KABELFABRIEK 2.0

Research Booklet & Graduation Thesis
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0 1 INTRODUCTION

1.1. OVERVIEW OF THE THESIS

This research booklet presents the topic chosen for the graduation year of the masters of Architecture & Heritage at the Technical University of Delft. The first two quarters of the graduation year were set up as a research phase, which will be used as the starting point for the design phase of the second half of the year. "Heritage 4all: Univer-Cities" is chosen as the graduation studio. The focus of this graduation studio lies on the following four themes: Co-creation, sustainability, univer-cities and digital heritage.

Firstly, as the name of the studio refers to, "Heritage 4all", the fundamental vision is that stakeholders, people related to a specific debate, are involved and that co-creation is the approach of the research and design assignment. In other words not only experts (e.g. architects, designers, planners), who are educated for it, would produce and decide over the built environment, but also the general public, who are not experts in the field of planning, design and management, would be taken along in such process of producing the built environment. Citizens values, thoughts and experiences must be taken into account since in the end the citizens use, work, live in the spaces created. This represents the heritage that needs to be preserved carefully. This process of co-creation may raise complicated issues, as the values and attributes, thoughts and experiences can be antipodal. (O'Hern and Rindfleisch, 2010)

The second theme of this graduation studio is sustainability, which has been a hot topic during the past thirty years. The Universal Declaration on Cultural Diversity divided it into "four pillars: economic prosperity, cultural vitality, social equity and environmental sustainability." (UNESCO, 2001) This in combination with heritage can culminate in complicated issues and ethical questions. For example how to deal with heritage values whilst adapting a building to make it energy neutral?

Sustainability can also be related to Univer-Cities. "Univer-Cities", cities with a symbiotic relation with the university hosted, like Delft with its high ranked Architecture education should have an example function for sustainability (Teo, 2013). Furthermore the theme Univer-City also addresses the phenomenon of co-creation; what is the relation between the city and its university? Are they separated or do they work together and replenish each other?

The fourth research theme of the graduation studio chosen is Digital Heritage. It does not only refer to computer-based information that has lasting values for contemporary and the future society (e.g. pictures, movies, figures, websites), but particularly digital games are addressed in this research. (UNESCO, 2009)

Recapitulating the graduation studio chosen, "Heritage 4all: Univer-Cities", addresses four themes, see figure 04 as well:
o   Co-creation
o   Sustainability
o   Digital Heritage
o   Univer-Cities

The old, partly abandoned, cable factory at the Schieoevers in Delft is chosen as a case study for this research and will be redesigned in the second half of this graduation year. The cable factory, in Dutch called De Kabelfabriek II, is one of the factories of the former called NKF company. When discussing the cable factory in this research paper, Kabelfabriek II at Schieweg 15 in Delft is meant. It is not listed as a monument, however it is part of Delft's industrial heritage. The city of Delft used to be known for its industry. Yet because of de-industrialization this image of Delft as an industrial city has changed. More elaborate information about this case study can be found in the chapter 'Case study'.

As mentioned before, the research and design phase will go hand in hand. The product of the research semester provides a methodology process on which the design semester of the Kabelfabriek II will be based. The Kabelfabriek II is one of the many factories that because of deindustrialization became vacant and obsolete. Nowadays adaptive reuse is an often used design strategy for industrial heritage. Inherently this creates a dilemma; what do you preserve as heritage and what do you adapt? (Canevaro et al., 2019) (Chatzi Rodopoulou, T., 2020) (Villacampa & Poli, 2013)

The involvement of stakeholders is of paramount importance to know what the citizens values and what their necessities are. Therefore this research questions how a co-creation approach can be applied for redesigning 20th century Industrial Heritage factories for adaptive reuse together with stakeholders. For the stakeholders involvement Minecraft is used as the heritage game to explore if it could be supporting the value assessment of the Kabelfabriek II. Other case studies (e.g. Westergasfabriek, DRU Industriepark, Stanley Mills, King's Cross and The Tobacco factory of Madrid) are studied to find out how to make the Kabelfabriek II sustainable in terms of energy efficiency and social inclusivity.

Besides, the relationship and possible supportive role between the Kabelfabriek II and the Technical University of Delft and the city Delft is researched. In the end this research will provide a strategy to redesign the Kabelfabriek II.

Figure 04. Four themes of Heritage4all (Syllabus, 2020)

1.2. PRESENTATION OF CHAPTERS

This research booklet is divided into eight chapters. This sub chapter of the introduction explains briefly what is being said in the different chapters. The different chapters are:

1. Introduction
2. Research approach
3. Case study
4. Digital Heritage & Co-creation
5. Design strategy & Sustainability
6. Conclusion
7. References
8. Annex

As you already might have read, the first chapter "Introduction" explains concisely what this research booklet is focussed on, which themes it has, what case study is being used, what problems it brings and what the state of art is.

The second chapter "Research approach" firstly shows what kind of research approach is being used. Subsequently to understand and know what the state of the art is on this research, a theoretical framework follows. Next to this the methods and tools used are exhibited. Additionally, a clear description is given on the issue of what is addressed in this research. It identifies the gap and finds out what the state of art is of the topic chosen. The research questions, based among others on the state of art and the gap in current literature, are shown. At last the aim, goals and expected results of this research are being explained.

The third chapter "Case study" focusses on the Kabelfabriek in Delft, in its broadest sense of the word. For example the history of the city Delft and the Kabelfabriek is investigated. Furthermore the current state of the Kabelfabriek, the urban block and the building complex (e.g. public/private, typology, construction, materialisation) are being researched.

The fourth chapter "Digital heritage & Co-creation" elaborates on the digital games used for this research. The first sub chapter shows the use of Pokémon Go for field-work as a first analysis of the Kabelfabriek. Secondly the civic engagement process is discussed. The third sub chapter explains the structure of the co-creation workshop where Minecraft was used as a medium to interact and to find out the needs of the people and what they value. Lastly the results of the workshop are shown. The sub question on the theme of digital heritage is being answered.

The fifth chapter "Design strategy" is focussed on the program and the design concept of the Kabelfabriek. This chapter answers the sub questions on the theme of univer-cities and sustainability.

The sixth chapter "Conclusion" recapitulates briefly the answers of the sub questions and ultimately answers the main research question.

The seventh chapter "References" exhibits the literature references and figure references used.

The eighth chapter "Annex" presents the interview protocols and interview transcripts used for this research, 'Values & Attributes' survey and a Minecraft evaluation survey of the Minecraft workshop and a values assessment of the author.

02 RESEARCH APPROACH

2.1. RESEARCH FRAMEWORK

The main research approach for this graduation studio is co-creation. Into this research the four themes of the studio "Heritage 4all: Univer-Cities" are integrated. Therefore, the main research question refers to co-creation and the three sub questions refer to digital heritage, sustainability and univer-cities.
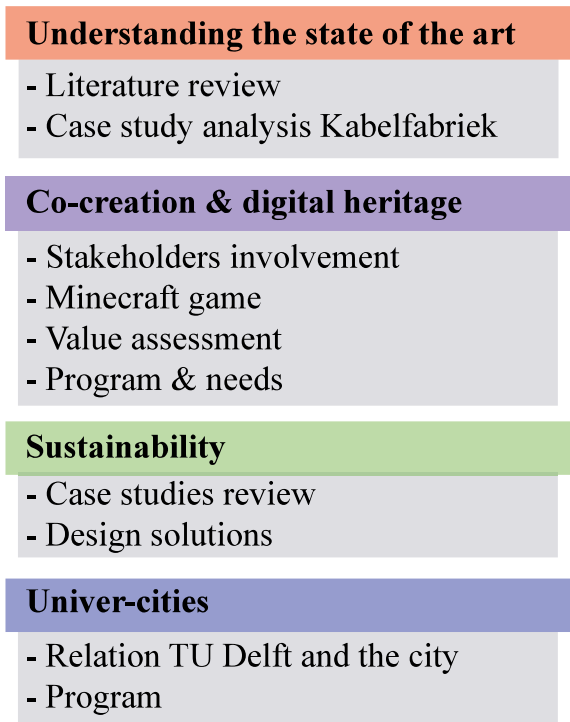
Understanding the state of the art
- Literature review
- Case study analysis Kabelfabriek

Co-creation & digital heritage
- Stakeholders involvement
- Minecraft game
- Value assessment
- Program & needs

Sustainability
- Case studies review
- Design solutions

Univer-cities
- Relation TU Delft and the city
- Program

Figure 05. Scheme of the different themes (Tol, 2020).

2.1.1. PROBLEM STATEMENT

In the Netherlands in the 20th century, a lot of industrial areas and buildings, such as factories, silos and hangars became vacant and obsolete. The main reason for this occurrence is the disappearance of its function in society, technological development and/or moving the building use to another area because production increase or reduction. (Canevaro et al., 2019) (Villacampa & Poli, 2013) Some of these industrial heritage buildings are listed and some are not.

Either way, on the one hand from a heritage point of view the industrial building should be conserved because of its historical and cultural meaning. Moreover, the historical significance and the cultural and social values can be controversial, since industrial heritage like the Kabelfabriek II can be seen as an icon of both progress, innovation, hardship and suffering. Chatzi Rodopoulou (2020) even states that some industrial heritage is not even aesthetically appealing, but the technological and scientific values make the difference compared to other heritage buildings.

On the other hand the building needs to be changed in a sustainable way for adaptive reuse, both in the sense of energy efficient and socially inclusive. This redevelopment needs to be done with the involvement of the stakeholders who related in some way to the building.

An interesting case study of this topic is, as mentioned earlier, the Kabelfabriek II in Delft. But how to tackle redesign projects such as the Kabelfabriek II? To find out what the state of the art is of the topic chosen, redesigning 20th century industrial heritage together with stakeholders for adaptive reuse, a literature review has been done. For this literature review the database of Elsevier, named Scopus, is used. Scopus provides more than 30.000 peer reviewed articles of the highest level of different sciences. Critical issues that need to be mentioned is the fact that only Scopus is used for this part of the literature review. And with the use of Scopus, only articles with 'open access' and written in Dutch or English are used.

The first search designation with the following key words, "Industrial Heritage" AND "adaptive reuse", showed search results in six documents. Three of them are valuable according to this research. The key words, "Industrial Heritage" AND "stakeholders", provided seven document search results, of which four are of value. The number of document results increased by 265 documents when leaving the word 'industrial' out of the search terms.

Furthermore, the review of Bottero, D'Alpaos, and Oppio (2019), a valuable research about a decision aiding approach in terms of industrial heritage, led to encounter in two further useful literature sources, Bottero, D'Alpaos, and Oppio (2018) and Plevoets & Van Cleempoel (2011). Bottero, D'Alpaos, and Oppio (2018) and Plevoets & Van Cleempoel (2011). Bottero, D'Alpaos, and Oppio (2018) present their applied method to preserve and adapt heritage and Plevoets & Van Cleempoel (2011) exhibit an overview of different strategies for heritage conservation and architecture.

All articles present either a design strategy or a methodology to approach the redesign of heritage. For example, as mentioned above, Bottero, D'Alpaos, and Oppio (2019) focus on one specific method, namely PROMOTHEE. "This method allows the evaluation and ranking of alternatives, identifying the variables that affect such a ranking and analyzing similarities and differences between alternatives."(Bottero, D'Alpaos, and Oppio, 2019, p.785) In their conclusion they state that it would be of scientific interest to use a combination of methods.

Moreover, comparing the different articles on their references different books, articles or other sources are being used to describe this one specific strategy to reuse heritage. One aspect that they all, the above mentioned ten scientific articles, have in common and is found essential for the redesigning process of heritage, from its value assessment till the design, is the involvement of stakeholders. However, even the group of stakeholders differs from people who are educated in the built environment to people who are not. An interesting remark of Plevoets and Van Cleempoel (2011, p. 155) in their article 'Adaptive reuse as a strategy towards conservation of cultural

heritage: a literature review' is that the group of stakeholders should not only be the owners and developers of the concerning project since that will be at the expense of the value assessment of the heritage at risk. They state that the assessment of values is the basis for every reuse project and that the owners and developers mostly are interested in only the socio-economic values, which will make the preservation of 'soft values' (e.g. historical, sociological and cultural) of less importance.

Design Strategy	Methodology	Author
Adaptive Reuse	Analysis of multicriteria decision making methods.	(Morkūnaitė, Kalibatas, & Kalibatienė, 2019)
Adaptive Reuse	Analysis of three approaches: typological, technical and architectural strategies.	(Plevoets & Van Cleempoel, 2011)
Adaptive Reuse	Stakeholder involvement through a.o. questionnaires and analysis of the existing.	(Gunn, 2012)
Adaptive Reuse	Methodology based on Burra Charter Process. Three stages: 1. understand the significance (value assessment) 2. develop policy (stakeholders) 3. manage in accordance with policy *note: how the stakeholders are involved (e.g. questionnaires, interviews) is not mentioned.*	(Ifko, 2016)
Adaptive Reuse	Multi-methodological approach: SWOT analysis, Stakeholders analysis (interviews and a big group of different stakeholders) and PROMOTHEE.	(Bottero, D'Alpaos, & Oppio, 2018)
Adaptive Reuse	Empirical analysis of design strategies.	(Loures, 2008)
Adaptive Reuse	PROMOTHEE; ranking criteria, using DM's (Decision Makers are all experts) *note: how the stakeholders are involved (e.g. questionnaires, interviews) is not mentioned.*	(Bottero, D'Alpaos, & Oppio, 2019)
Adaptive Reuse	Case study analysis lacking in-depth approach to methodology.	(Villacampa & Poli, 2013)
Adaptive Reuse	Multidisciplinary approach to optimize preservation of the existing and suitable reuse. *note: how the stakeholders are involved (e.g. questionnaires, interviews) is not mentioned.*	(Canevaro et al., 2019)
Adaptive Reuse	Combination of an analysis of the case study (e.g. materiality and values) and stakeholder involvement (e.g. interviews and polls).	(Lo Faro & Miceli, 2019)

Figure 06. Overview of the ten used articles with their design strategy, methodology and author. (Tol, 2020)

Furthermore, of all these ten articles only three of them mention that interviews or questionnaires are used to involve different stakeholders in the process. The others only state that the involvement of stakeholders is of importance, but do not go into depth how to involve them. This points out the research gap in terms of the approach of co-creation in combination with adaptive reuse projects.

Concluding one could say that the state of art on preserving and redesigning heritage presents different strategies. Most of the articles are just focussing on one specific strategy, whilst a combination of these would provide a more balanced outcome. This research will investigate which strategies could be combined to make it to one balanced strategy wherein different aspects as co-creation, stakeholders involvement, sustainability and univer-cities are addressed. The research of Morkunaite, Kalibatas, and Kalibatiene (2019) show a compilation of these different methods and present a clear figure on the number of the methods identified in their review (see below figure 07). In consonance, Loures (2008) in his research states the following:

> "Moreover, one should notice that the application of these principles is not a sine qua non equation to the success of any project. Site and context research, analysis and synthesis must be performed, once "no size fits all"." (Loures, 2008, p. 300)

MCDM method used (Multi-Criteria Decision Making)	Number of times
AHP (Analytic Hierarchy Process)	20
Fuzzy AHP (Analytic Hierarchy Process)	3
ANP (Analytic Network Process)	8
Fuzzy Delphi	4
Delphi	3
Experts	6
EDAS (Evaluation based on Distance from Average Solution)	1
Fuzzy SAW (Simple Additive Weighting)	1
ELECTRE (ELimination Et Choice Translating Reality)	1
Fuzzy WLC (Weighted Linear Combination)	1
PROMOTHEE (Preference Ranking Organization Method for Enrichment of Evaluations)	2
WSM (Weighted Sum Method)	1
TOPSIS (Technique for Order Preference by Similarity to Ideal Solution)	2
ARAS, ARAS-G (Additive Ratio Assessment with the grey criteria scores)	3
TOPSIS Grey (Technique for Order Preference by Similarity to Ideal Solution with grey numbers)	1
SAW (Simple Additive Weighting)	1
COPRAS (COmplex PRoportional Assessment)	1
Other methods	18
Combination of methods	31

Figure 07. The mostly used MCDM methods used in cultural heritage topic (Morkunaite, Kalibatas, & Kalibatiene, 2019, p. 94)

As seen in figure 07, Morkunaite, Kalibatas, and Kalibatiene (2019) give an overview of different methods used for decision making process:

"Fuzzy, Fuzzy Delphi, ANP and Delphi approaches applied for adaptive reuse. PROMETHEE, ARAS, SAW, TOPSIS, COPRAS used for heritage buildings preservation and renovation." (Morkunaite, Kalibatas, & Kalibatiene, 2019, p. 93)
Therefore a description of the methods used for adaptive reuse, heritage buildings preservation and renovation will be given below:

ANP (Analytic Network Process)
"In order to comprehensively analyze the relationship between different levels of factors, the analytic network process (ANP) is widely used." (Dong, Liu, Wang, & Zhang, 2019)

ARAS, ARAS-G (Additive Ratio Assessment with the grey criteria scores)
ARAS (Additive Ratio Assessment) method capable for dealing with problems encompassing qualitative and quantitative criteria being hinged on different units of measurement and a different optimization direction. (Razavi Hajiagha, Mahdiraji, & Hashemi, 2018)

COPRAS (COmplex PRoportional Assessment)
"COPRAS method as a compromising method evaluating the alternatives on the ratio to the ideal solution and the ratio to the anti-ideal solution." (Razavi Hajiagha, Mahdiraji, & Hashemi, 2018)

Delphi
"The Delphi method is a common method to collect the consensus of opinions. Influencing factors can be obtained according to the established processes." (Dong, Liu, Wang, & Zhang, 2019)

Fuzzy
"Fuzzy logic is intended to model logical reasoning with vague or imprecise statements." (Stanford Encyclopedia of Philosophy, 2017)

PROMETHEE (Preference Ranking Organization Method for Enrichment of Evaluations)
"PROMETHEE is based on the comparison of alternatives taking into account the deviations that they show according to each criterion." (Selmi, Kormi, & Bel Hadj Ali, 2016)

SAW (Simple Additive Weighting)
"the SAW method is the most popular approach for classical multiple attribute decision-making." (Piasecki, Roszkowska, & Łyczkowska-Hanekowiak, 2019)

TOPSIS (Technique for Order Preference by Similarity to Ideal Solution)
"TOPSIS is based on the principle that the preferred solution should be simultaneously as close as possible to a positive ideal solution, PID, and as far as possible from a negative-ideal solution, NID." (Selmi, Kormi, & Bel Hadj Ali, 2016)

COPRAS (Complex Proportional Assessment)
"COPRAS method as a compromising method evaluating the alternatives on the ratio to the ideal solution and the ratio to the anti-ideal solution." (Razavi Hajiagha, Mahdiraji, & Hashemi, 2018)

In effect, the terms 'method' and 'strategy' are used disorderly in the different articles. Mainly, the design strategy in these researches is adaptive reuse, but the methods used differ from each other.
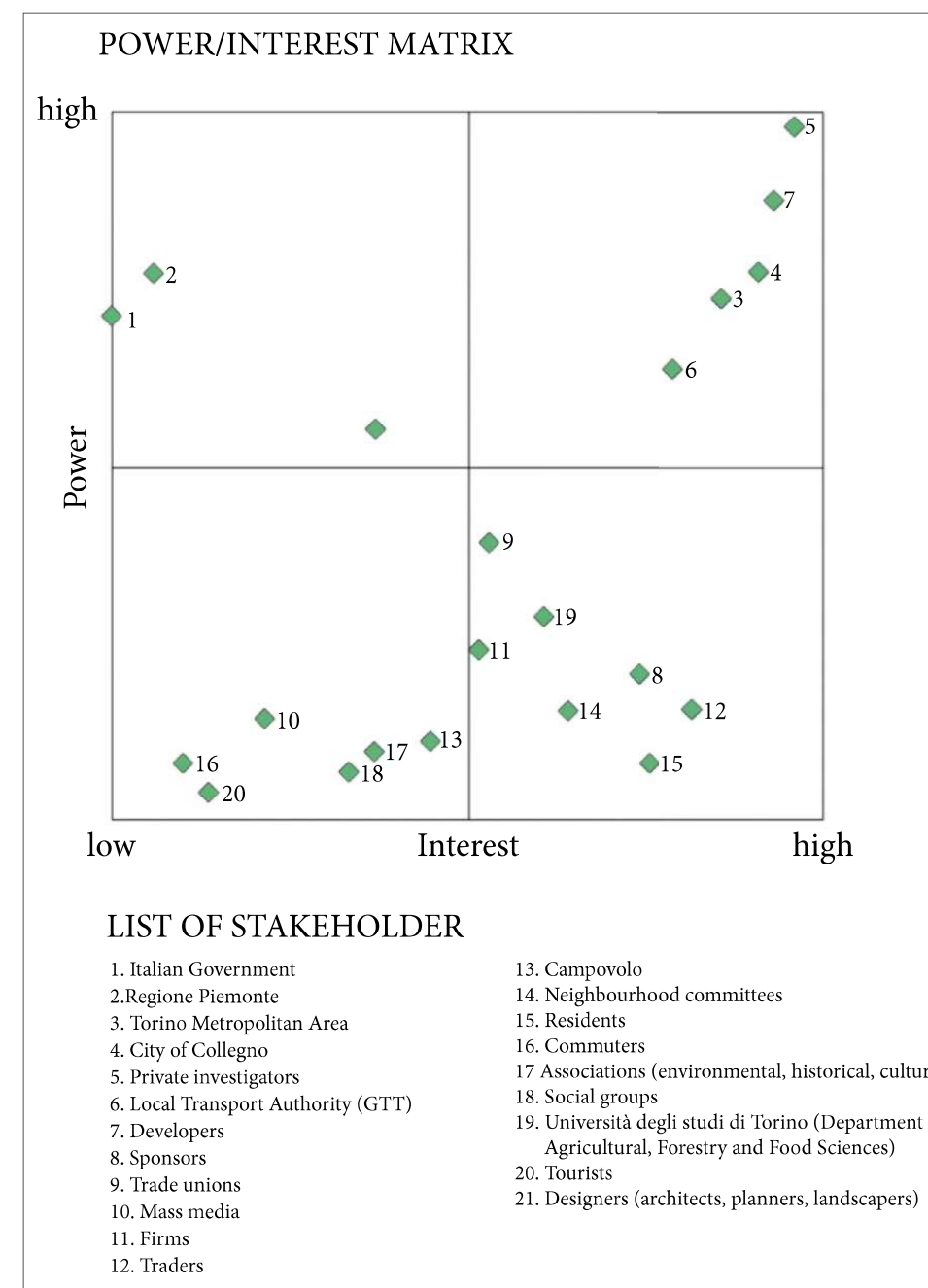

