like brushes on the ground to clean the tire or something like that
- I want to feel invited, rather than just look at it
- I enjoy the artistic part, but the design is random

N: Would you like it in your neighborhood?

- Yes, since there is not a lot around here, but it could be improved!
- Really interested in more artistic things around Enschede
- Just a nice place to show friends that visit

Design #3: PAVILION

N: What are your first thoughts?

- It might be a little scary if homeless people were there at night
- I don’t expect homeless people to be there over day where people would actually visit it, but keep it in mind
- Looks very massive
- Maybe too big to dare sitting inside it?

N: Thoughts on the materials?

- Glass can be tinted here, make it another color
- Inside looks fun, but since it looks a little boring, I might not stop and take a photo

N: Any ideas for improvement?

- There is not a lot too look at in Enschede, maybe you can change that with this idea
- The functionality is nice but the looks are a little too simplistic
- The previous ones can be admired, but this one not so much
- If people are not invited properly, they might not even go inside and use what it was planned for
- Exterior should be changed to something more interesting
- Composition could also be changed, and the number of exits and entrances
- Multiple openings sound nice

End of Design Presentation

N: Which one did you prefer most?

F: Aesthetically I prefer the one with the ribbon around it. I would be nice if you could add more features to it, so it also is best regarding its purpose! I think the garden idea is a very good one.

Appendix D: User Focus Group Interviews

The user focus group consists of people living in “de Bothoven” area.
Interviews have been conducted on the first iteration of the designs.

Participant 1: L B, 23 years old, female
Interview Duration: 38 minutes

Participant 1 is part of the user focus group and participant of the co-creation session.

N: Do you remember what happened during the Co-Design Session and its results?
L: Yes

N: In what way do you think the designs were translated; how were the results used during the design process?
L: You probably used them more inspirational, like ideas to go into a certain direction. You probably also paid attention to different intentions. For example showing the history of Enschede or making it a functional object for people to use. I do not imagine that you used the ideas from the session directly and translated them into designs.

N: What do you hope for was put focus on?
L: Making it multi-purpose, so basically an object that can be used in many forms.

Now the three different designs are introduced.

Design #1: RIBBON

N: What are your first thoughts?
- Like it
- Simplistic design
- Has movement, something dynamic
- Still shows what is inside
- Clear concept

N: What do you think of the interactional features?
- You could design the area around it to give it more meaning
- Less interactive, what is it?
- People are very likely curious about it
- Give information about it in a creative way for example
- I would not visit it intentionally

N: Any improvements you have in mind?

- Experiment with the spiral shape
- Go physical with it
- What do you want to convey with the spiral ribbon?
- Be more conscious about what you want to convey

N: Would you like it in your neighborhood?

- I would not hate it in the neighborhood
- But I would also not really go there

Design #2: TAP

N: What are your first thoughts?

- It does show what it does in a way
- What is that? (The tap drawing)
- The tank looks very static
- I can only see the function of the bike cleaning station secondary
- It does not look bad, it looks more like a sculpture
- Everything is static
- See-through is functional

N: What is your opinion on the materials?

- Wood, metal, and glass look cool together

N: Any improvements you have in mind?

- See-through is functional, but you should it push more towards functionality
- It should have more purpose
- How meaningful is it to just see the water? What does it mean? You should visualize what it means
- At which level did it save enough water until it has made a noticeable difference?
- Why that shape? It needs a story
- A little random, you should add intention to it

N: Would you like it in your neighborhood?

- I would not dislike it in my neighborhood
- It does not look bad, and could be nice actually
- It has cool materials
- Transparency is really cool

Design #3: PAVILION

N: What are your first thoughts?

- Simple, cool, aesthetic
- Function can always be used in public spaces (a place to rest)
- Walk through it to look at it, and sit there to really take it in
- It is nice that there are two openings, it invites to walk through it
- Do not use orange

N: Thoughts on the materials?

- Why are the seats orange? It has a very clean look, so why are they orange? It clashes
- Transparency is nice
- Like the materials of the previous ones better, like the metal and wood
- Greenery could or should be also added

N: What about the composition of the pieces?

- Matches with the type of space it is supposed to facilitate (like a place to hang out)
- Positioning of the halves give the space a very different atmosphere
- How much do you invite people to walk through it? How much do you invite them to sit down?
- Closed space, or more public?
- People might not want to sit enclosed
- Try different configurations, more openings, or less? Different shapes
- Maybe cut out shapes inside to create engravings on the glass
- Maybe not a glass structure
- Instead of relying on a flat roof, maybe a cone?
- Maybe angled pieces that create a roof?
- It would be nice if it could be used by multiple groups of people

N: Would you like this in your neighborhood?

- Yes, very much

End of Design Presentation

N: Which one did you prefer most?

L: I liked the pavilion most, I think it offers the biggest potential on making it popular amongst people to hang out there and really appreciate its presence

Participant 2: S G, 26 years old, female
Participant 3: K, 27 years old, male
Interview Duration: 33 minutes

Participant 2 & 3 are a couple living together in “de Bothoven” area.

N: Are you familiar with the flooding problems that occur in Enschede?
S: Yes, we know a little about it. We also heard about it and occasionally read about it, but nothing in detail.

N: How long do you already live in Enschede?
K: For 2.5 years already in de Bothoven area.
S: For 2 years, and for a few months now in de Bothoven.

Following, the SRB and the SRB XXL were explained to the participants and what role it plays in this interview. They are informed about how this project revolves around designing an SRB XXL and that it might be placed in the area that they live in.

The designs are now shown.

Design #1: RIBBON

N: What are your first thoughts on this?
- Like the colors and the industrial look
- Good connection to the place
- Seeing the water levels due to transparency is really cool
- There is more going on than only water and a tank, so that is nice
- The sculpture around it looks a little like a staircase, so that is a little misleading
- The spiral is a good addition
- If you look at it from the back, it looks like an entirely different sculpture

N: Any preferences on a material?
- Wood can be a nice addition
- Coloring the glass would be good, rainwater might look dirty
- A blue tint, or any color would do, actually

No further comments

Design #2: TAP

N: First thoughts?
- Can the bike cleaning station be added to other designs as well? (Yes)

- If the tank is filled from the bottom, the picture of the tap does not make a lot of sense anymore
- Looks a little futuristic and that is not really my thing

N: What about the materials in this design?

- Combination of materials is cool, though
- Prefer the white metal in the previous design
- Wood looks like an old-school wooden barrel

N: Would you like this in your neighborhood?

- Yes, it looks really cool actually
- It would be nicer if the previous was not shown earlier, since that one is preferred
- The previous design is more aesthetic, the design is cool
- The shape of this design does not really work for me
- The dynamics in the spiral design are preferred

No further comments

Design #3: PAVILION

N: What are your first thoughts?

- Really cool since you are entirely surrounded by water that goes very high
- It also looks very much like an artwork
- The top being closed gives a feeling of double safety; being saved from the floods, and also from the rain when it is actually raining

N: What do you think of the chosen materials? Like, the orange benches for example?

- Divided opinion; orange and blue goes well together, while the other thinks it does not
- Wooden seats or any kind of wooden material would be nice; water + wood together are very natural
- Transparent seats that might also hold water would be an interesting idea
- What about the effect of the sun, though?
- Maybe use the water as temperature regulator?

N: Any other comments or ideas in order to improve this?

- Maybe make it more children friendly
- More attractive for people to sit
- At the performance factors people often go out to smoke, even though it is raining; they usually hide under really ugly stairs, so the SRB as a pavilion might be very nice there
- You could change the shape of the srb, into a wave for example
- Maybe create more private places
- More openings, or an entirely flowing shape
- I like the feeling of it, it might look like an aquarium

- Maybe add something more educational?
- Reading facts or information while sitting there
- Offer interesting information; like at Oldenzaalsestraat, they have a poster that says the new drainage system will hold 15 million glasses of beer
- You can turn it into a mini-museum, something like that

N: Would you show the SRB to your friends from other cities, if they were to come over?