Figure 08. Figure and list of stakeholders (Bottero, D'Alpaos, & Oppio, 2018, p.4)

The methodology of this research booklet is similar to the methodology of Ifko (2016), consisting of the following three stages:
1. Understand the significance (values & attributes assessment).
2. Develop policy (stakeholders)
3. Manage in accordance with policy
The main difference with Ifko (2016) lies in the detailing of the process, methods and tools used, which are described extensively.
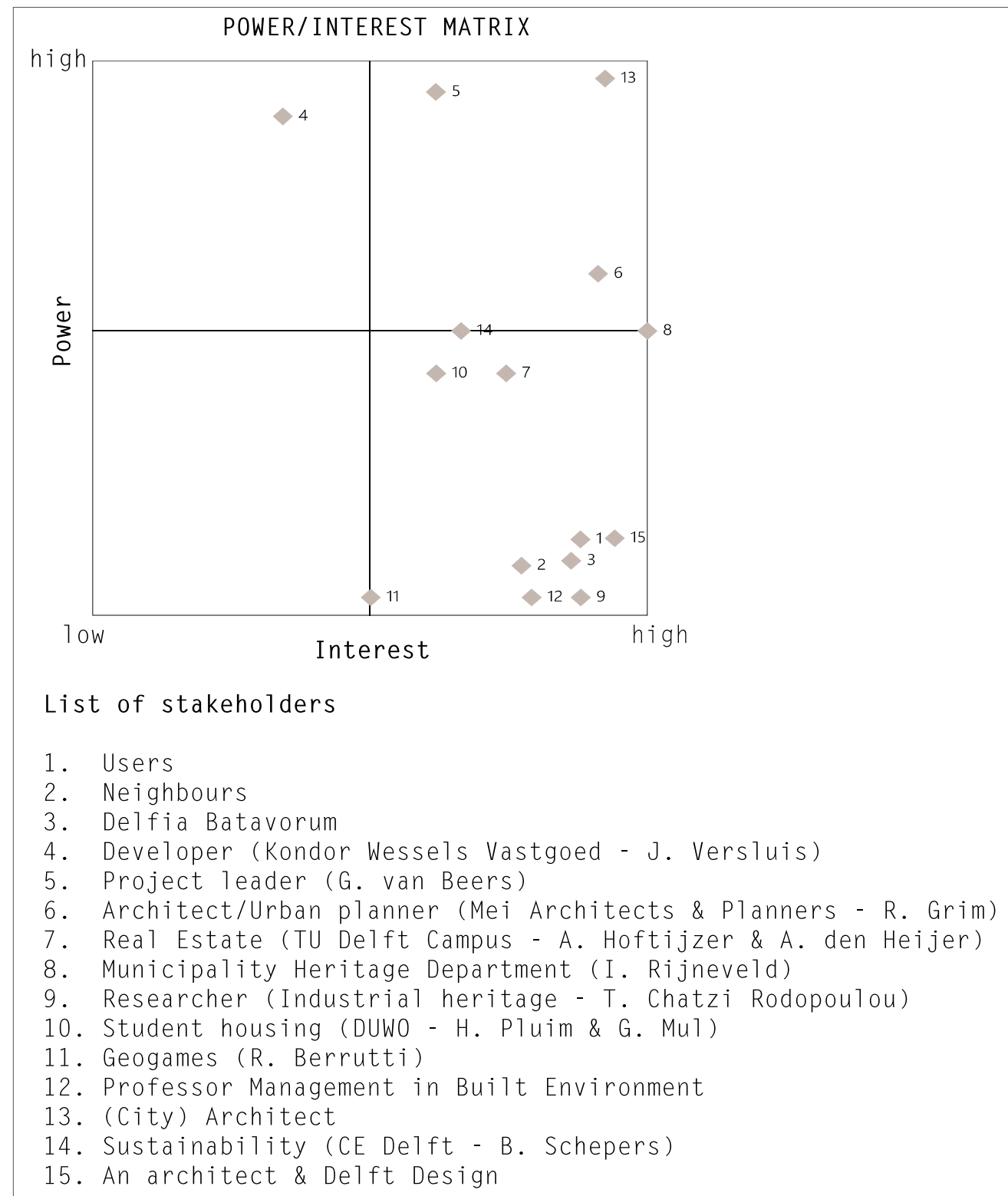

List of stakeholders

1. Users
2. Neighbours
3. Delfia Batavorum
4. Developer (Kondor Wessels Vastgoed - J. Versluis)
5. Project leader (G. van Beers)
6. Architect/Urban planner (Mei Architects & Planners - R. Grim)
7. Real Estate (TU Delft Campus - A. Hoftijzer & A. den Heijer)
8. Municipality Heritage Department (I. Rijneveld)
9. Researcher (Industrial heritage - T. Chatzi Rodopoulou)
10. Student housing (DUWO - H. Pluim & G. Mul)
11. Geogames (R. Berrutti)
12. Professor Management in Built Environment
13. (City) Architect
14. Sustainability (CE Delft - B. Schepers)
15. An architect & Delft Design

Figure 09. Figure and list of stakeholders (Tol, 2020).

2.2.2. QUESTIONS AND SUB-QUESTIONS

Therefore the main research question is:

How can a co-creation approach be applied for redesigning 20th century Industrial Heritage factories for adaptive reuse together with stakeholders?

This research question refers to co-creation design and decision-making. To answer this research question the following sub-questions have been formulated referring to the other themes of the 'Heritage4all' graduation studio:

How can heritage games support the value assessment of stakeholders for the redesign of the Kabelfabriek II in Delft? (Digital heritage)

What design relation with the TU Delft Campus and the city of Delft could be supported by the Kabelfabriek II? (Univer-Cities)

How to redesign Kabelfabriek II Delft on sustainable attributes while preserving cultural values? (Sustainability)
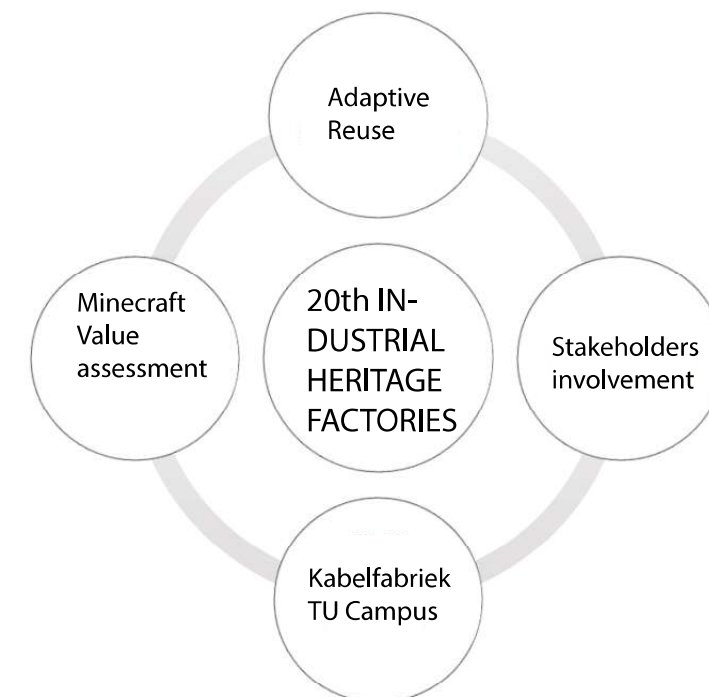

Figure 10. Topics of this research. (Tol, 2020).

2.2.3. AIMS AND GOALS

The aim of this research is to develop a co-creation design and decision-making approach for redeveloping industrial heritage with the involvement of stakeholders. In order to do this, a literature review is done to identify previous methods and tools for adaptive reuse and use them as basis to frame

the methodology of this research.

A goal of this research is to explore Minecraft as a simulation tool for involving stakeholders in co-creation workshops. One of the expected outcomes of such method is to understand and decode citizen's needs, wishes, visions and decode them in a structured value assessment matrix (Pereira Roders & Tarrafa Silva, 2012) (Kuipers & Jonge, 2017). Another goal is to organize an overview of sustainable design solutions for 20th century industrial heritage based on literature review, case studies review of Chatzi Rodopoulou (2020), interview with Benno Schepers and an investigation on reference projects. A specific interest is directed to the concept of sustainability in Univer-Cities, which defines the last goal related to investigating how the TU Delft Campus and the city Delft can replenish each other.

The relevance of this research lies in the fact that there is still a challenge on how to deal with vacant and obsolete industrial buildings. Heritage that can be considered as crystallized memories of the past or the embodiment of memory should not be demolished, because it is not sustainable in terms of energy and material use, but also in terms of preserving cultural heritage, whether it is listed or not.
The search in literature revealed that the involvement of stakeholders is of paramount importance, however in most articles the methods and tools in which stakeholders are involved is not highlighted or explained properly (Bottero, D'Alpaos, & Oppio, 2019) (Canevaro et al., 2019) (Ifko, 2016) (Loures, 2008) (Morkunaite, Kalibatas, & Kalibatiene, 2019) (Plevoets & Van Cleempoel, 2011) (Villacampa & Poli, 2013). An interesting experiment was conducted by Dr. de Andrade, Poplin and Sousa de Sena (2020) which clearly shows that the use of Minecraft leads to civic engagement, in this specific article children.

2.2.4. EXPECTED RESULTS

The expected results can be divided into main research question and three sub questions.

How can heritage games support the value assessment of stakeholders for the redesign of the Kabelfabriek II in Delft? (Digital heritage)
Expected is that the simulation tool Minecraft can be of great help, especially in the future. The fact that the older generation finds it harder to work digitally, will probably cause a barrier.

How to redesign Kabelfabriek II Delft on sustainable attributes while preserving cultural values? (Sustainability)
The expected result for this sub question is an overview of sustainable design solutions. This overview will among others probably consist of common and well-known sustainable solutions as solar panels and insulation. Additionally less-known solutions will replenish this overview for future use.

What design relation with the TU Delft Campus and the city of Delft could be

supported by the Kabelfabriek II? (Univer-Cities)
An expected result as a design relation is the program of student housing and other functions for the Kabelfabriek II.

How can a co-creation approach be applied for redesigning 20th century Industrial Heritage factories for adaptive reuse together with stakeholders?
The expected outcome is that there are many ways of redesigning 20th century industrial heritage factories and many methods to involve stakeholders. However doing interviews and organising workshops together with stakeholders to come to a value assessment in order to use that as the starting point of the redesign, should create a social inclusive redesign project. This in combination with the sustainable design solutions overview should follow into a successful adaptive reuse project.

2.2. RESEARCH METHODOLOGY

Different architectural research approaches are applicable for this research. The research approach is a combination of historical, qualitative, simulation and case studies. This research is related to the following epistemes: praxeology and ecology (Groat and Wang, 2013). Praxeology is related to Simulation due to engaging stakeholders in a purposeful behaviour on co-creation design and decision-making on the Minecraft game. Ecology is related to the application of interviews, questionnaires and case studies in order to capture the diversity of ideas, opinions and values of stakeholders".
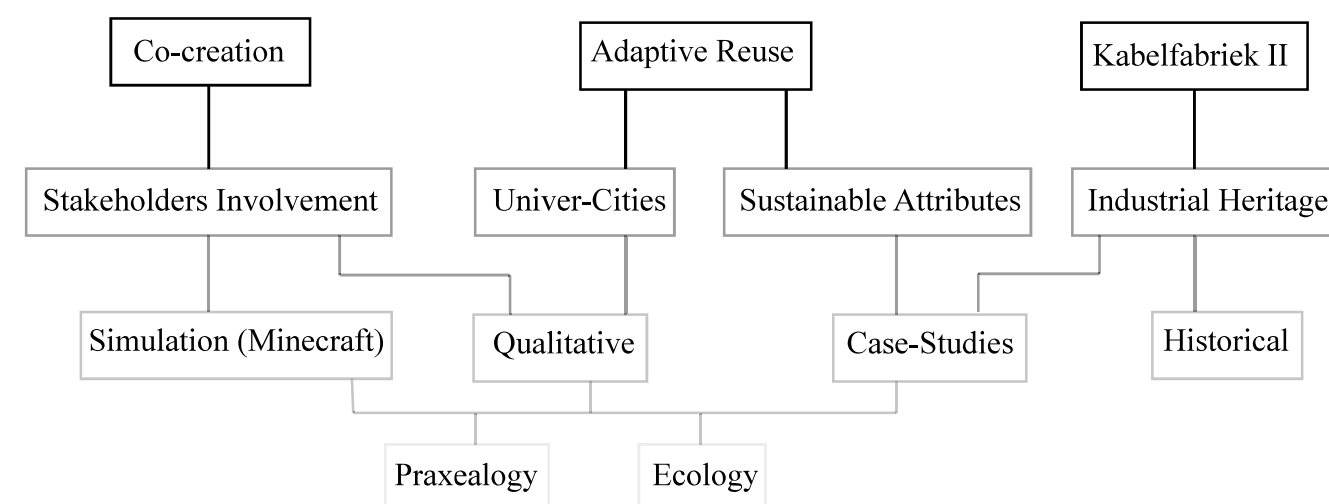

Figure 11. Scheme of the research topics, approaches and epistemes (Tol, 2020).

2.2.1. THEORETICAL FRAMEWORK

This chapter explains the key concepts, which are of importance to this research, and their related theory.

Industrial heritage
In her PhD, 'Control Shift - European Industrial Heritage Reuse in Review', Theodora Chatzi Rodopoulou (2020) defines the concept of industrial heritage

as follows:

> The Industrial Heritage consists of sites, structures, complexes, areas and landscapes as well as the related machinery, objects or documents that provide evidence of past or ongoing industrial processes of production, the extraction of raw materials, their transformation into goods, and the related energy and transport infrastructures. Industrial Heritage reflects the profound connection between the cultural and natural environment, as industrial processes - whether ancient or modern - depend on natural sources of raw materials, energy and transportation networks to produce and distribute products to broader markets. It includes both material assets - immovable and movable -, and intangible dimensions such as technical know-how, the organization of work and workers, and the complex social and cultural legacy that shaped the life of communities and brought major organizational changes to entire societies and the world in general. (Chatzi Rodopoulou, T., 2020)

The Kabelfabriek II is part of the industrial heritage area called the Kabeldistrict. In this research the area of the Kabeldistrict will be taken into account. However the focus lies on the object, the Kabelfabriek II.

Adaptive reuse (design strategy)

Several scholars have studied the design strategy of adaptive reuse. The best known scholars in this respect are Eugène Emmanuel Viollet-le-Duc (1814-1879), John Ruskin (1819-1900), William Morris (1834-1896) and Alois Riegl (1858-1905). Viollet-le-Duc was one of the first to acknowledge the potential for adaptive reuse as a strategy to preserve heritage. He stated that the best manner of preservation is finding a new use and adapting the building to the new use in such a way that there is no more need for future adjustments. On the other hand Ruskin and Morris argued against restoration in favor of regular maintenance to preserve heritage. (Plevoets & Van Cleempoel, 2011, p. 156) Riegl added another important feature to this discussion. This important feature is explained in the book 'Designing from Heritage' by Marieke Kuipers and Wessel de Jonge (2017, pp. 68) as a 'dialectic system of essential heritage values'. This will be explained under the subheading 'Value assessment'.

The definition given in the Charter for the Conservation of Places of Cultural Heritage Value is the most concise and therefore best suited for understanding adaptive reuse:
"Adaptation means the process(es) of modifying a place for a compatible use while retaining its cultural heritage value. Adaptation processes include alteration and addition." (ICOMOS NEW ZEALAND, 2010)

Method

The main research question looks at developing an approach for such adaptive reuse strategy. An approach, in this case co-creation, encompasses a direction in which a methodology will be developed as a well-thought-out manner of implementing architectural research. The product of this research therefore will be a methodology, described as a set of methods and tools, to deal with adaptive reuse for 20th century industrial heritage factories. A test is made at the Kabelfabriek II in Delft.

Since for this research only a limited amount of time was available, the dissertation for the doctorate of Chatzi Rodopoulou (2012), titled "European Industrial Heritage Reuse in Review" was chosen, in which Rodopoulou also uses the Delphi Technique. "The Delphi method is a common method to collect the consensus of opinions. Influencing factors can be obtained according to the established processes." (Dong, Liu, Wang, & Zhang, 2019)

Values assessment

The Heritage & Architecture Department of the Technical University of Delft set up a valuation tool by way of a matrix. The horizontal axis represents the six layers of Brand, with three more layers added by the H&A Department. The vertical axis represents the heritage values set up by Riegl, with two more values added by the H&A Department. Kuipers and de Jonge (2017, p. 68) state the following:

> "By filling the boxes of this matrix where relevant with text and images, and leaving non-relevant relationships blank, values are identified and related to tangible and intangible layers. This identification and revealed relationships, once established, become the basis for further understanding the value of a built heritage resource." (Kuipers & De Jonge, 2017, p. 68)

BRAND +	RIEGL +	AGE value	HISTORICAL value	INTENTINAL COMMEMORATIVE value	NON INTENDED COMMEMORATIVE value	USE value	NEW-NESS value	(relative) ART value	RARITY value [+]	OTHER relevant values [+]
SURROUNDINGS / SETTING [+]										
SITE										
SKIN (exterior)										
STRUCTURE										
SPACE PLAN										
SURFACES (interior) [+]										
SERVICES										
STUFF										
SPIRIT of PLACE [+]										

Figure 12. Value matrix (Kuipers & de Jonge, 2017, p. 69).

Pereira Roders and Tarrafa Silva (2012) describe in their paper "Cultural Heritage Management and Heritage (Impact) Assessments" "a new method to assess the significance of cultural heritage assets." Three stages are explained together with a newly made matrix on cultural values.

	Secondary Values	References
Social	Spiritual	beliefs, myths, religions (organized or not), legends, stories, testimonial of past generations;
Social	Emotional, individual	memory and personal life experiences;
Social	Emotional, collective	notions related with cultural identity, motivation and pride, sense of "place attachment" and communal value.
Social	Allegorical	objects/places representative of some social hierarchy/status;
Economic	Use	the function and utility of the asset, original or attributed;
Economic	Non-use	the asset's expired function, which has it value on the past, and should be remained by its existence (of materials), option (to make some use of it or not) and bequest value (for future generations);
Economic	Entertainment	the role that might be have for contemporaneous market, mainly for tourism industry;
Economic	Allegorical	oriented to publicizing financially property;
Political	Educational	the education role that heritage assets may play, using it for political targets (e. g. birth-nations myths, glorification of political leaders, etc.);
Political	Management	made part of strategies and policies (past or present);
Political	Entertainment	it is part of strategies for dissemination of cultural awareness, explored for political targets;
Political	Symbolic	emblematic, power, authority and prosperous perceptions stem from the heritage asset;
Historic	Educational	heritage asset as a potential to gain knowledge about the past in the future through;
Historic	Historic-artistic	quality of an object to be part of a few or unique testimonial of historic stylistic or artistic movements, which are now part of the history;
Historic	Historic-conceptual	quality of an object to be part of a few or unique testimonial that retains conceptual signs (architectural, urban planning, etc.), which are now part of history;
Historic	Symbolic	fact that the object has been part/related with an important event in the past;
Historic	Archaeological	connected with Ancient civilizations;
Aesthetical	Artistic	original product of creativity and imagination;
Aesthetical	Notable	product of a creator, holding his signature;
Aesthetical	Conceptual	integral materialization of conceptual intentions (imply a conceptual background);
Aesthetical	Evidential	authentic exemplar of a decade, part of the History of Art or Architecture;
Scientific	Workmanship	original result of human labour, craftsmanship;
Scientific	Technological	skillfulness on techniques and materials, representing an outstanding quality of work;
Scientific	Conceptual	integral materialization of conceptual intentions (imply a conceptual background);
Age	Workmanship	craftsmanship value oriented towards the production period;
Age	Maturity	piece of memory, reflecting the passage/lives of past generations;
Age	Existential	marks of the time passage (patine) presents on the forms, components and materials;
Ecological	Spiritual	harmony between the building and its environment (natural and artificial);
Ecological	Essential	identification of ecological ideologies on its design and construction;
Ecological	Existential	manufactured resources which can either be reused, reprocessed or recycled;

Primary values

Figure 13. The cultural values (Pereira Roders & Tarrafa Silva, 2012).

Stakeholders
Stakeholders, the group of people who are in some way connected to the project, should consist of both people who are educated in the built environment and people who are not.

Digital heritage
The fourth research theme of the graduation studio chosen is Digital Heritage. It does not only refer to computer-based information that has lasting values for contemporary and the future society (e.g. pictures, movies, figures, websites), but particularly digital games are addressed in this research (UNESCO, 2009). For this research Minecraft is the heritage game, used as a simulation tool to get to the value assessment together with stakeholders and Pokémon Go is used for field-work.

Sustainability
Sustainability has been a hot topic during the past thirty years. It has a broad meaning and therefore the Universal Declaration on Cultural Diversity divided it into "four pillars: economic prosperity, cultural vitality, social equity and environmental sustainability." (UNESCO, 2001) For the second sub research question (How to redesign Kabelfabriek II Delft on sustainable attributes while preserving cultural values?) case studies are investigated to create a list of design solutions looking at environmental sustainability, for example systems to control the climate in the building or layers to be added for insulation. Concluding, the focus of this research with regard to sustainability lies in energy efficiency and social inclusivity.
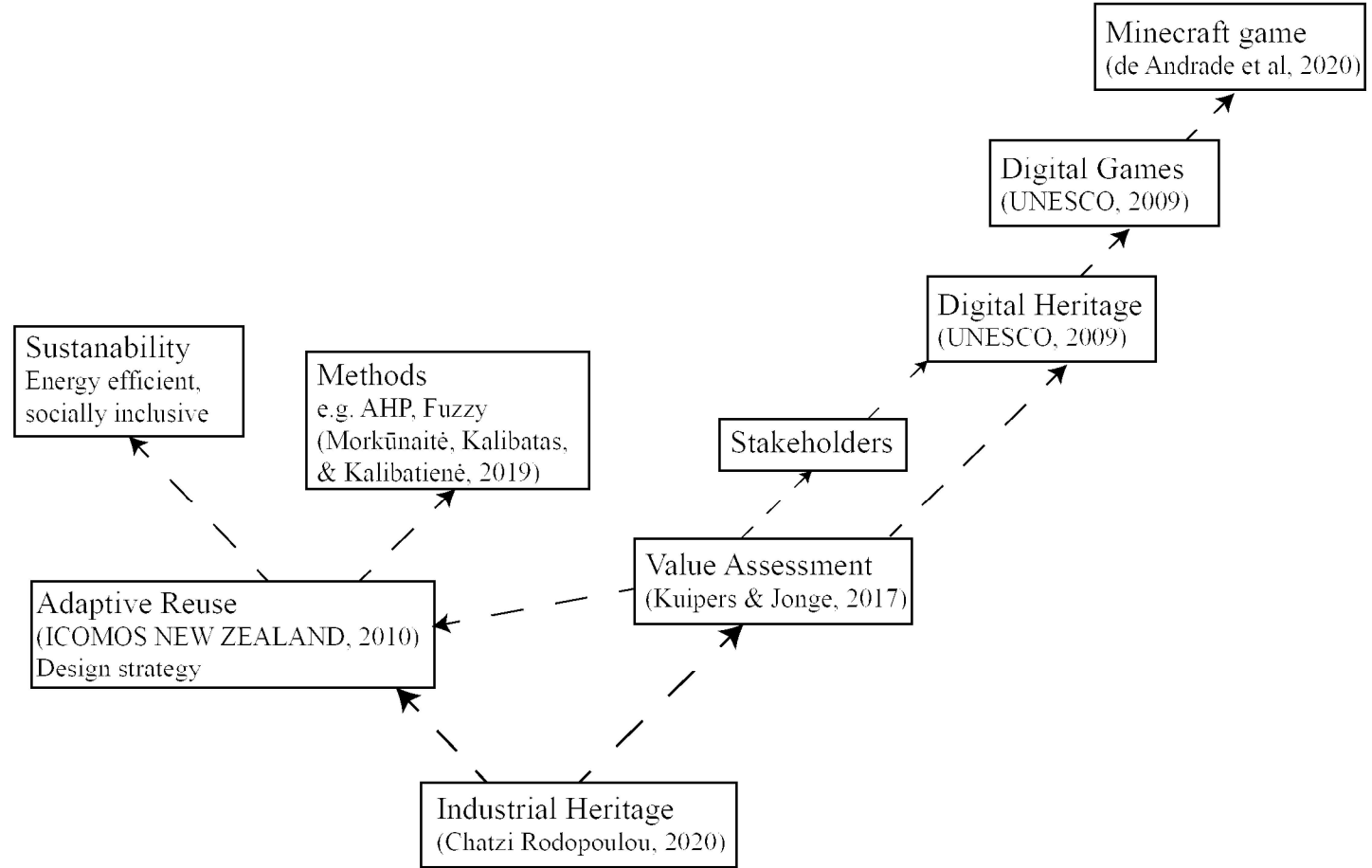
Figure 14. Diagram of the related theories (Tol, 2020).

2.2.2. METHODS AND TOOLS

Various methods are applied for the earlier mentioned research approaches. The historical approach consists of analysing the historic evolution of the Kabelfabriek II and surroundings through collecting data in (digital) archives. For the qualitative approach a simulation game and surveys, including interviews, are applied. Through digital gaming models the simulation approach is applicable. The Kabelfabriek II is used as the main case study to answer the different research questions. Besides, other architectural industrial heritage buildings are analysed to answer the second sub-question about sustainable design solutions. Furthermore, literature review is done to analyse all the different methods for redesigning industrial heritage.

The sequence of steps are taken:

Research Plan (draft)	week 42
Research Plan (final)	week 43 (P1)
Historical & Site analyses	week 42-45
Literature review on different methods	week 42-48
Stakeholders' involvement	week 42-49
Case studies sustainable design solutions	week 48-49
Research paper (draft)	week 46-50
Research paper (final)	week 50-02 (P2)

Industrial Heritage

To analyse the Kabelfabriek II field-work is done. Pokémon GO, an augmented reality mobile game, is used to explore the existing values and attributes of the building and site in a different way. This approach to fieldwork is aligned with the Theory of the Derive to ensure that the site visit is guided not by visuals but by the gaming mechanics, making it a spontaneous, surprising, neutral and smooth site visit (Debord, 1958). Archives and libraries are visited to collect data for the historical evolution analyses. Besides, desk research about the Kabelfabriek II is conducted in consonance with expert interviews. For example an interview with Ilse Rijneveld, monument advisor

at the municipality of Delft and an interview with Theodora Chatzi Rodopoulou about the reuse of industrial heritage.

Stakeholders involvement & Univer-Cities

For the stakeholders' involvement Minecraft is used as a medium to interact and to find out the needs of the people and what they value. To be able to properly use Minecraft as a simulation tool to communicate with the stakeholders, it is necessary to follow training sessions. These sessions consists of testing the Minecraft game tool for the co-creation design workshop. The first training was a session with two tutors and three architecture master students. The aim of the session was to get the know the game Minecraft and how to use the different tools in the game. At the end of the session a role play game was set up in order to practice and see how it works for the final workshop. The following step was a Minecraft workshop organised by Bruno de Andrade for the minor course, Minor Heritage & Design - Architecture and Re-use, of the architecture bachelor students of the TU Delft. The students were asked to make an intervention on the basis of their role as a represented stakeholder. For this workshop a different environment, then the final one, in the game was used. Orsanmichele, in the city of Florence, was the case study. The redesign of the students had to be presented together with a values matrix (Pereira Roders & Tarrafa, 2012). Due to this the intervention made was a values-based design. Interesting to note are the elaborated and well detailed models that were made by the students since some of them already had experience with the game Minecraft.

Hereafter the Kabelfabriek II was put into Minecraft for the trial workshop with three architecture master students. Two other All three of these student did not have any experience with Minecraft. During the trial workshop they explored the game. Subsequently an assignment to make an intervention on the skin, surrounding and interior was given by means of their represented stakeholders role. Two of the three students created their ideas in Minecraft. The other student used Minecraft as a visualising tool and used the given tracing paper and floor plan for her design ideas. The last assignment of this
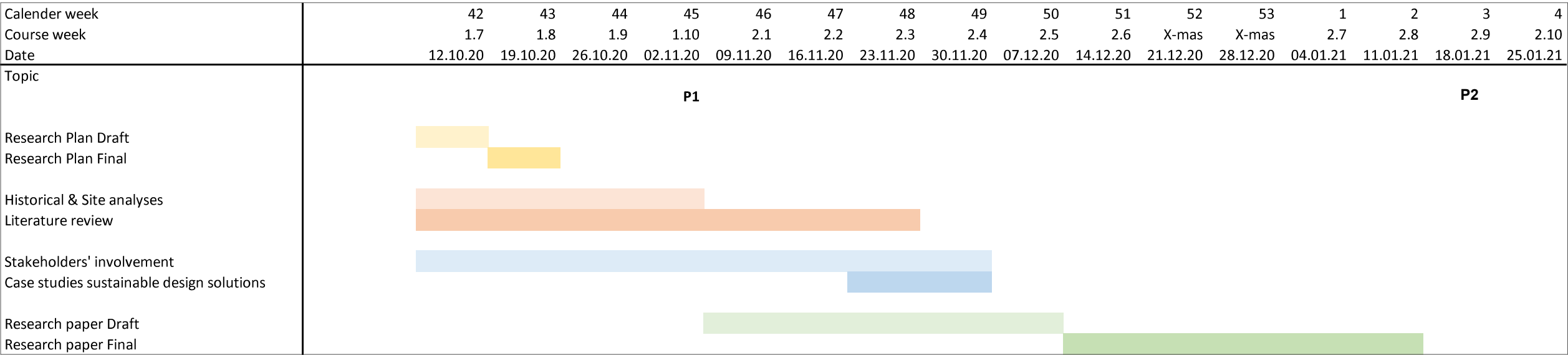
Calender week	42	43	44	45	46	47	48	49	50	51	52	53	1	2	3	4
Course week	1.7	1.8	1.9	1.10	2.1	2.2	2.3	2.4	2.5	2.6	X-mas	X-mas	2.7	2.8	2.9	2.10
Date	12.10.20	19.10.20	26.10.20	02.11.20	09.11.20	16.11.20	23.11.20	30.11.20	07.12.20	14.12.20	21.12.20	28.12.20	04.01.21	11.01.21	18.01.21	25.01.21

Figure 15. Timetable for the research (Tol, 2020).

trial workshop was a values based assignment, where the students needed to put coloured blocks on the attributes in the Minecraft model. The different colours used were: Red - demolish, orange - adapt and green - preserve. In this way a values and attributes assessment could be obtained out of the game Minecraft. Furthermore needs to be mentioned that the trial workshops and final workshops of two other master students, Diana Ugnat and Mick Bloemendal of the studio "Heritage4all" with the same graduation assignment with other case studies, are attended and assisted in facilitating their workshops. Lessons of all these training sessions and workshops were adopted into the final workshop with the real stakeholders of the Kabelfabriek II. The structure and results of this workshop can be read in chapter 4 "Digital heritage & Co-creation".

Other than Minecraft workshops interviews are done to involve stakeholders. One group of these stakeholders are the people not educated in the built environment. The other group, educated in the built environment, are called experts. Both groups are invited to the final workshop. An example of an expert interview is the one with Anne-Lize Hoftijzer, who is Manager Real Estate Development of the Technical University Delft to find out the relation between the Kabelfabriek II and the TU Campus and how they can reinforce each other.
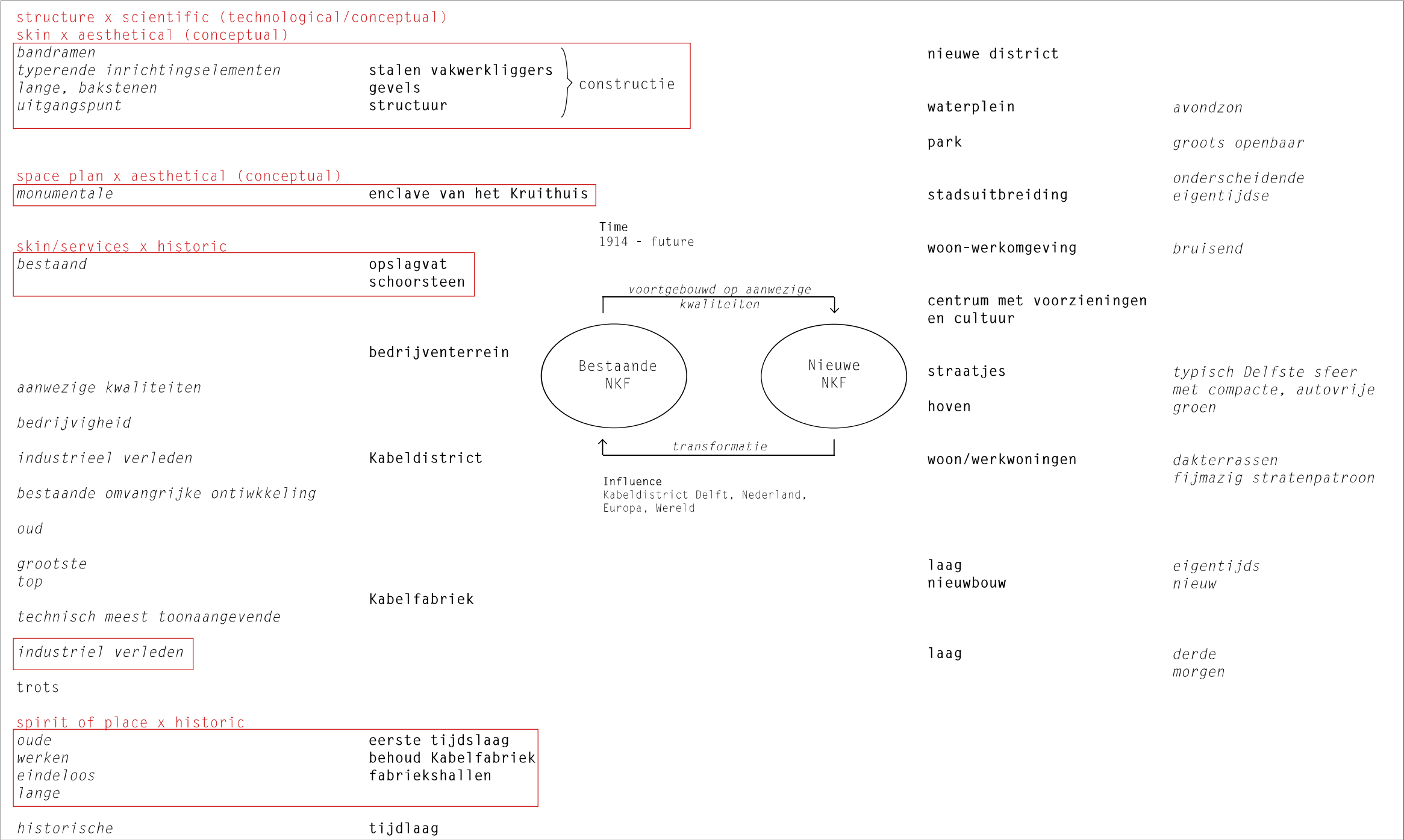
Figure 16. Indicators obtained from values and attributes assessment from report Mei Architects and Planners (Tol, 2020).

Furthermore, an interview with developers of the Kabeldistrict Amvest and Kondor Wessels Vastgoed and an interview with Georges van Beers, project leader of the Kabeldistrict, is done. A non expert interview is for example an interview with the former and current inhabitant of the Kruithuis, a monument next to the Kabelfabriek II. The interview protocol and transcripts can be read the chapter 8 "Appendix". The process of involving the stakeholders, civic engagement, can be read in the sub chapter 4.2. "Civic engagement".

During the workshop a 'Values & Attributes' survey, see chapter 8 "Annex", is given to the stakeholders as a supportive tool to get to a values and attributes assessment of the stakeholders. The outcome of this workshop and the survey is discussed in chapter 4 "Digital heritage & Co-creation". The 'Values & Attributes' survey is mainly based on the outcome of value and attributes assessment by the author. The method of Pereira Roders and Tarrafa Silva (2012) is chosen to get to a values and attributes assessment and to select attributes for the survey. Concluding can be stated that the Kabelfabriek II has many attributes with various values which contribute to the fact that the Kabelfabriek II is heritage even though it is not listed as a monument. As the figure on the previous page makes clear, different indicators (value x attribute) are present in the Kabelfabriek II. The following indicators were obtained from the report of Mei Architects and Planners and are marked in red.

The values and attributes assessment done by the author is based on available sources (e.g. report of Mei Architects and Planners and previous graduation papers). These reports and pictures are being coded as described by Pereira Roders and Tarrafa Silva (2012). Important to mention is that the report of the city archive Delft, see below, shows that not much investigation has been done on the Kabelfabriek II in Delft. This is confirmed by Ilse Rijneveld, monument advisor at the municipality of Delft. The only description is the document below, which states the following:

"Complicated files, many rebuildings. The Nederlandsche Kabelfabriek were founded in 1914. The main office was built in 1918. Between 1949 en 1952 a completely new factory was realised." (City Archives Delft, n.d.)

Therefore the values and attributes assessment of the author is based on only a few available resources.

As mentioned before, the attributes emerged from the assessment are being used for the 'Values & Attributes' survey. Next to these attributes, other attributes were added in the survey to investigate if they are valued by others, since they were not obtained from the available resources.

NUMMER:	SCH11	SCH11
WIJK:	Bedrijventerrein Schieoevers	
NAAM:	Bedrijfscomplex NKF	
ADRES:	Schieweg 15	
POSTCODE:	2627 AN	
OORSPRONKELIJKE NAAM:	Bedrijfscomplex NKF	
HUIDIGE NAAM:	Kantoorgebouw Pirelli	
OORSPRONKELIJKE FUNCTIE:	bedrijfsgebouw - categorie RDZM: XIV-1	
HUIDIGE FUNCTIE:	bedrijfsgebouw	
ARCHITECT:	onbekend (complex bouwdossier) mogelijk bouwbureau NKF of Lucas & Niemeijer	
MEDEWERKERS:		
BOUWJAAR:	1949 - 1952	
OPDRACHTGEVER:	NKF	
STAAT:	diverse malen uitgebreid	
BOUWAANVRAAG:	14759-14773	
GOEDKEURING:		
GEVELS:	metselwerk	
VENSTERS / DEUREN:	stalen kozijnen	
DAKVORM:	plat	
CONSTRUCTIE:	staalconstructie	

BESCHRIJVING:
Ingewikkelde dossiers, vele verbouwingen.
De Nederlandsche Kabelfabrieken NKF zijn in 1914 opgericht. In 1918 werd het hoofdkantoor gebouwd.
Tussen 1949 en 1952 werd een compleet nieuwe fabriek gerealiseerd.

WAARDERING:
• Standaard architectonische kwaliteit.

LITERATUUR:

Sustainable attributes
To create an overview of sustainable design solutions different case studies are looked at. The PhD thesis, entitled 'Control Shift – European Industrial Heritage Reuse in Review', of Theodora Chatzi Rodopoulou (2020) is analysed as some relevant case studies are selected to integrate this research as good design practices.

Furthermore expert interviews are done. For example an interview with Theodora Chatzi Rodopoulou, who obtained her PHD on a review on reuse of European industrial heritage. Moreover, Benno Schepers of CE Delft, senior researcher/ advisor and leader of the sector sustainable cities is interviewed. The sustainable design solutions extracted from this interview are presented in chapter 5 'Design strategy'. In addition to this, well succeeded reference projects in terms of sustainability mentioned by Benno Schepers, are investigated to create an overview on sustainable design solutions.

2.2.3. ETHICAL ISSUES AND RESEARCH INTEGRITY

As indicated in this chapter two "Research approach" this project involves working with human participants. We do not expect any potentially critical ethical implications of the research results. However, the Technical University of Delft and the graduation studio "Heritage4all" will comply with the European Legal Framework and will apply its ethical standards and guidelines. Moreover, the studio will comply to relevant EU legislation, including:
• The Declaration of Helsinki in its latest version;
• The charter of fundamental rights of the EU (2000/C 364/01);
• The principles enshrined in the Oviedo Bioethics Convention;

"Heritage4all" will comply with the countrywide Covid-19 regulations of the Netherlands in order to control the number of participants and make sure 1.5. metre social distancing is being respected in citizens engagement workshops. Personal data will not be disclosed and participants will be kept anonymous.

Protection of personal data
"Heritage4all" follows the Personal Research Data Workflow to comply with all requirements regarding data management, privacy and human research ethics. "Heritage4all" provides contact persons relevant for the research project, who can assist with advice and support. Participants will only be considered if there is consent to join the research activities, in compliance with the European Union's General Data Protection Regulation (GDPR) for the protection of personal data. Personal data will not be disclosed and participants will be kept anonymous.

Research integrity
"Heritage4all" complies with the new version of the Netherlands Code of Conduct for Research Integrity dated 1 October 2018, which includes five principles which form the basis of integrity in research: honesty, scrupulousness, transparency, independence and responsibility. "Heritage4all" will be responsible for providing a working environment that promotes and safeguards good research practices. In event of an investigation into alleged research misconduct, all relevant research and data will be made available for verification.
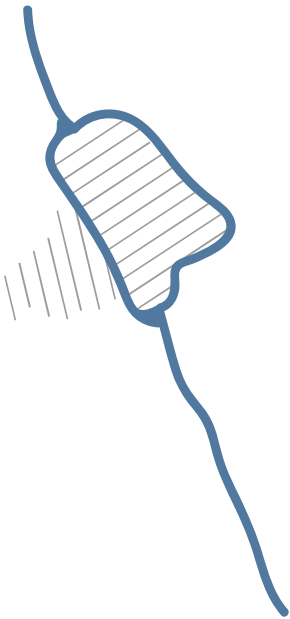
03 CASE STUDY

3.1. HISTORY
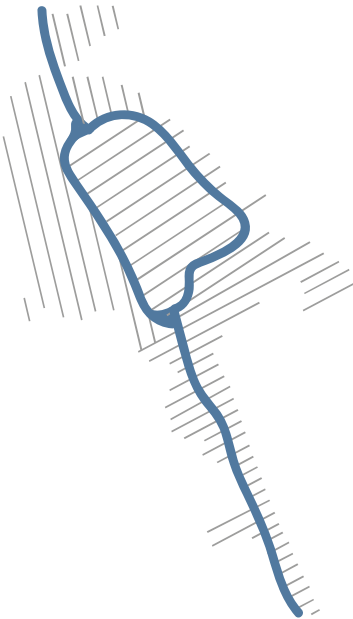
3.1.1. THE CITY OF DELFT

1850

The walled city Delft, is a small market city with a function for the agrarian area, with some factories like 'vijlenfabriek' and 'glazfabriek'. (Van Walsum, 2001)

1950

In 1950 the industry has recovered from the Second World War. Moreover, the 'Technische Hogeschool' has grown again. (Van Walsum, 2001)
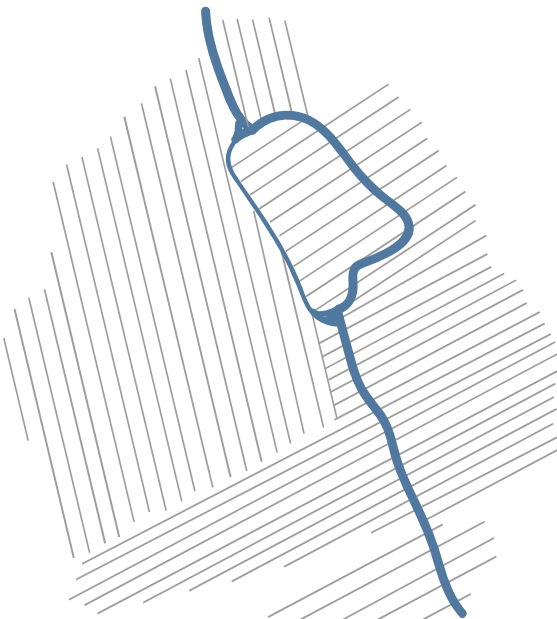
1900

Delft has become a real so called industrial city. The industry is mainly situated next to the canal Schie. Even the 'Polytechnische School' grew enormously. In 1905 the 'Polytechnische School' changed in the 'Technische Hogeschool'. (Van Walsum, 2001)
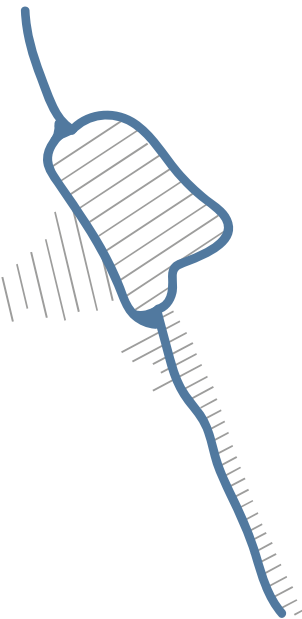
2000

Delft is no longer an industrial city and can be seen as a city of knowledge. The 'Technische Hogeschool' changed its name in 'Technische Universiteit'. The industry together with the university, and its predecessors, created the city Delft over the past two centuries. (Van Walsum, 2001)

3.1.2. TIMELINE

1949

Finish of the first part of the construction of Kabelfabriek II.