- Yes, definitely
- We live close, so it is actually really nice to show it
- I would also like to try it out, do something with it

End of Design Presentation

N: Which design did you prefer most?

S: I prefer the pavilion most, since the functionality is really nice. But if you were to add a functionality like that to the ribbon design, it would be even between those two.

K: I also like the pavilion most, since I love the idea of the double sheltering. I like the aesthetic of the spiral most, though. The ribbon.

fig.appdxD1 drawings for participants 2 & 3

Appendix E: Decision Maker Interview

The decision making instance is the client; the municipality of Enschede.

Participant 1: N H, female
Interview Duration: 48 minutes

Explanation of how the interview will go

N: I will show you three designs now, and this is the first one (lightbulb). Please tell me your first thoughts.
H: The water is in the top I assume? (Yes). Can you explain a few details of the design? (Explanation). How is the energy collected to power this? Solar panels? (Depends on the technical part). The design is a little confusing regarding the shape. It does not give off a water vibe, or an environmentally friendly message. It has nothing to do with climate adaptation or water. I understand that you want something that gets your attention, but it should also have an educational part in it. This looks more artsy, it has a wow-factor, but it does not explain anything about climate adaptation, and the reason why the rainwater buffer is placed there. It looks a little like something from outer space. Like a UFO or something. You can tell a story through pictures.

N: Any other comments?
H: There is a logo from “de regentoren”. Was the logo used in the designs? (No).

N: This is the second design (umbrella). Any first thoughts?
H: This is like an umbrella, I see. Can you explain the design? (Explanation). Interesting design, I like this one. It is obvious that it has something to do with the climate. What I miss is where you can use the water. You can use it for watering the plants, e.g. But there is also a lot of heat, since the summers are very warm. You need to store water to water plants and clean windows, etc. It would be nice if the use was more emphasized. To make it understandable, why do we have to store the water? You can explain it as heat stress. It would be better to design it like there is a sun for instance. It is not nice if it’s really hot and you see a very rain and water based design. You have to design something that will be interesting in 10-20 years, since it is also getting warmer. Have you put any thought into educational factors? It would be very helpful if the landmark was explained. If people want to visit it, it tells you a story of what it is about. It could be an advertisement for the small SRB, advertisement for “de regentoren”. You can buy your own, even though this is the XXL version, and help the municipality and the Earth.

N: What do you think of these kinds of seats?

H: I like it, and it is also necessary. If you tell a story about climate adaptation, there needs to be something for people to stay. Like a museum; people need to be around to take in the story. If people cannot be there, they will just walk by and very likely never look at the SRB XXL. It would be nice, if you would also consider the area around it and adapt the design to that. You can also do something with a voice explanation, for example. Push a button to hear a voice, instead of art and text.

N: Any further comments?
H: This is not transparent, right? (Explanation, carved/drawn raindrops, tinted glass). Is there an aspect that considers children? (Add a place to stay, add an interaction that is easy; in this case it is sitting).

N: The third design, the interaction includes a ramp. Please share your thoughts before I explain too much about it.
H: This looks more like the original “watertoren”. In the original design of it, the water is stored up there; the people might think the water is placed in the top. If the buffer is transparent, they will see where the water is, I assume. What story would this design tell? (Environment Awareness, since it is a big topic right now. Promoting planting trees, nature, gardening; Enschede has organized nature, they want to have wild nature and something nice to look at.) How are the plants watered when there is a drought season? (The SRB is self sustaining). It could also add as an explanation on how people can use their own SRB, to water their own gardens for examples. You can also change it into a playing area, not only educational but also recreational and a playing area. It would give it an extra dimension. If children go there, and take their parents, you can also tell the story to the grown ups.

N: Any comments in general?
H: They all have a story, but if you were to add things about heat stress in order to use the water in dry periods, that would be good. You should combine different aspects of the design, in order to create your final design. You should make people try to do something themselves. You should use it to tell a story, it’s the most important thing. You must be able to tell the story somehow, via art or in other ways. It would be good if it is something that can be used by people. For example, there is a school nearby, they could use the water to water their plants in the garden. People would go there more often and can also feel the use and need of the SRB. Those are the most important aspects.

Otherwise, in neighborhoods, in the beginning it’s new and people go there and look at it, people do not see it really anymore. It would be nice if it’s used and put somewhere else, but if people can use it, they will always be aware of it. And also buy a small one for themselves. And when it’s gone, they miss it, and will replace it by the small SRB.

I would prefer a mix of the designs (umbrella and garden) tell the story best. Since they have to do something about climate change. It is really necessary to think about how to attract as many people as possible.

N: Thank you very much!

Appendix F: Final User Evaluation Script

The final user evaluation included co-designers and representatives of “de Bothoven” area. The final evaluation was conducted via an email interview.

1. Introduction

Hey _____! Thank you for getting back to me yesterday.

This evaluation will work as follows: I will firstly send you a picture and a description of my design, followed by pictures of the scaled model. Afterwards, there will be a list of questions you need to answer. Please reply to this mail: n.m.tunc@student.utwente.nl

Thank you very much again! Your participation is greatly appreciated.

2. Design & Description

The following design image was chosen:

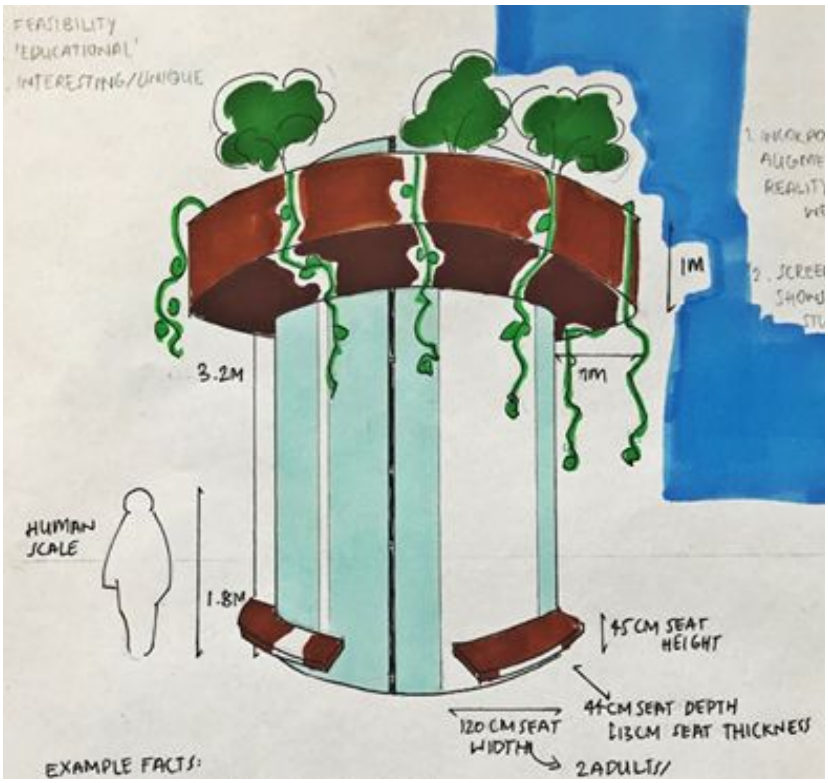

fig.appdxF1 Final Design SRB XXL

Design description:

A cylindrical tank was chosen, based on the feasibility of this project. Choosing a generic shape that has elements added to it is easier to realize than a shape that must be custom made. Added to this tank is greenery and nature, in the top; having such greenery added to the design combines solutions for heat stress in Enschede, additionally to the advertising instance it offers. Showing off the possibility that the SRB XXL can water itself, it inclines the visitors to buy their own SRB, especially after being exposed to the educational facts the SRB XXL is offering regarding the scale of the water collection and its waste.