1958

Queen Juliana visits the NKF in Delft.

1913

C. von Lindern establishes a public limited company. Starting of the construction of the factory next to the Schie (canal) in Delft.

1936

NKF establishes a steal factory, Nedstaal, in Alblasserdam.

1952 & 1953

Finish of the second and third part of Kabelfabriek II.

The construction of the factory is finished and the company, NKF, is commissioned. Start of the first World War, which led to the fact that there was no more competition with the German cable factories. Therefore the start of the NKF was successful.

1914

Delft, a wealthy city because of its industry. NKF was one of the biggest factories. Other factories were: Gistfabriek, Calvé, Lijm & Gelantinefabriek et cetera. Technische Hogeschool, later on Technical University Delft, was the biggest employer of that time.

±1950

In the NKF in Delft a new department, 'Ontwikkeling en Onstpanning', has been established.

1946

Finish of the fourth part of the Kabelfabriek II.

1956

2002

Kabelfabriek II becomes obsolete, is bought by Van der Helm and being used for depository.
Van der Helm moves out and part of the factory is put for rent.
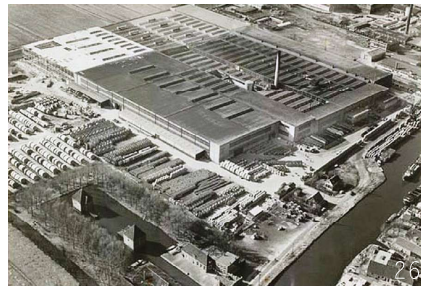
1962

Finish of the fifth part of the Kabelfabriek II. NKF moves from Delf to Waddinxveen.

1986

Philips pulls back, because of a stagnating market and another focuspoint NKF Groep falls apart.

1987

NKF becomes indepent.

1990

NKF becomes part of NOKIA.

2011

The enterpreneurs transform the factory as a workplace themselves.
NKF becomes part of Prysmian Cables and Systems.
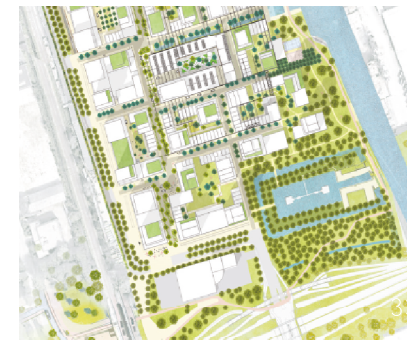
2017

Amvest and Kondor Wessels Vastgoed buy the Kabelfabriek II. Mei architects and planners gets the assignment to create a vision on the area and an urban plan.

NKF is at its best. It's one of the largest cable factories in the world.

1975

NKF is taken over by Pirelli.

2000

NKF becomes part of Draka Holding concern and only keeps the head office.

1999

More and more entrepeneurs are situated in the Kabelfabriek II. Cable reels are being made again in the old Kabelfabriek II for the new kabelfabriek.

2016

Prysmian Cables and Systems closes the factory in Amsterdam and moves its production to Delft.

2014

Voorlopig Stedenbouwkundig Plan, Temporary Urban Plan was completed together with the municipality of Delft, Mei architects and planners and other experts.

2019

Train station Delft Campus is finished. Philips is taking over the company. NKF-concern is changed in NKF Groep.

1970

Entrepeneurs move from the Spoorzone to Kabelfabriek II for a new workplace.

2009

1949

1953

1969

1974

1952

1962

1971
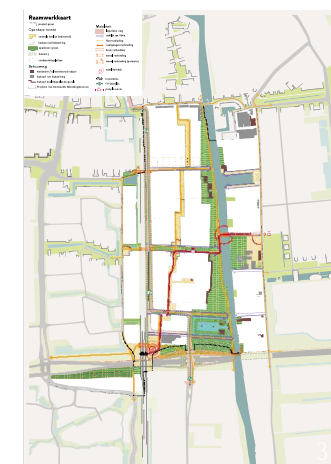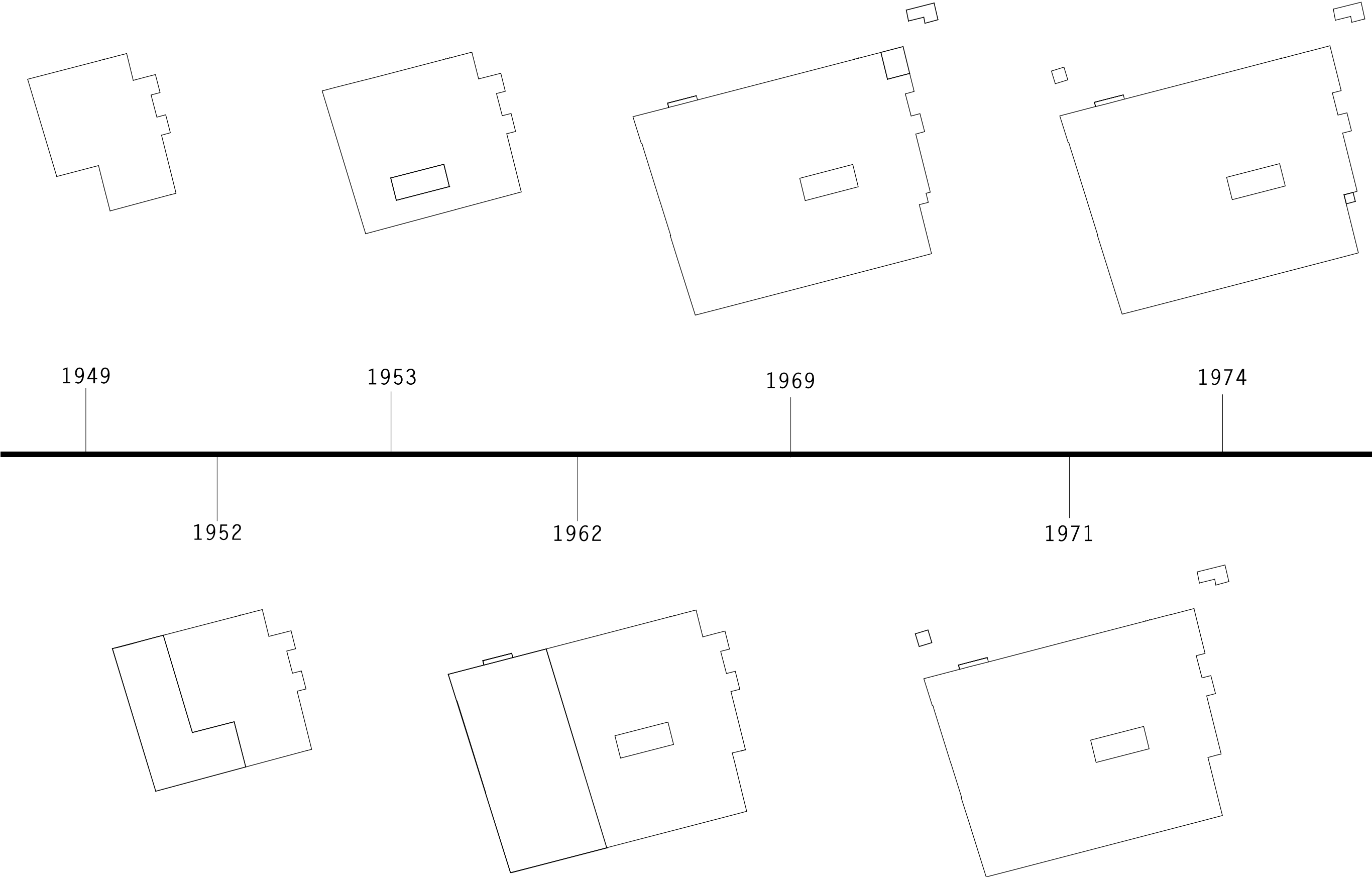
3.1.4 THE KABELFABRIEK II FUNCTIONS

This page and the previous page show the expansion of the Kabelfabriek II. One may wonder whether the entrance of the factory changed location. One might assume that extra entrances were added for different functions, but it is clear that the entrances already present did not change location since the functions stayed at the same location.

It is interesting to investigate the former façades whether they were kept as is and are now part of the interior walls.

1949   1952   1954   1962

Color	Function		Color	Function
■ Red	Offices and storages		■ Yellow	Expedition
■ Light blue	Production hall		■ Salmon	Boilerhouse and workspaces
■ Green	Laboratory		■ Pink	Lead processing
■ Dark brown	Transformer space		■ Dark blue	Storage
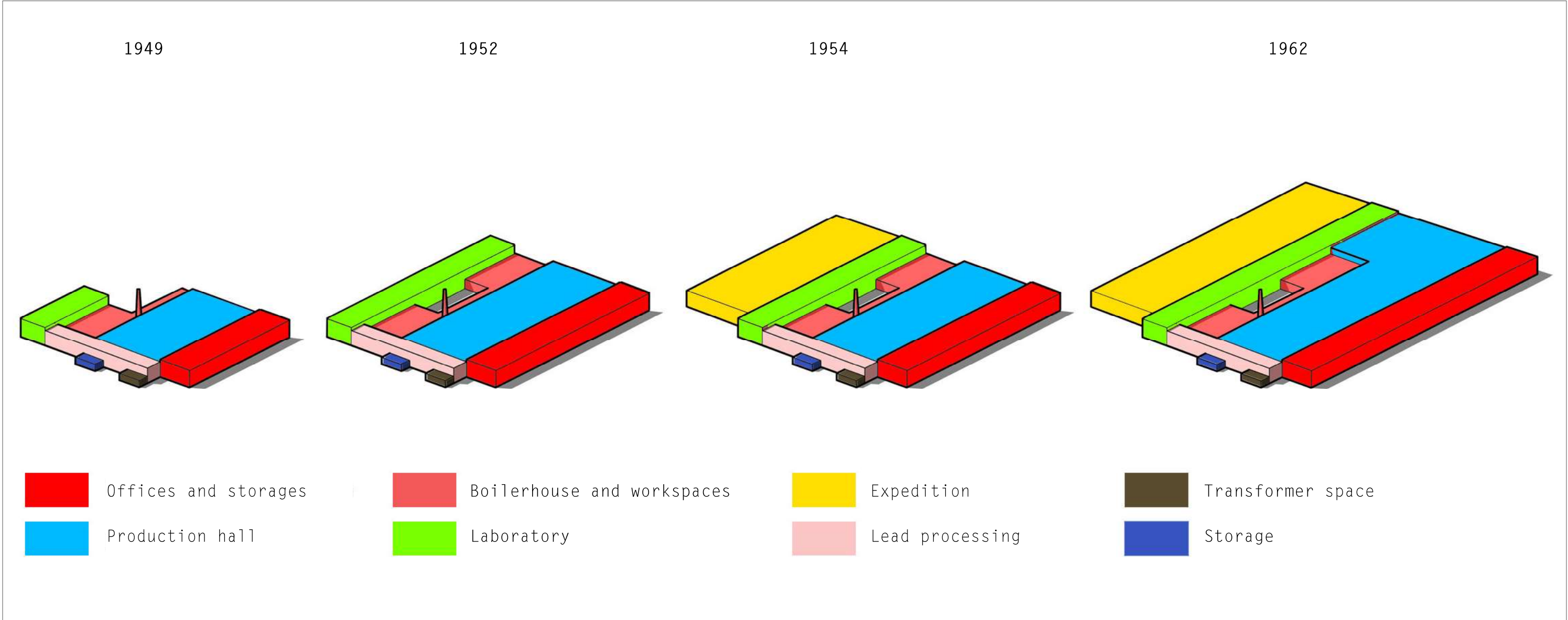
Figure 35. Historic evolution Kabelfabriek II functions (Van der Weijden, 2014)

3.2. THE URBAN CONTEXT

3.2.1. NEIGHBOURHOODS

When going from Delft station to the Kabelfabriek II you pass three different areas. First the historic city centre of Delft, then a residential neighbourhood, the "centrum schil", and then Schieoevers Noord. West of the Kabelfabriek II, next to the railways, the neighbourhood Voorhof is situated. Moreover, the canal Schie divides Schieoevers Noord into two separate worlds. On the east side of Schieoevers Noord the TU Campus of Delft is situated.
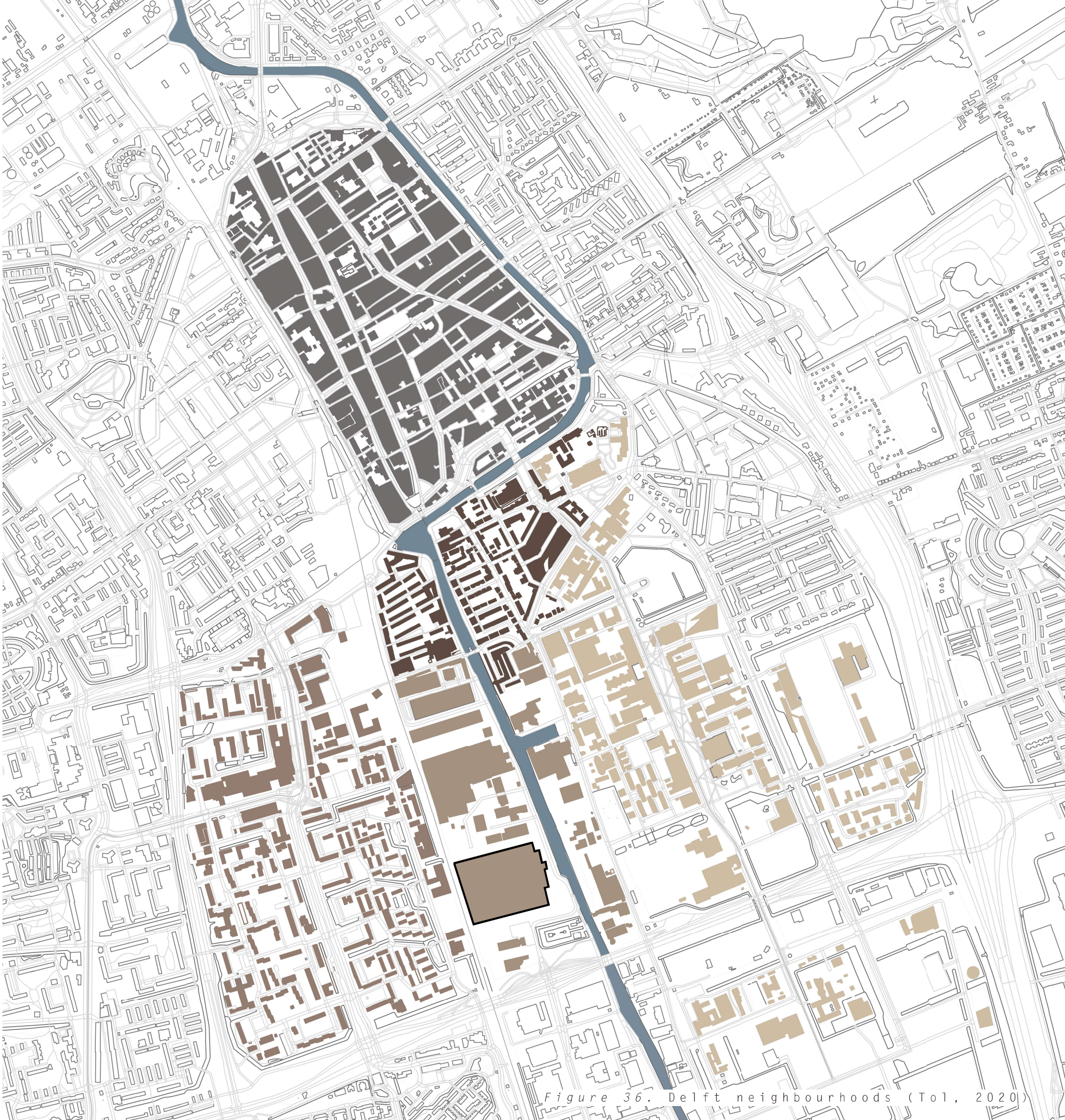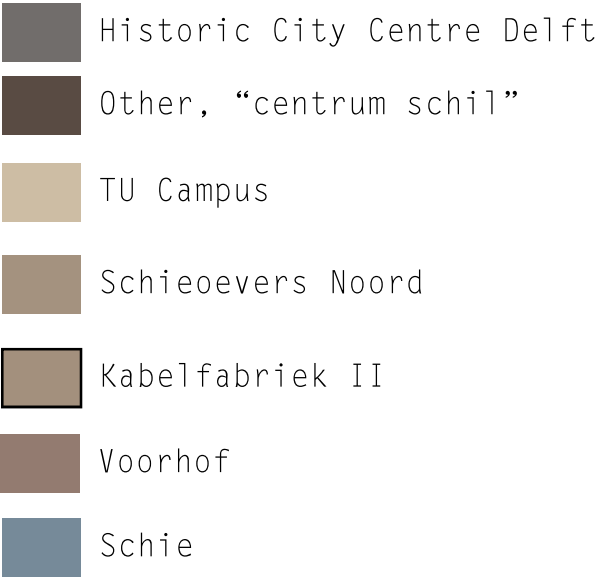
■	Historic City Centre Delft
■	Other, "centrum schil"
■	TU Campus
■	Schieoevers Noord
■	Kabelfabriek II
■	Voorhof
■	Schie

Figure 36. Delft neighbourhoods (Tol, 2020)