Seating arrangements are offered also, being extruded from the bottom of the tank. The wooden benches having a similar shape to the garden platform adding to the desired coherency. Creating a look as if these benches were sliced from the platform, downscaled, and added to the bottom of the SRB are part of the consistency of the design.

Having the garden lifted up does not only create an interesting look that includes greenery smartly in the centre of the city, but also offers a second functionality, which is picked up from prior designs. The platform being extruded over the seats like that offers shelter from rainfall for visitors of the tank. These can sit on the benches and stay dry, while it rains.

Concluding, the final design is based on many characteristics that have been mentioned and worked our prior to this iteration.

A few ideas from the very first design iteration have stuck, for example the resting place as introduced in the “pavilion” design, and its transparent cylindrical shape. The combination of wood and glass was also picked up again, while the most prominent idea from the second design iteration was chosen. The “garden” design was very popular, given its functionality and being visually preferred. Its usefulness has proven to be very suitable for this project.

3. Scaled Model Images

fig.appdxF2 & 3 Scaled Model SRB XXL


fig.appdxF4 & 5 Scaled Model SRB XXL

4. Questionnaire

- Does this design fulfill your expectations of the SRB XXL?
- Do you see your opinions reflected in this design?
- How could this design have been translated better?
- What interactions / additions are you missing?
- What should I do differently in the next design iteration?
- What questions should I have asked you during our past interviews?
- Any additional comments?

Appendix G: Final User Evaluation

The final evaluation of the representatives of “de Bothoven” area and the co-designers are elaborated in this appendix.

1. **Representative of “de Bothoven” area:**

Participant 1: female, 26 year old

Does this design fulfill your expectations of the SRB XXL?
Yes, it is an approved version of my expectations.

Do you see your opinions reflected in this design?
Yes, especially in the educational part about the beer glasses and stuff :P. Like the creativity in those ideas.

How could this design have been translated better?
I think you translated your ideas well, with an eye for details on purpose and possibilities.

What interactions / additions are you missing? What should I do differently in the next design iteration?
I don't really understand the part of buying your own SRB, maybe you can explain this in more detail in your next iteration

What questions should I have asked you during our past interviews?
I don't know if you asked it, but you could have asked our opinion about the garden part, because I don't remember it. But I don't know if it was already an idea when you interviewed us.

Any additional comments?
Really nice to see how you used our input. Keep up the good work.:)

Participant 2: female, 23 year old

Does this design fulfill your expectations of the SRB XXL?
Yes, it is a multi functional design that fits well in the area. It offers a place to sit, offers shelter and informs people about the water problem. The glass and wood, modern and traditional materials, fit in with the vibe of the repurposed industrial area together with the green roof.

Do you see your opinions reflected in this design?

Yes, I've previously mentioned that I liked the materials, and that I liked the idea of the SRB providing shelter. The ideas I had that weren't included were a lot less feasible.

How could this design have been translated better?
It seems like the garden may be a little hard to see, maybe some vertical gardening can be added or the fence can be removed (keeping the wood edge to the height of the sand).

What interactions / additions are you missing?
I'm not missing anything, was not looking for anything super specific. Only that the SRB could have some more to it than a huge cylinder, which was successfully done.

What should I do differently in the next design iteration?
Add more details, think about how people can see the garden when it's all the way up there.

What questions should I have asked you during our past interviews?
Can't think of any.

Any additional comments?
I like the reasoning behind the design.