3.2.2. ENCLOSEMENT

The Kabeldistrict is enclosed by the canal
Schie, the busy road Kruithuisweg, the
railway, the Schieweg and the WEngelsestraat.
This creates the island feeling of the
district and is especially tangible where the
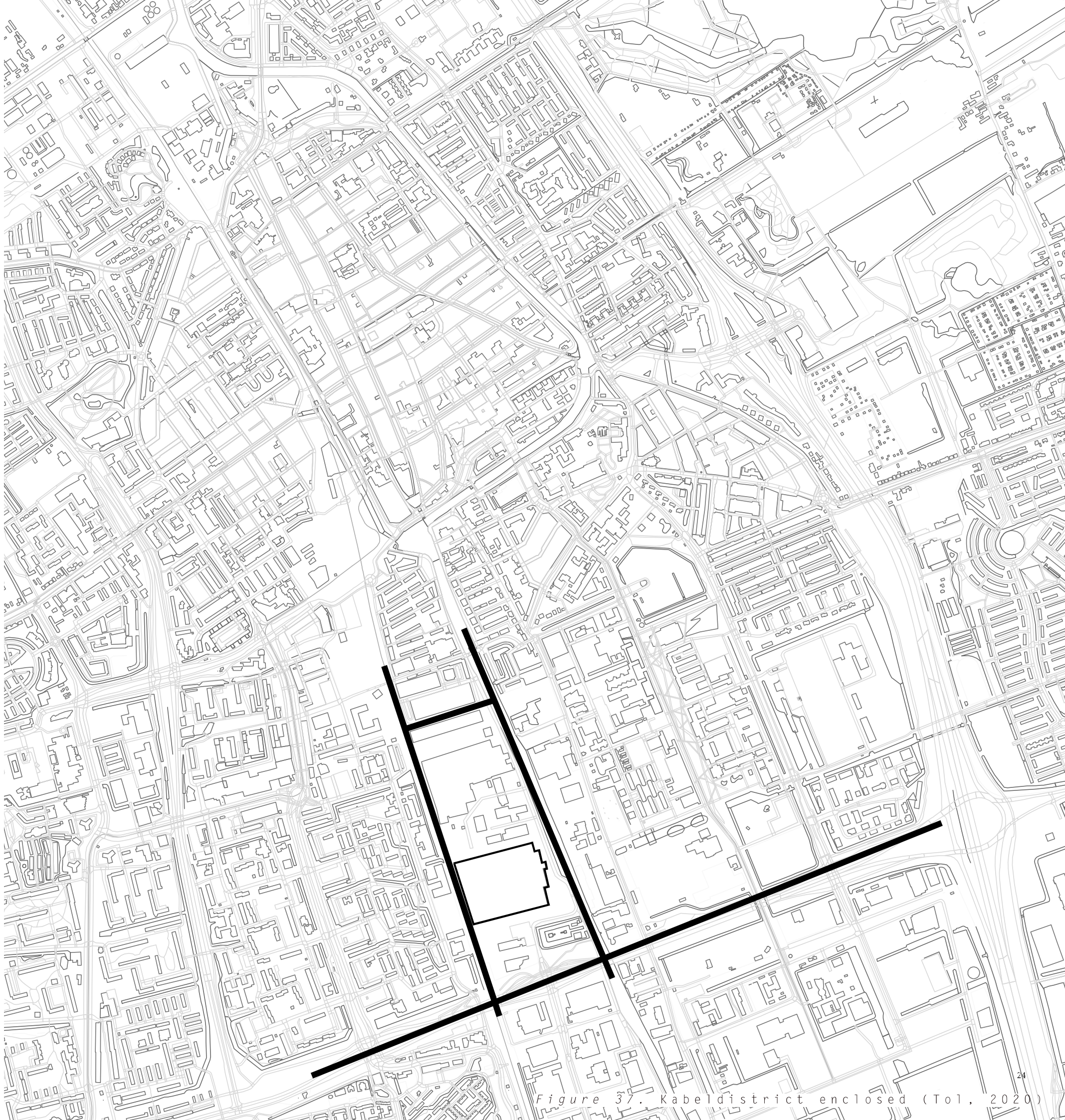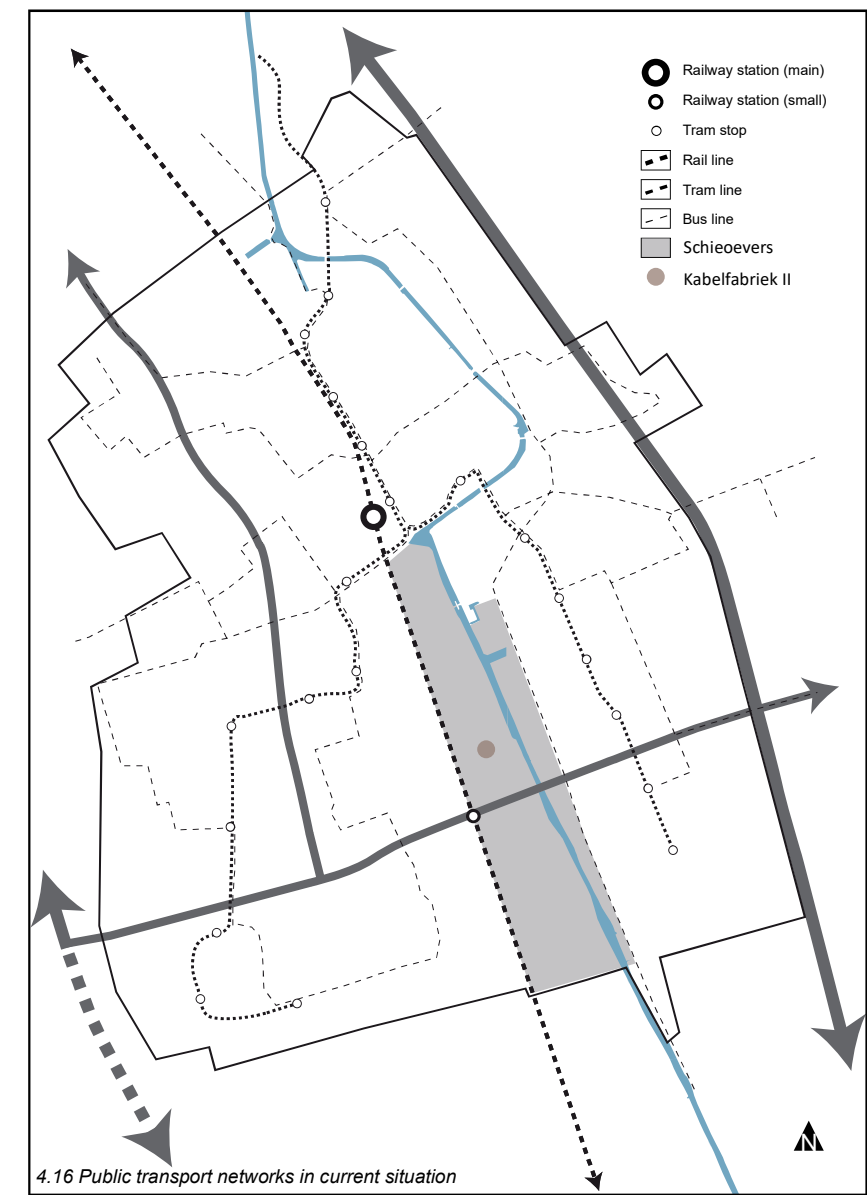Schieweg continues in the Engelstraat.
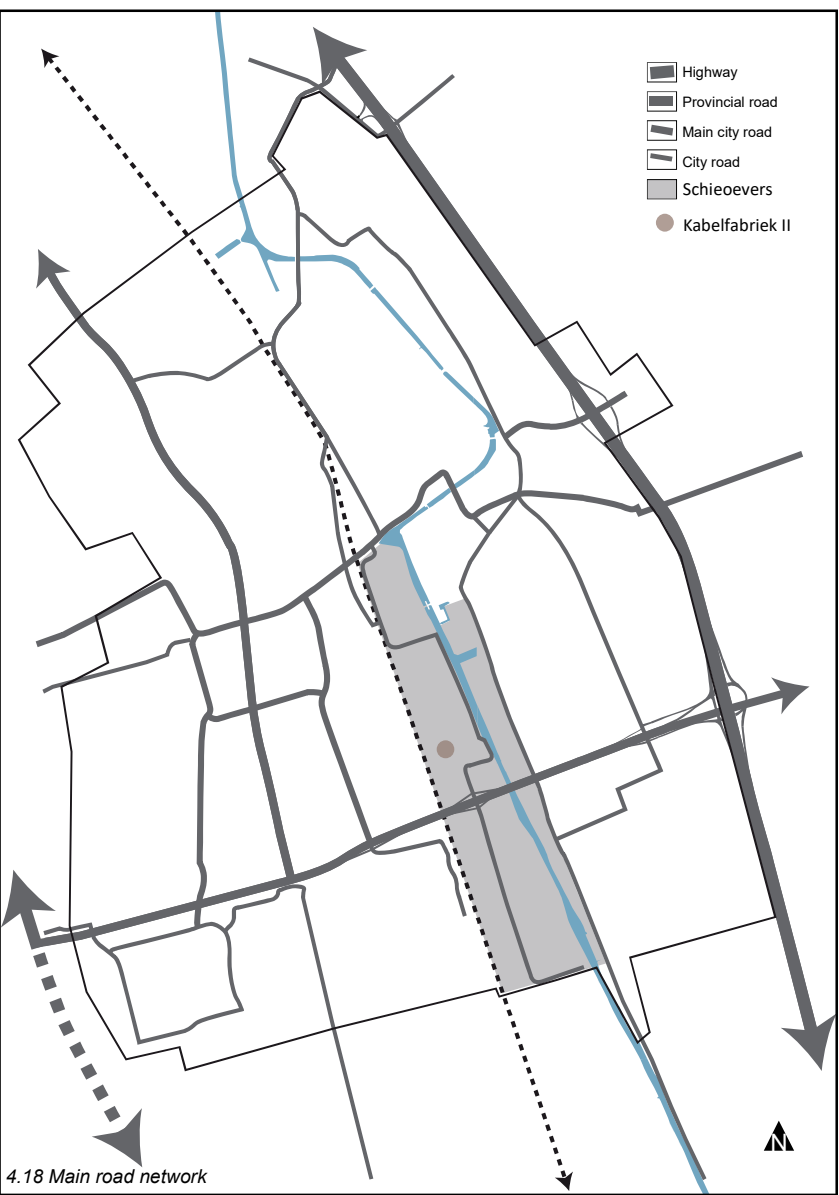
Figure 37. Kabeldistrict enclosed (Tol, 2020)

3.2.3. MOBILITY

This page shows the accessibility of among others Schieoevers Noord. As can be seen, the Kabelfabriek II is well accessible by car, motorcycle or bicycle and by public transport. The train station Delft campus is at walking distance. However a connection with the TU Delft Campus is currently missing, as well as a public transport connection (e.g. tram or bus) to the historic city centre.
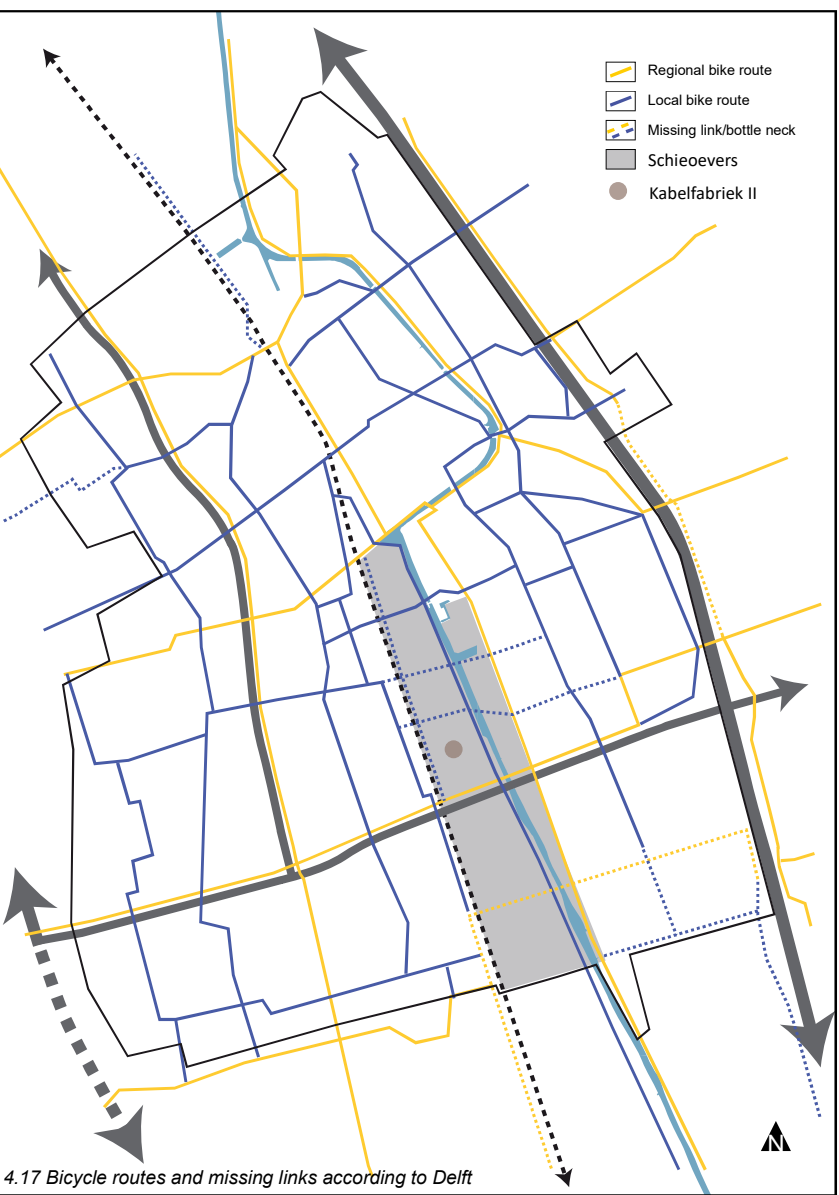
Public transport

Railway station (main)
Railway station (small)
Tram stop
Rail line
Tram line
Bus line
Schieoevers
Kabelfabriek II

4.16 Public transport networks in current situation

Road network

Highway
Provincial road
Main city road
City road
Schieoevers
Kabelfabriek II

4.18 Main road network

Cycling network

Regional bike route
Local bike route
Missing link/bottle neck
Schieoevers
Kabelfabriek II

4.17 Bicycle routes and missing links according to Delft

Figure 38. Accessibility (Kuipers, 2013)

Figure 39. Kabeldistrict 1:20000 (Tol, 2020)

3.2.5. MASTERPLAN KABELFABRIEK II WITH ITS ENVIRONMENT

The following pages show the surroundings of the Kabelfabriek II.

Figure 40. Environment Kabelfabriek II (Tol, 2020)

QR-code to a short film of the Kabelfabriek II.

Figure 41. Environment Kabelfabriek II (Google Earth, 2020)

VOORHOF

Voorhof is a residential neighbourhood. It was built in the sixties and it is known for its apartment buildings.

Figure 43. Voorhof Delft (Holland Luchtfoto, n.d.)

Figure 42. Environment Kabelfabriek II (Tol, 2020)

Figure 44. Voorhof Delft (Holland Luchtfoto, n.d.)

VOORHOF BUSINESS AREA

This area is part of the neighbourhood Voorhof. In this area various companies are located.

2

Figure 45. Environment Kabelfabriek II (Tol, 2020)

Figure 46. Voorhof Delft (Google maps, 2020)

Figure 47. Voorhof Delft (Google maps, 2020)

KABELFABRIEK I

The "Nederlandse Kabelfabriek" was originally located here. Nowadays the company called "Prysmian Cables and Systems B.V." is housed in the factory.

Figure 49. Prysmian Cables and Systems B.V. (Google maps, 2020)

Figure 48. Environment Kabelfabriek II (Tol, 2020)

Figure 50. Prysmian Cables and Systems B.V. (Google maps, 2020)

COMPANIES SCHIEOEVERS NOORD

At the moment various companies are situated at the north of the Kabelfabriek II.

Figure 52. Car company Schieoevers Noord (Google maps, 2020)

4

Figure 51. Environment Kabelfabriek II (Tol, 2020)

Figure 53. Praxis Bouwmarkt Delft (Google maps, 2020)

THE CANAL SCHIE

The Schie was canalized when the city of Delft was founded. Nowadays the Schie divides Schieoevers Noord into two areas. The Schie is used for cargo transport, recreation boats and rowing.

Figure 55. The canal Schie (Breuring, n.d.)

Figure 56.. The canal Schie (Gemeente Delft, n.d.)

Figure 54. Environment Kabelfabriek II (Tol, 2020)

LOADING BELLOWS

These loading bellows are still being used. They characterise the industrial neighbourhood Schieoevers Noord.

Figure 58. Loading bellows (Tol, 2020)

Figure 59. Loading bellows (Google maps, 2020)

Figure 57. Environment Kabelfabriek II (Tol, 2020)

LIJM & CULTUUR

Lijm & Cultuur, is the old Glue and Gelatine Factory, which was built in 1885. Nowadays in one part a restaurant is located. The other part is used for workshops and events.

Figure 61. Lijm & Cultuur (Erfgoed bekeken, n.d.)

Figure 60. Environment Kabelfabriek II (Tol, 2020)

Figure 62. Lijm & Cultuur (Holland.com, n.d.)

DYCKERHOFF BASAL BETONMORTEL DELFT

Dyckerhoff Basal Betonmortel is a Dutch company working with sand, gravel and concrete mortar.

Figure 64. Dyckerhoff Basal Betonmortel Delft (Bommele, 2019)

Figure 63. Environment Kabelfabriek II (Tol, 2020)

Figure 65. Dyckerhoff Basal Betonmortel Delft (Leeflang, 2019)

HET KRUITHUIS

"Het Kruithuis" is a former storehouse for gun powder. It was built in the 17th century after the "Delftse Donderslag", when the original storehouse located within the city walls exploded causing fires destroying half the city. It is surrounded by a two metres thick brick wall and it is accesible by boat or foot.

Figure 67. Het Kruithuis (Scoutcentrum Delft, Het Kruishuis,n.d)

Figure 66. Environment Kabelfabriek II (Tol, 2020)

Figure 68. Het Kruithuis (Scoutcentrum Delft, Het Kruishuis, n.d.)

KRUITHUISWEG

The Kruithuisweg is a provincial road which connects the A4 motorway A4 and
the A12 motorway.

Figure ?. Environment Kabelfabriek II (Tol, 2020)

Figure 70. Kruithuisweg (Google streetview, 2019)

SUEZ AND FESTO

Suez is a waste collector. Festo is a company specialised in automation.

Figure 72. Suez (Van Dijke, 2020)

Figure 71. Environment Kabelfabriek II (Tol, 2020)

Figure 73. Festo (Caparol, n.d.)

TRAIN STATION DELFT CAMPUS

The train station used to be called Station Delft Zuid and was opened in 1970. Nowadays it is called Delft Campus and the pictures on the right show the newly made plans by Benthem Crouwels Architects.

Figure 75. Train station Delft Campus (Benthem Crouwels Architects, n.d.)

Figure 76. Train station Delft Campus (Benthem Crouwels Architects, n.d.)

Figure 74. Environment Kabelfabriek II (Tol, 2020)

CONCLUSION

Concluding it can be stated that the surroundings contribute to the industrial character of the site (number 3, 5, 6, 7 and 8). Furthermore, the monumental importance of the Kruithuis should be taken into account when redesigning the Kabelfabriek II. Besides, the redesign of the train station, Delft Campus, will contribute to the transformation of the Schieoevers Noord. On top of that, the area of the currently present companies, number 4, and Kabelfabriek I, number 3, should also be redesigned to improve the whole neighbourhood.

Figure 77. Environment Kabelfabriek II (Tol, 2020)

INDUSTRIAL CHARACTER OF THE SURROUNDINGS OF THE KABELFABRIEK II, SCHIEOEVERS NOORD

Figure 78. Prysmian Cables and Systems B.V. (Google maps, 2020)

Figure 79. The canal Schie (Gemeente Delft, n.d.)

Figure 80. Loading bellows (Tol, 2020)

Figure 81. Lijm & Cultuur (Holland.com, n.d.)

Figure 82. Dyckerhoff Basal Betonmortel Delft (Bommele, 2019)

3.3 THE BUILDING COMPLEX

3.3.1. STREET PROFILES

STREET PROFILE 1 WEST SIDE KABELFABRIEK II - ENVIRONMENT 1:200
This street profile shows the poor connection the factory has with its west
surroundings, neighbourhood Voorhof, because of the railways.
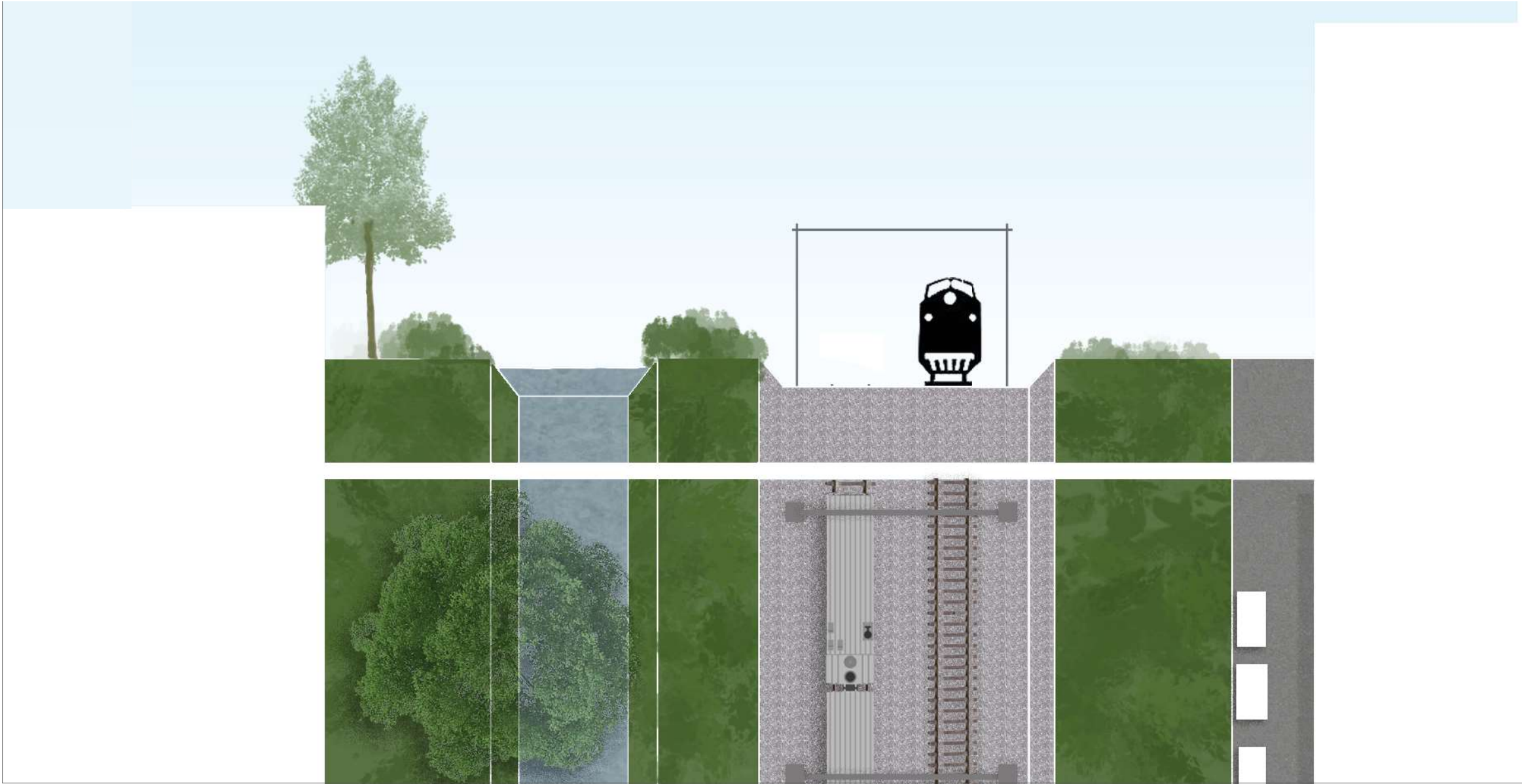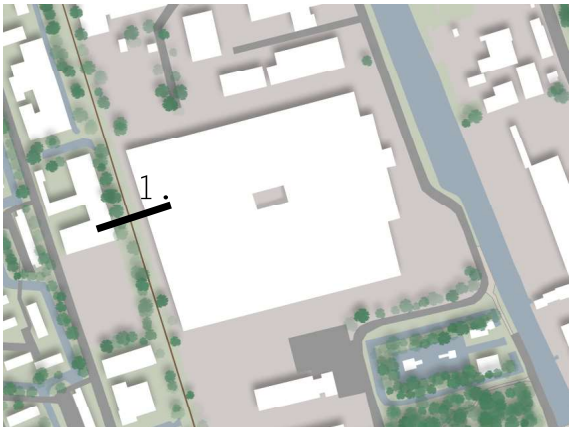
STREET PROFILE 2
WEST SIDE KABELFABRIEK II - ENVIRONMENT