2. Co-designers:

Participant 1: male, 23 years old

Does this design fulfill your expectations of the SRB XXL?
Somehow, yes! It looks really nice, however I am a bit concerned about a few things:
1. Is it realistic for that much weight of the soil and plants to be elevated at that height? Considering the weight, I think it would make more sense if the buffer is underground... But then again, if the buffer is underground, there's no aesthetic appeal to it. It just becomes a garden...

2. I'm worried if the garden is elevated, how can people (especially kids) see the plants in the soil above it? It becomes something pretty, which nobody could see.

3. Wouldn't it also be quite hard to maintain it regularly? What happens to the large amount of water that accumulates in the soil, and not the buffer? It may easily backfire for the exact reason it is being built (flooding the soil, which could lead to cascade effect). What happens during different seasons?

Do you see your opinions reflected in this design?
Yes! I like that the buffer is multi-functional and not just a buffer. I also love that it can act as a social hub. I also like its educational feature, providing transparency to the local users.

How could this design have been translated better?
I think the beauty of the design will be missed by a lot of people. The garden is the highlight of this buffer, yet it won't be visible to anyone underneath it. I also think that the design choices could be improved with consideration to weather seasons.

What interactions / additions are you missing?
Not much!

What should I do differently in the next design iteration?
I think in the next iteration you could look into factors that actually affect the real world. Practicality.

What questions should I have asked you during our past interviews?
I know we gave you quite crazy design ideas, however we didn't talk through what's actually practical, and we missed out on some critical factors. We should have talked about feasibility in Enschede.

Any additional comments?
As much as I gave you quite critical comments, I love the uniqueness of the idea. I love the fact that you've designed something really uncommon, and I love that kind of stuff.

Participant 2: female, 25 years old

Does this design fulfill your expectations of the SRB XXL?
I think so, it seems functional, informational, and has prioritized aesthetics and design as well.

Do you see your opinions reflected in this design?
Yes! I was a part of user test 1 and 2, and in the first user test I was making suggestions that included combining the SRB with garden features. So that was cool!

How could this design have been translated better?
Right now the sketch is showing hanging plants, while the model I showing oversized flowers. It confuses me as a reader, since I don’t know which one more accurately represents the intended idea. Furthermore, the current design feels a bit “top heavy”. It would have been nice if the top felt a bit lighter, maybe by being thinner, and not having the wooden fence around it.

What interactions / additions are you missing?
It would have been nice if the garden was more visible or accessible to the viewer.

What should I do differently in the next design iteration?
Make the design less top heavy. Make it feel lighter. Maybe make the garden even more hanging.

What questions should I have asked you during our past interviews?
No suggestions.

Any additional comments?
I really like the concept!

Participant 3: male, 21 years old

Does this design fulfill your expectations of the SRB XXL?
I think so. I am aware that not all mentioned aspects can be implemented. After all, the SRB should be accepted by the whole city, not just by me.

Do you see your opinions reflected in this design?
Yes, for instance the shelter functionality to protect citizens from rain.

How could this design have been translated better?
The storytelling element could have been more dominant. As mentioned during the co-design session, if each location had an SRB which would tell its own story related to its area, the whole set of SRBs in Enschede would acquire more meaning collectively; they are then not only part of a network which prevents flooding, but they would also form a network of stories.

What interactions / additions are you missing?
I think that the garden is one of the main selling points design-wise. However, the general passerby cannot observe it. As acceptance through aesthetics is one of the key points for acceptance, I do miss the possibility to enjoy the view on the garden. The ribbon design on the other hand, had core design elements which could be viewed by anyone entering the area, regardless of height.

For the people that sit on the bench, what do they see if they look up? Potential forms of storytelling on the 'ceiling' could trigger curiosity and other forms of interaction.

What should I do differently in the next design iteration?
Consider if the interactions or surroundings for those who make us of the benches can be enriched.

What questions should I have asked you during our past interviews?
-

Any additional comments?
-