This street profile shows the large distance between the factory and the canal Schie. Moreover, the connection between the factory and the Schie is interrupted by the busy road Schieweg.
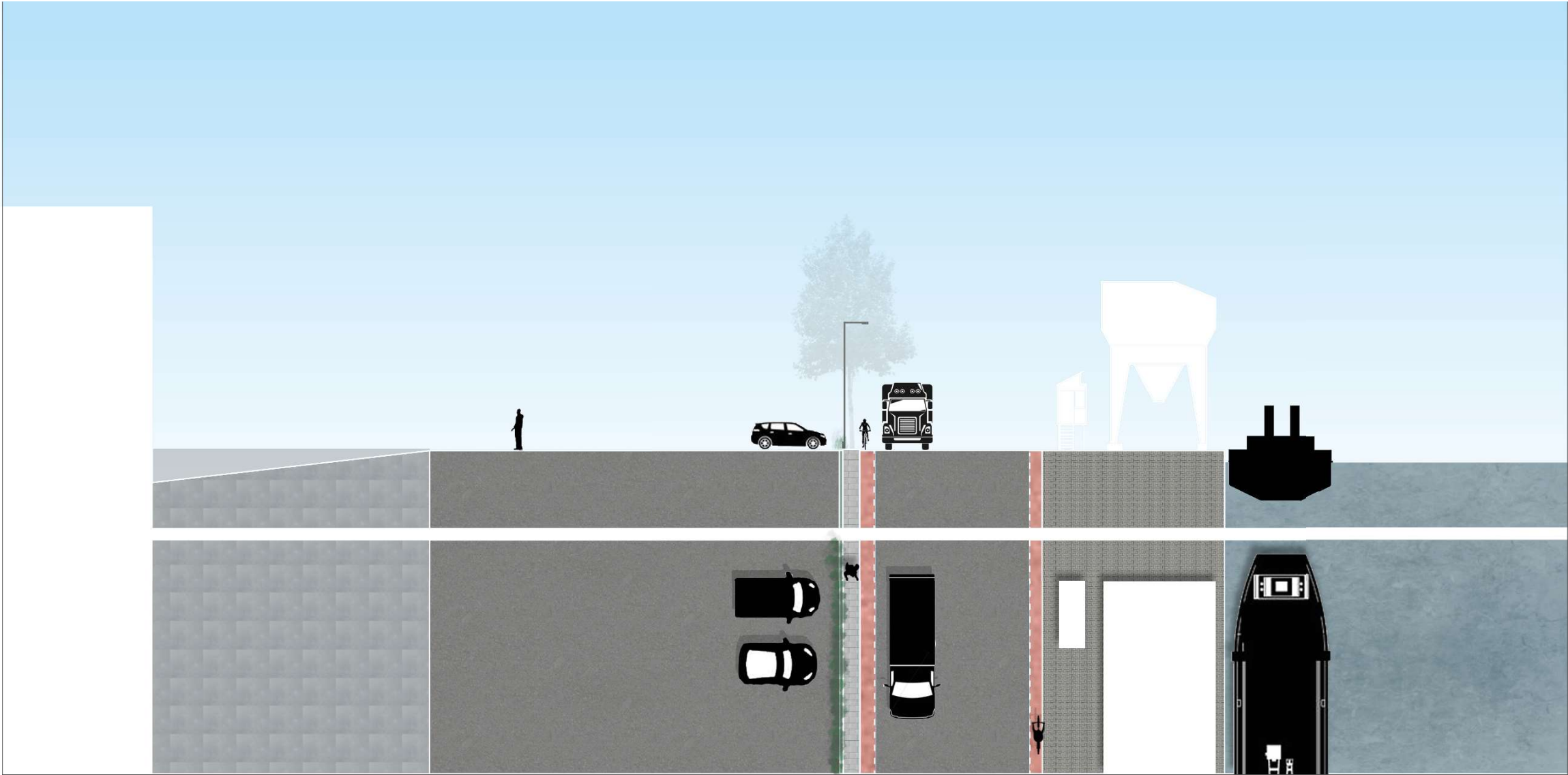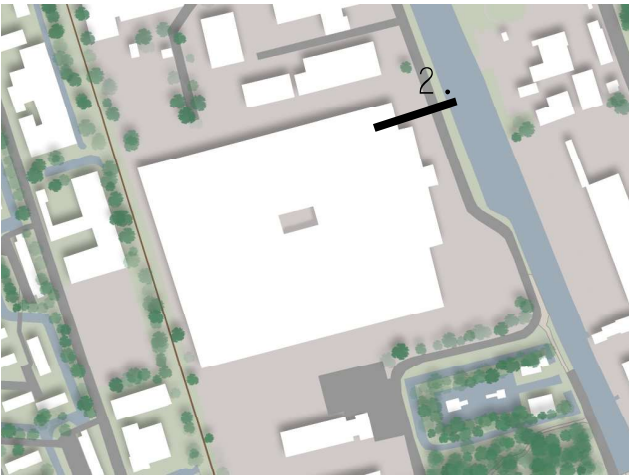
3.3.2. THE KABELFABRIEK II FEATURES

The Kabelfabriek II has some typical characteristics and features which are of importance for its aesthetical appearance and architecture. Beginning at the top right, the Kabelfabriek II is known for its steal beams and structure (see also next page). Furthermore the (little) chimneys and blue steel elements are typical for the outside of the Kabelfabriek II. Moreover, the long halls inside are a reminder of the function of the former factory. The patio, with its rusty barrel, is an unexpected space to find in the middle of the factory. The different masonry shows the various layers and changes over time. The masonry consists of Stretcher bond and Cross bond or Dutch bond. Next to the inside length of the halls, the height also acts as a reminder of the former factory, as well as the length of the façades.
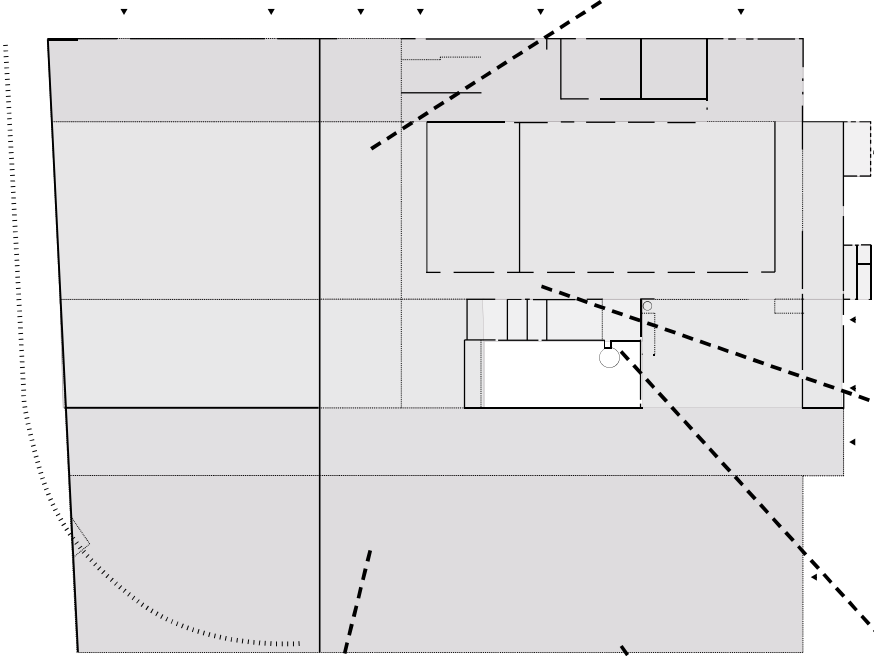
3.3.3. STRUCTURE OF THE KABELFABRIEK II

The Kabelfabriek II is known for its steal structure, lattice girders, which are typical for factory halls in order to span large distances. The colour of the beams and columns inside the building are dark green. The grid construction is based on distances of 5 metres in north south direction. The span of the beams is dependent on the width of the factory hall.
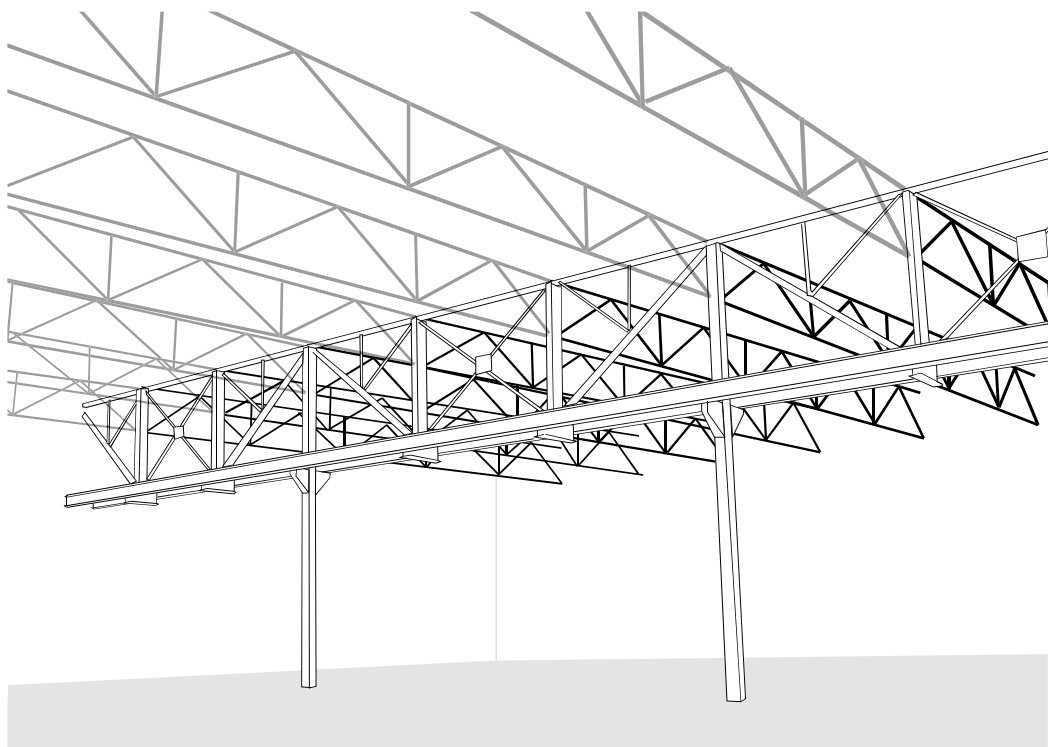

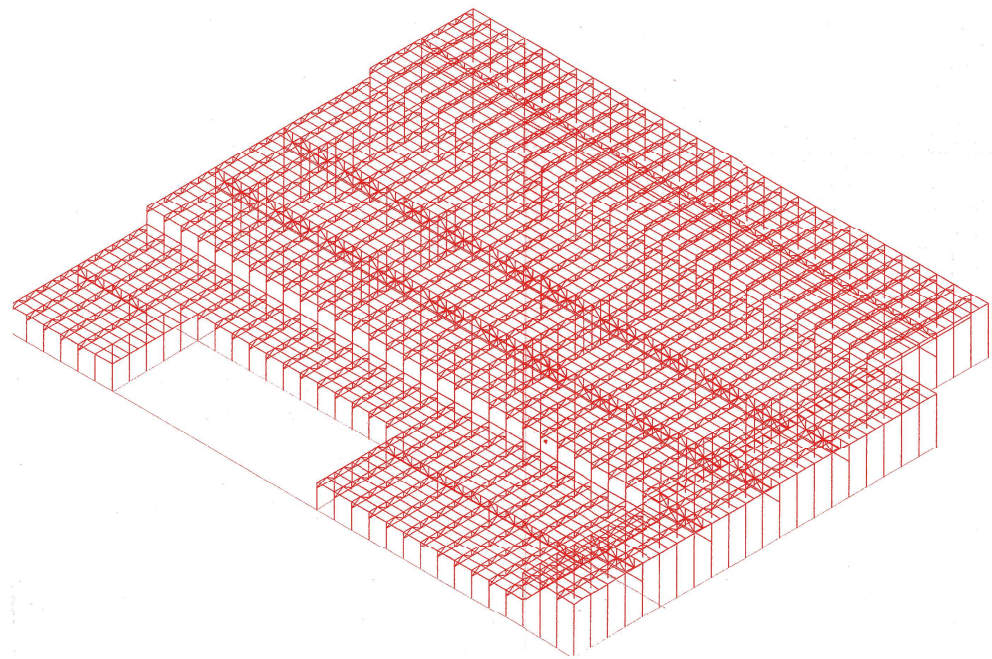*Figure 90.* Structure of the Kabelfabriek II (Schoenmaker,2011)

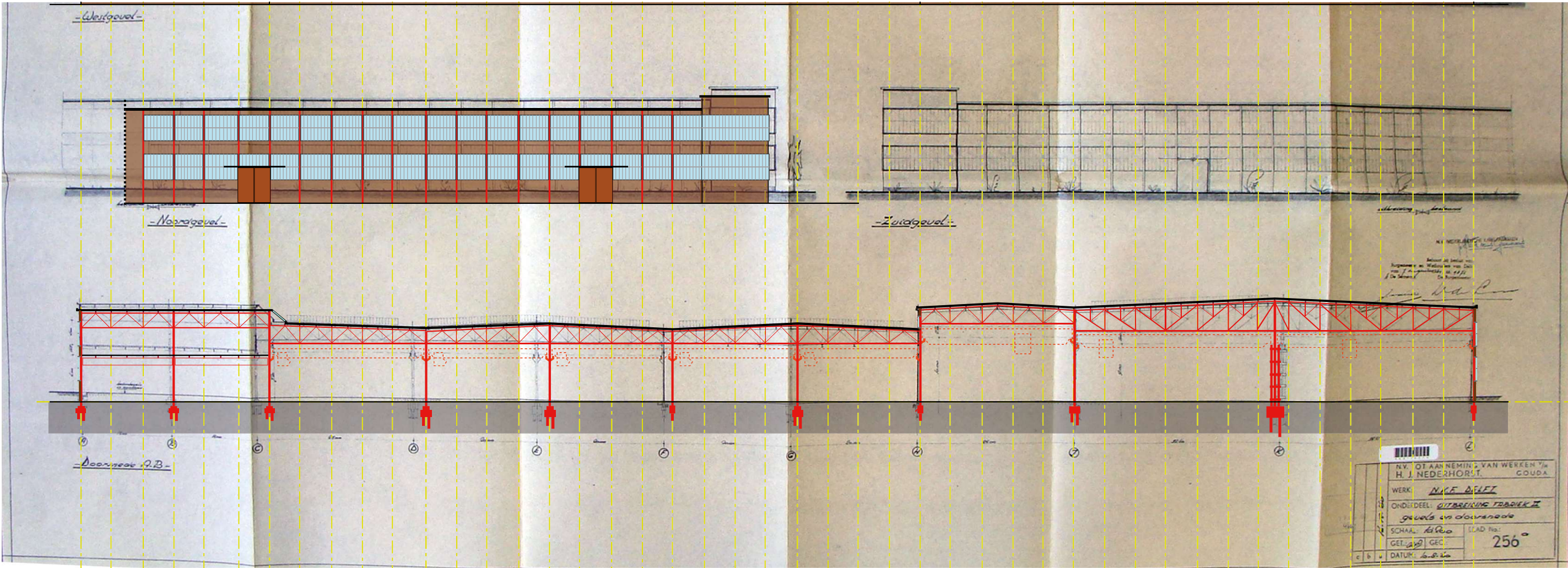*Figure 91.* North part of the structure of the Kabelfabriek II (Schoenmaker,2011)

Figure 92. Structure of the Kabelfabriek II (Schoenmaker,2011)

3.4. FUTURE PLANS

3.4.1 MUNICIPALITY

ZONING NEIGBHOURHOOD VISION DELFT 2040
This map retrieved from the municipality Delft (2020), part of the document 'Vision on the neighbourhood Delft 2040', shows the envisaged functions for each neighbourhood. The Kabelfabriek II is situated in the area 'wonen en werken', 'living and working'.

DEELGEBIEDEN DELFT

- HET CENTRUM
- STERKE EN LEEFBARE WIJKEN
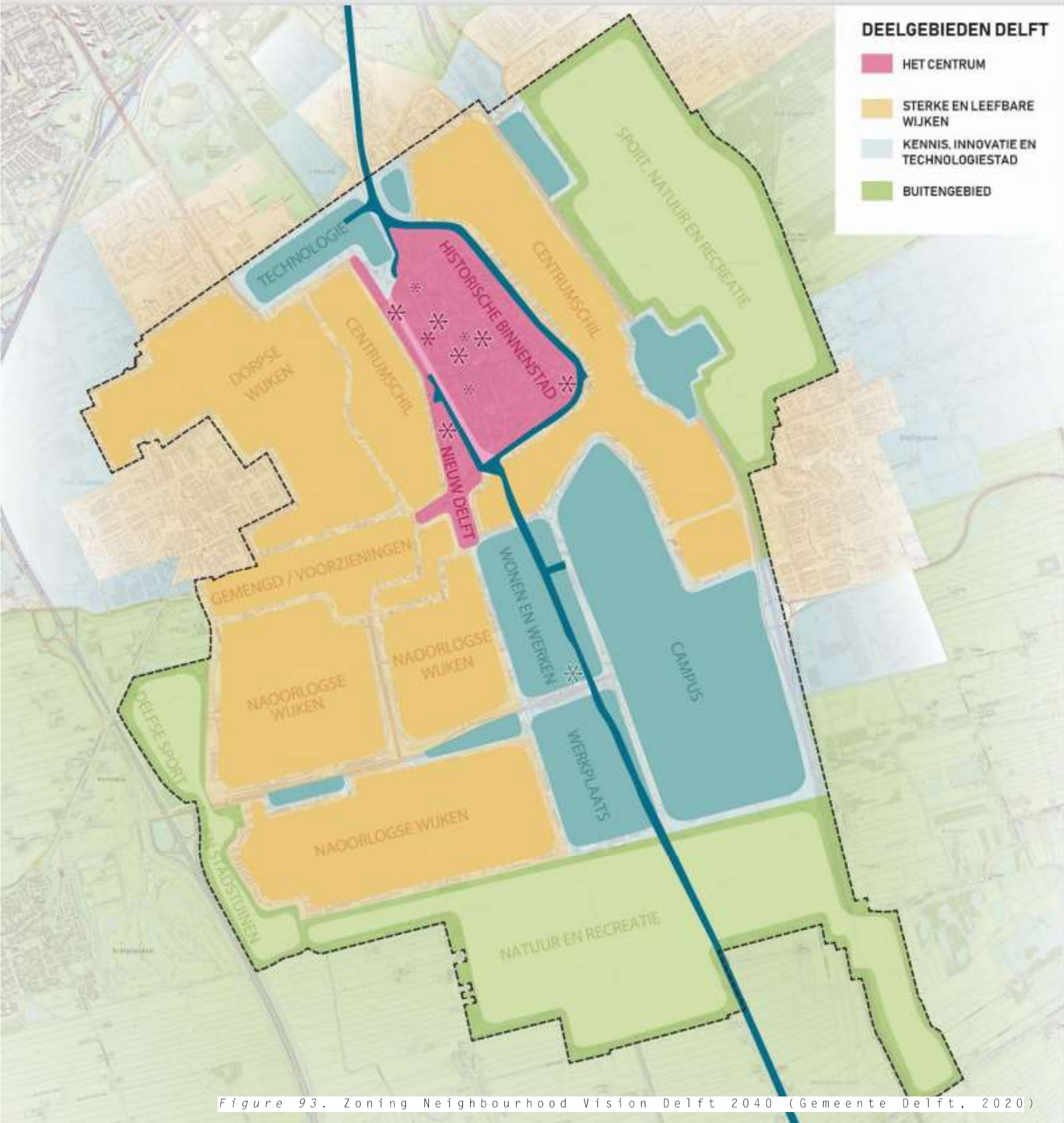- KENNIS, INNOVATIE EN TECHNOLOGIESTAD
- BUITENGEBIED

Figure 93. Zoning Neighbourhood Vision Delft 2040 (Gemeente Delft, 2020)

SIX PSERSPECTIVES IN THE WEB

This map and the spiderweb retrieved from the municipality Delft (2020), part of the document 'Vision on the neighbourhoud Delft 2040', show the features each neighbourhood should contain. As mentioned before the Kabelfabriek II is situated in the area 'wonen en werken', 'living and working'. The most important perspective for this area is that Delft should be the capital of innovation and technology.

Innovation, education and technology should lead to economic vitality of the area, which should create job opportunities for a broad target group. Moreover sustainability (e.g. climate adaptation, circulair economy and energy transition) are important. The other perspectives, 'live and recreate safely and nicely', 'facilities', 'mobility' and 'cultural city' come in third place.
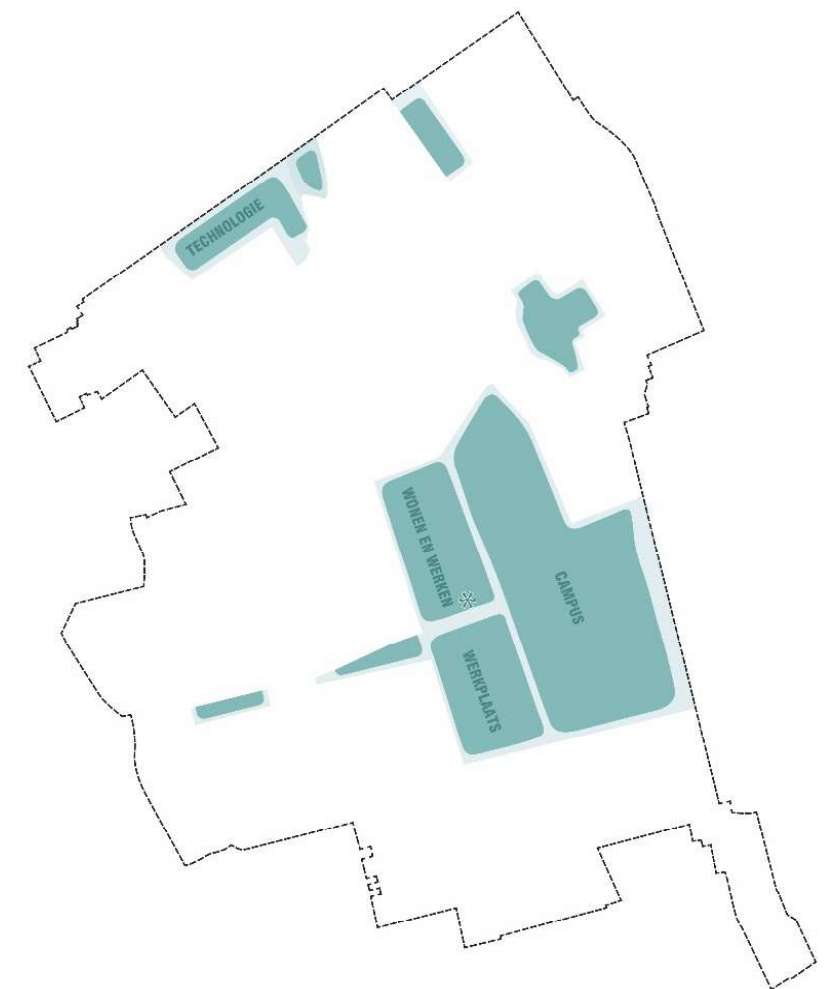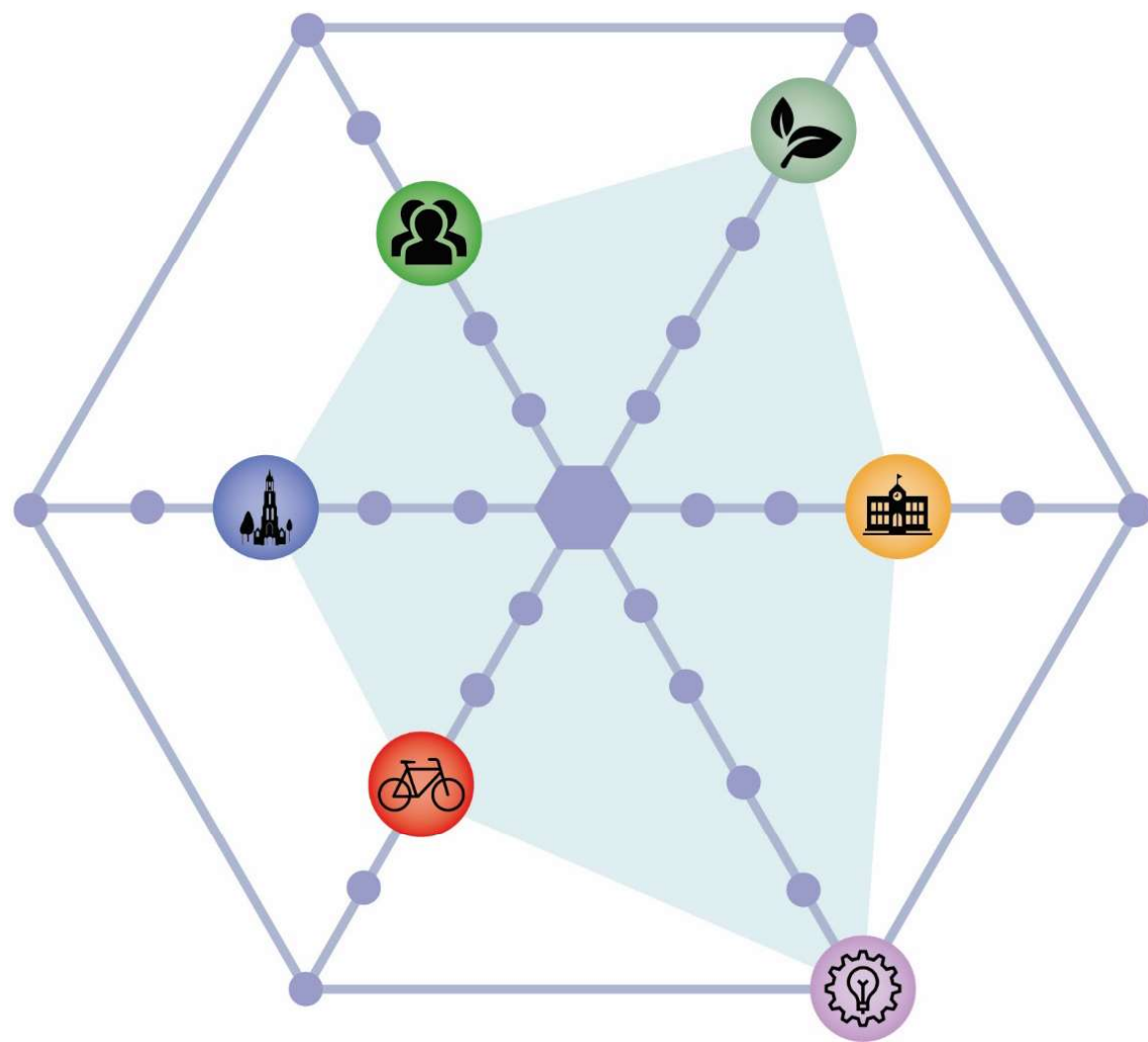

Figure 94 & 95. Spiderweb and map Neighbourhood Vision Delft 2040 (Gemeente Delft, 2020)

SCHIEOEVERS NOORD DELFT DEVELOPMENT PLAN

This map, retrieved from the document 'Schieoevers Noord Delft
Ontwikkelplan' (2020) made by the municipality Delft, broadly shows
the desired spatial framework of the whole area. The development
plan is based on five starting points:

1. Vivid mixed urban area
2. Space for the innovative making industry
3. Socially inclusive and cultural diverse
4. Healthy and sustainable environment
5. Good connections and new mobility

Furthermore, the municipality of Delft states in this developement
plan that a total of 3.200 dwellings and 1.250 extra jobs is to be
created.

The starting points will be taken into account for the redesign of
the Kabelfabriek II as a graduation project. Parts of this framework
will be used for the redesign. What parts will be used is dependent
on the outcome of the research phase where stakeholders will be
involved.

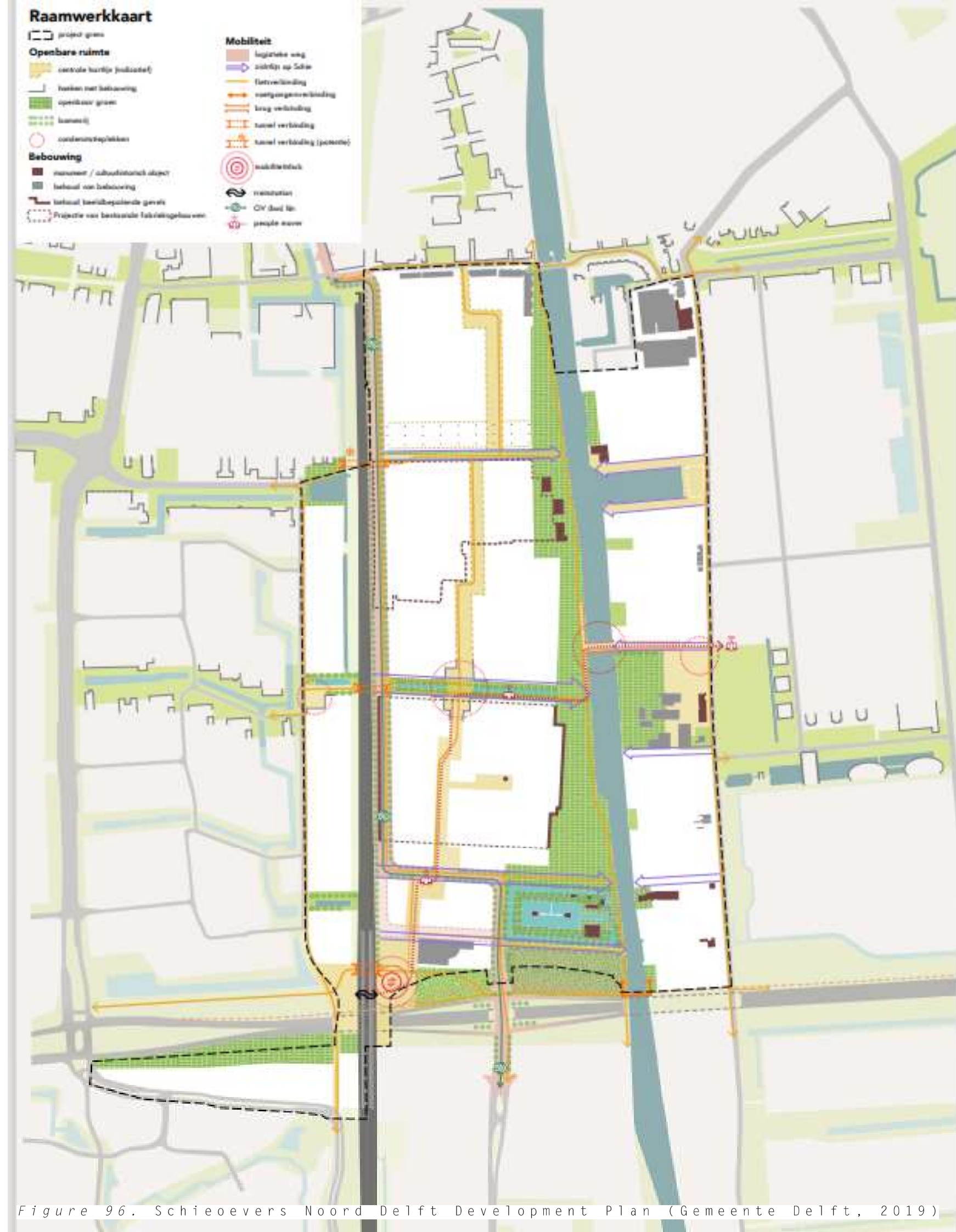Figure 96. Schieoevers Noord Delft Development Plan (Gemeente Delft, 2019)

3.4.2. MEI ARCHITECTS AND PLANNERS

For the Kabeldistrict and the Kabelfabriek II
Mei Architects and Planners made the plans
shown on the map on the right. These plans will
be used as a source of inspiration. However a
new redesign will be made together with the
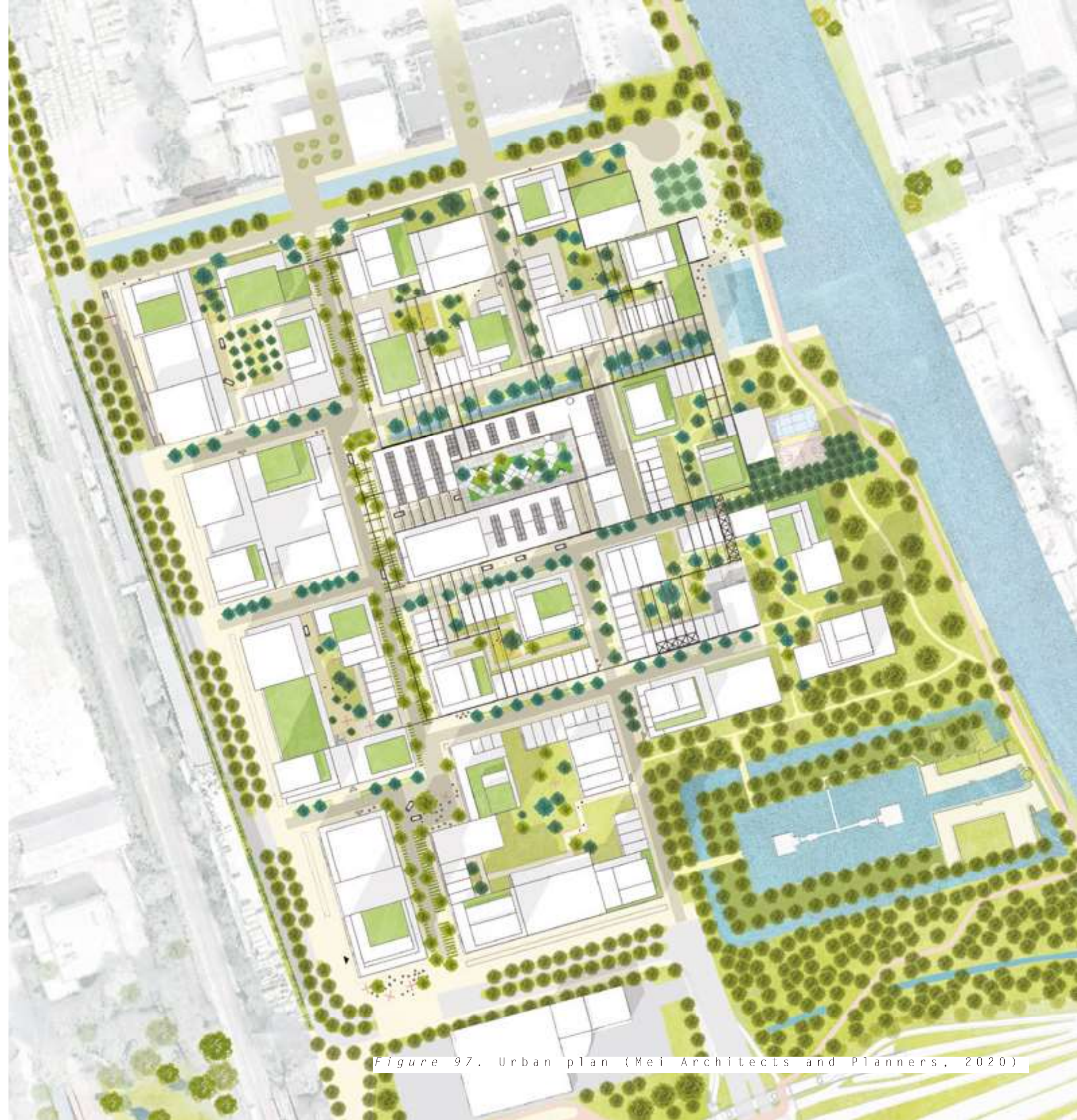involvement of stakeholders.

Figure 97. Urban plan (Mei Architects and Planners, 2020)

PLANS MEI ARCHITECTS AND PLANNERS

This spiderweb is a summary showing what Mei Architects and Planners has designed for the Kabelfabriek II.

A road is created which connects the train station Delft Campus with the northern part of Schieoevers Noord.

Roof gardens will be created.

Schieweg is moved from the east side to the west side of the Kabelfabriek II.

The old structure of the factory will be preserved in some public spaces.

The height of the Kabelfabriek II is used as a "plinth layer" on which the high rise is situated.

The west side of the Kabelfabriek II will be removed, since it is the 'newest' part of the factory.

The brown line shows where the original façades of the Kabelfabriek II were situated.

Water of the Schie will be used in the public space.

A park will be created on the location where the Schieweg used to be.

The patio with its rusty barrel and chimney will be preserved. The high rise will be situated around it. This should give the feeling that the high rise creates a 'pit', the patio.

Parts of the old brick façades will be preserved.

Figure 98. Urban plan (Mei Architects and Planners, 2020)

04 DIGITAL HERITAGE & CO-CREATION

This chapter elaborates on the digital games used for this research. The first sub chapter shows the use of Pokémon Go for an experimental fieldwork as a first analysis of the Kabelfabriek II. Secondly the civic engagement process will be presented and discussed. The third sub chapter explains the structure of the co-creation workshop where Minecraft was used as a medium to interact and to find out the needs of the people and what they value. Lastly the results and discussions of the workshop will be shown.

It is interesting to mention that before Pokémon Go was used as a tool to analyse the Kabelfabriek II for the first time, the author had been seeing the building already many times. She had been passing by the Kabelfabriek II already for one and a half year, since she had to travel by train from Rotterdam to Delft. The first thoughts that came to her mind, when seeing the building, were the enormous size of the building and that it was a shame that it looked obsolete, since the building has a lot of opportunities.

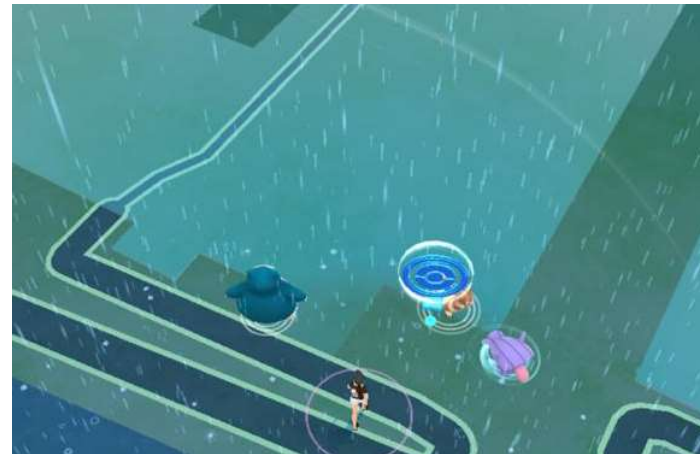QR-code to a short film of the Kabelfabriek II from the train.

Figure 99. Pokémon Go floor plan (Tol, 2020)

4.1. FIELDWORK WITH POKÉMON GO

Before starting the process of co-creation, the site has been observed on the basis of the geogame Pokémon Go. Geogames stimulate people to go outdoors, move and communicate with each other. (De Andrade, Poplin, & Sousa de Sena, 2020) Pokémon Go can be downloaded for free on mobile phones. In addition to this, the game has non-obligatory options for buying items in the game itself. Geogames can contribute to a healthier life, both physical and mental. Some experts even belief that, for example Pokémon Go, helps people who suffer from depression or social fears.('Pokémon Go', 2020)

Pokémon GO, an augmented reality mobile game, is used to explore the existing values and attributes of the building and site in a different way. This approach to fieldwork is aligned with the Theory of the Derive to ensure that the site visit will be guided not by visuals but by the gaming mechanics, making it a spontaneous, surprising, neutral and smooth site visit (Debord, 1958). The visitor will be the flaneur, 'the rambler of public space, the one that discovers paths and urban places through walking in the city.' (Berrutti, 2018)

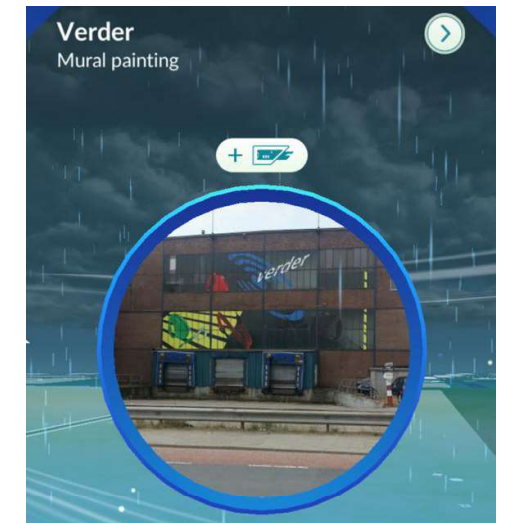*Figure 100.* Mural painting (Tol, 2020)

Figure 101. Pokémon Go Pokéstop (Tol, 2020)

After arriving at the Kabelfabriek II Pokémon Go shows you on the Pokémon Go map, next to the Pokémon's, two highlights, of the factory. The first highlight, a so called 'Pokéstop', points out a part of the façade with mural painting, see second picture above. Unfortunately an explanation of this mural painting is still missing in the game. Even though, the rest of the façade of the whole building still remains unknown, the curiosity for the building has been raised.

The industrial environment of the factory, cargo ships, factories, cranes et cetera, contribute to the feeling that the area, the factory is situated in, is made for the people who work there. It gives you, as a visitor, the feeling you are not allowed to enter the building. Moreover, the entrance of the building does not look inviting because of its darkness and hidden position in the façade. On top of that, when entering the building a little beep can be heard which leads to the same feeling as described before.

However Pokémon Go shows you the 'street' on the map giving the possibility to enter the factory. In this way Pokémon Go stimulates you to be adventurous and explore the area and/or building. This is the positive effect that geogames have. One can say that in this case Pokémon Go tells you as a visitor where the border lies between private and public.

In- and outside the factory a lot of signs and name boards show you all the different companies which are situated in the factory. Because of all the different materials, objects, openings, companies et cetera, it feels like no man's land even though it probably is everyone's land, since a lot of different companies are situated in the factory. The presence of these stakeholders in the building, without seeming to have a connection with each other, the dusty smell, not knowing the companies and the way in the building, contribute to the feeling of being an intruder. An extra highlight on the Pokémon Go application, with an explanation of what is situated in the factory at the moment, would result in a warmer welcome and a better understanding what, where and who to find.

Figure 102 & 103. Mural exhibition and explanation of the history of the Kabelfabriek II. (Mural exhibition (attributes) x historic value)

On the wall of this inside street multiple images with a small text exhibit the history of the Kabelfabriek II, see the pictures above. Unfortunately these historic photo's, which can be considered as digital heritage, are not shown on the Pokémon Go application. Recapitulating, adding the historic time line of the building in combination with what is happening in the Kabelfabriek II at the moment would conduce to a better and warmer feeling for the visitor.

As mentioned before, the chance of entering the Kabelfabriek II has increased due to the Pokémon Go application. Moreover, Pokémon Go also displays a courtyard in the middle of the factory. This courtyard would never have been noticed when standing in front of the Kabelfabriek II. The same applies to the attribute called 'hidden artwork' in the Pokémon Go application, which was shown as the second highlight on the Pokémon Go map, see picture below. Unfortunately the word 'hidden' is to be taken literally, since it was unfindable during this observation. A further explanation, besides 'Inside a dark old factory building we found this piece of art', of this hidden artwork would have helped finding and understanding this piece of art. On the other hand this unfindable artwork did cause an even more curious attitude, which resulted in finding other interesting textures, objects and artworks.
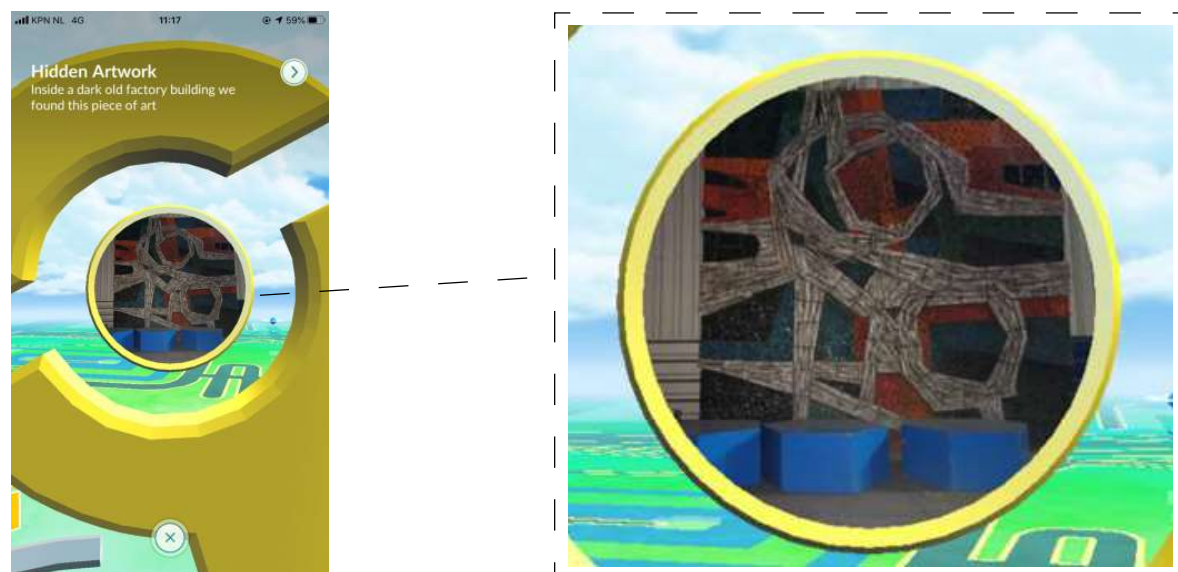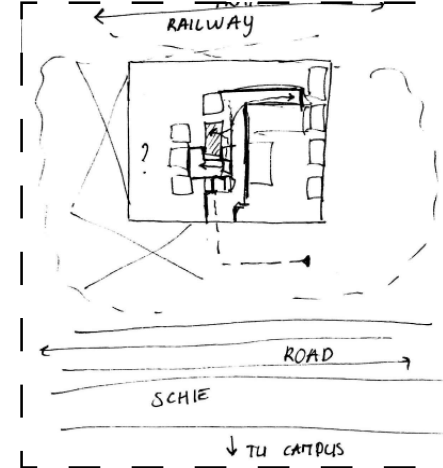
Apart from the positive effects of Pokémon Go, one more aspect of the application and reason for concern is the safety of the users. When opening the application, the first thing you see is: 'Remember to be alert at all times. Stay aware of your surroundings.' And after that another reminder: 'Be courteous to members of real-world communities as you play Pokémon Go'. This is in line with what is shown as public and private on the Pokémon Go application. The South side of the factory is still being used and therefore was fenced off and not accessible. The West side of the factory is situated next to the railway, which in combination with the application in the past has led to problematic situations.

Concluding, one can state that in this case the Pokémon Go application contributed to a more explorative experience. The exploratory character of the game with its Pokéstops, gyms and Pokémons foster a derive through a place, which would not be possible in real life without playing the game. Furthermore, Pokémon Go tells you as a visitor where the border lies between private and public and which areas can be visited and which areas not. Put differently, the game background map helps self-orientation making it a derive embedded with spatial awareness, in other words, getting lost consciously. Moreover, it triggers the player to look for hidden streets and alleys that are not yet visible during the exploration.
Nevertheless there is still opportunity to improve the game to make it even more interesting for digital heritage, stakeholders and other players. For example by adding Pokéstops and highlights of the already present historic time line with its photos and stories of the Kabelfabriek II. Another interesting remark to increase the civic engagement could be to involve the recently designed plans for the area by various design teams in the Pokémon Go application, for example the plans of Mei Architects and Planners (Mei Architects and Planners, 2020) or the vision of the municipality (Gemeente Delft, 2020).

Figure 104 & 105. Attribute "Hidden Artwork" (Tol, 2020)

8. hidden courtyard (economic value) - hidden artwork - textures (rusty barrel x historic value)

9. not accesible

RAILWAY
?
ROAD
SCHIE
↓ TU CAMPUS

cable spools x historic value

7. no man's land - everyone's land

dusty smell - intruder

1.three area's

CENTRE
TRAINSTATION
SCHIE
residential livings
INDUSTRIAL AREA : SCHIEOEVER

"beep"

6. entrance -street Pokémon Go

4. Pokéstop - mural painting x aesthetic value - truck entrance x economic value

Verder
Mural painting
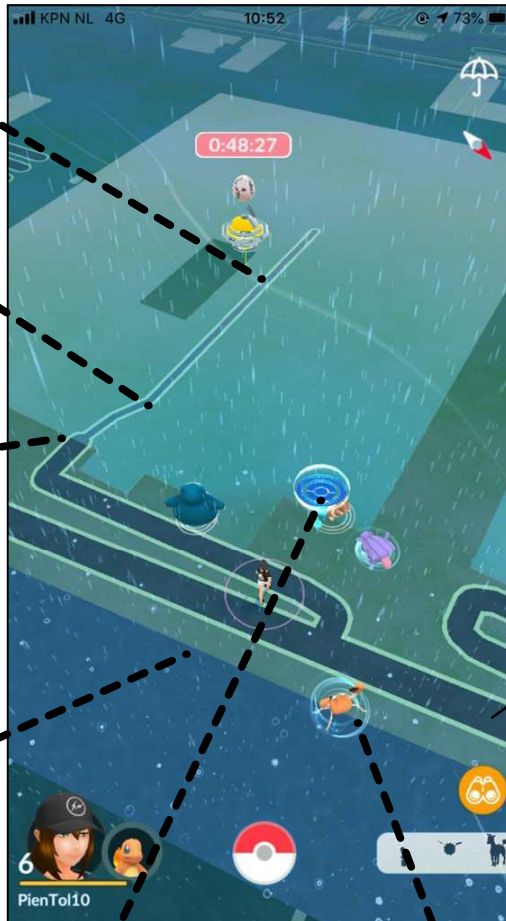
3. The Pokémons

Snorlax, Furret, Shellder and Kingler were the Pokémons found at the Kabelfabriek II. These Pokémons can be in some way related to water, in this case the canal Schie. For example Kingler, resembling a crap, is often found at the edges of water, as you can see on the map as well. Snorlax is known to be a good swimmer and is known for his butterfly stroke.

Therefore one can state that because the Kabelfabriek II is situated next to the canal Schie, one is more likely to find water-type Pokémons.

5. industrial environment

2.visual connection TU

ALTERNATIEVE IN 8 UIT

Pokémon Go perception map (Tol, 2020)
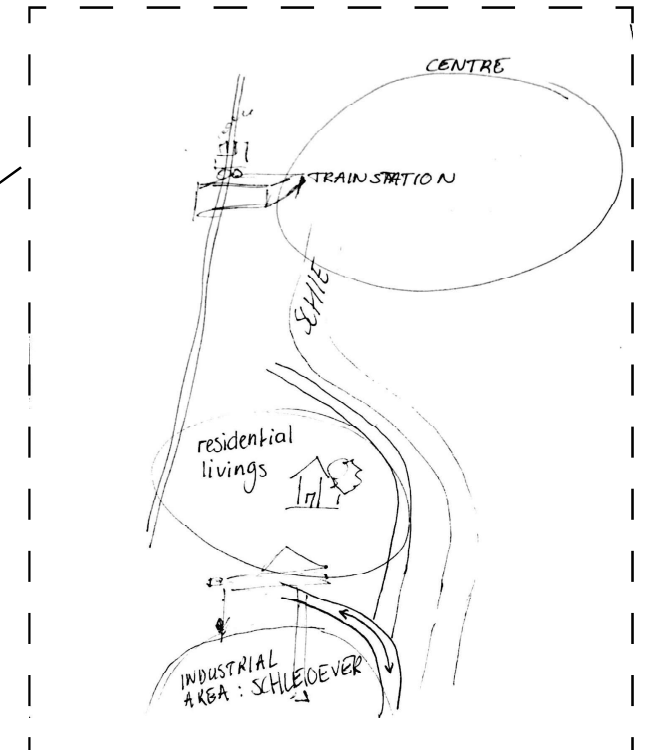
4.2. CIVIC ENGAGEMENT PROCESS

This sub chapter describes the process of engaging stakeholders for the adaptive reuse redesign of the Kabelfabriek II. There are many methods for involving people in redesigning heritage topics as can be seen in figure 07 page 08. Since for this research only a limited amount of time was available, the dissertation for the doctorate of Chatzi Rodopoulou (2012), titled "European Industrial Heritage Reuse in Review" was chosen, in which Rodopoulou also uses the Delphi Technique. "The Delphi method is a common method to collect the consensus of opinions. Influencing factors can be obtained according to the established processes." (Dong, Liu, Wang, & Zhang, 2019)

In this research different stakeholders were contacted before the redesign in order to give them an active role in the design process, which is called co-creation. By doing so the process became a bottom-up approach instead of a top-down, which appears to be the most used approach. Chatzi Rodopoulou (2012) states in her PhD that a bottom-up decision-making process and involving various stakeholders is conducive to the democratization of preservation. Furthermore, she declares that a shift from top-down to bottom-up approach is currently happening.
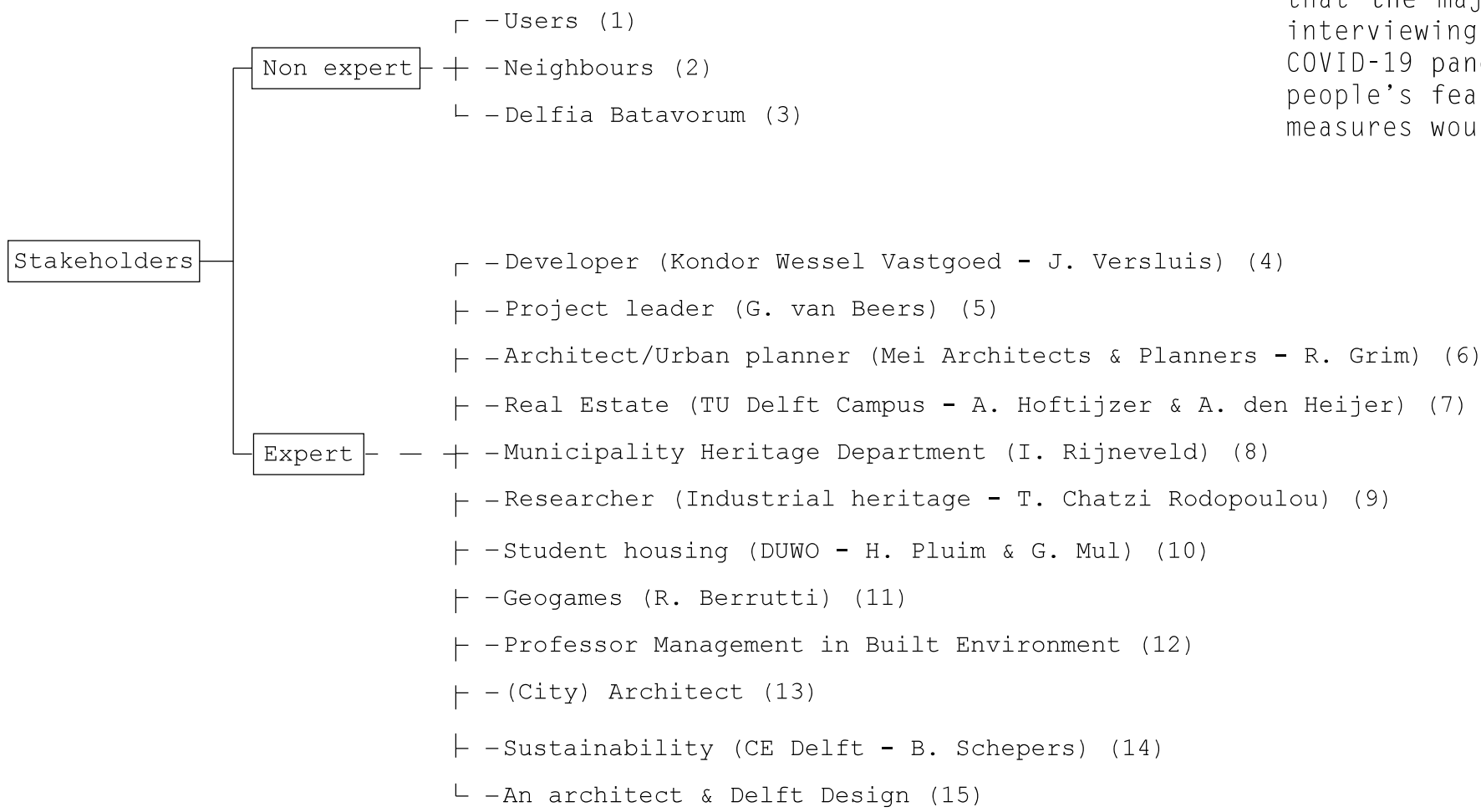
The group of stakeholders in this research can be divided into experts, who are educated in the built environment, and non experts, who are not educated in the built environment. The process of contacting the stakeholders was mainly conducted via e-mail or telephone. Important to mention is that the process of contacting people took quite some time. With the help of the tutors, Alexander de Ridder and Bruno de Andrade, the process accelerated, a total of five stakeholders accepted the invitation to join the workshop from a total of sixteen stakeholders who were interviewed. One may assume that stakeholders are less interested in having an active role in a co-creation approach of student projects compared to real heritage projects. Because of Covid-19 the majority of interviews were taken place via video-calls. Next to this, during most interviews English was the spoken language, which was never the mother tongue of neither the interviewer nor the interviewee. This led to some language barriers in terms of jargon. Interview protocols were made beforehand for the different roles of stakeholders, see chapter 8 "Appendix". The transcripts of the interviews used in this research booklet can be found there as well.

The figure below shows all the stakeholders involved in this research process. These experts and non experts were either interviewed or present at the co-creation workshop or both. The amount of interviewed people is larger then the amount of participants of the workshop, sixteen versus five. One may assume that the majority of stakeholders does have time to be interviewed, since interviewing takes less time then a workshop of half a workday. Besides, the COVID-19 pandemic was a barrier in the organisation of the event as well as people's fears of gathering together in a same room even knowing all safety measures would be taken.

Stakeholders

Non expert
- Users (1)
- Neighbours (2)
- Delfia Batavorum (3)

Expert
- Developer (Kondor Wessel Vastgoed - J. Versluis) (4)
- Project leader (G. van Beers) (5)
- Architect/Urban planner (Mei Architects & Planners - R. Grim) (6)
- Real Estate (TU Delft Campus - A. Hoftijzer & A. den Heijer) (7)
- Municipality Heritage Department (I. Rijneveld) (8)
- Researcher (Industrial heritage - T. Chatzi Rodopoulou) (9)
- Student housing (DUWO - H. Pluim & G. Mul) (10)
- Geogames (R. Berrutti) (11)
- Professor Management in Built Environment (12)
- (City) Architect (13)
- Sustainability (CE Delft - B. Schepers) (14)
- An architect & Delft Design (15)

Figure 107. All involved stakeholders related to the Kabelfabriek II. (Tol, 2020)
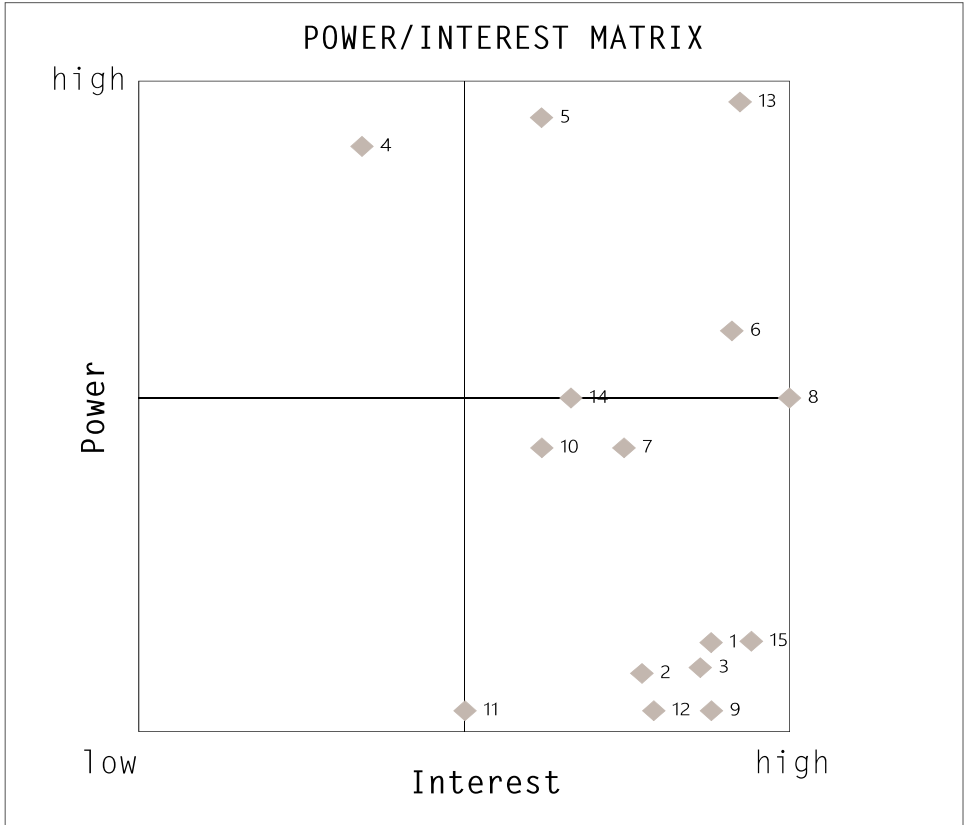

Figure 108. Figure and list of stakeholders (Tol, 2020)

4.3. CO-CREATION WORKSHOP

Trial workshop
On the 26th of November, the trial workshop was held by the author, Pien Tol, at the design studio area of the faculty of Architecture of the Technical University Delft. For this trial workshop three master architecture students were invited. Other attendees and facilitators of the trial workshop were: Dr. Bruno de Andrade, Diana Ugnat and Mick Bloemendal.

The program of the workshop is explained chronologically.

15.00 - 15.15 h - Welcome & Info
15.15 - 15.30 h - Explore
15.30 - 16.00 h - Round 1
16.00 - 16.15 h - Presentation round 1
16.15 - 16.30 h - Values & attributes assessment

15.00 - 15.15 h - Welcome & Info
First of all, the participants were welcomed, introduced and an introduction about the workshop was given. An introduction video[1] about Minecraft was shown. The use of the game Minecraft itself was explained. Every participant was assigned a laptop.

15.15 - 15.30 h - Explore
The participants were given time to explore the game and to get used to the tools of Minecraft.

15.30 - 16.00 h - Round 1
Hereafter an assignment was given to make an intervention on the skin, surroundings and interior according to the stakeholder's role each student had chosen. The first master student represented the role of the municipality, the second master student represented the role of DUWO, specialist and facilitator in student housing, and the last one represented a neighbour or user of the Kabelfabriek II. All three students did not have any experience with the game Minecraft. This lack of experience created a level playing field with the stakeholders.

16.00 - 16.15 h - Presentation round 1
After each assignment was given and completed, the redesign, intervention, ideas and visions were presented to each other. Subsequently the students were asked with which stakeholder and ideas they wanted to collaborate and with whom not. Two of the three students created their ideas in Minecraft. The other student used Minecraft as a visualising tool, since the student was insecure about his/her gaming qualities and felt intimidated by the tool. The given tracing paper and floor plan were used for the design ideas, because the student felt he/she could let his/her mind flow more easy on the tracing paper.

16.15 - 16.30 h - Values & attributes assessment
The last assignment of this trial workshop was a values based assignment, where the students needed to put coloured blocks on the attributes in the Minecraft model. The different colours used were: Red - remove, orange - adapt and green - preserve. In this way a values and attributes assessment could be obtained out of the game Minecraft.
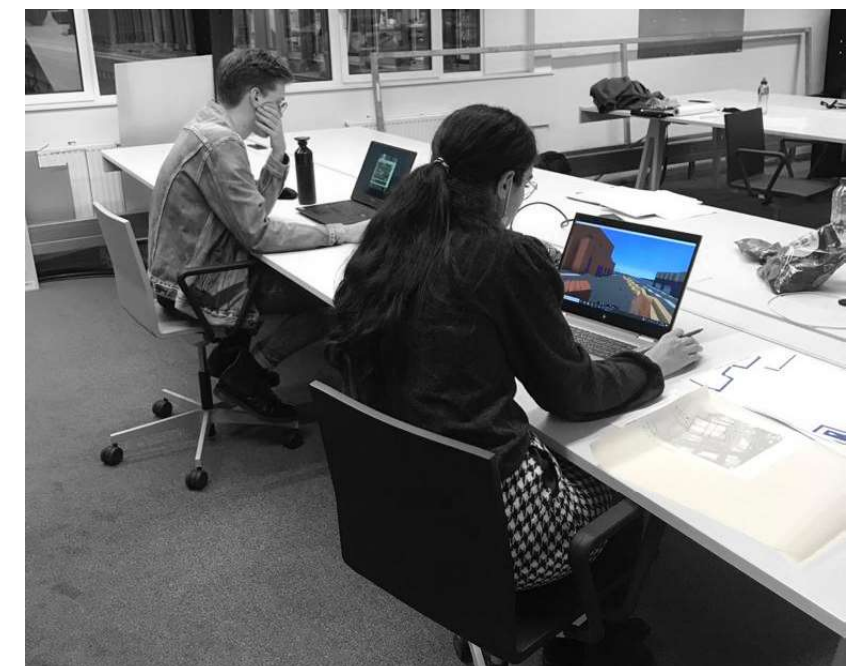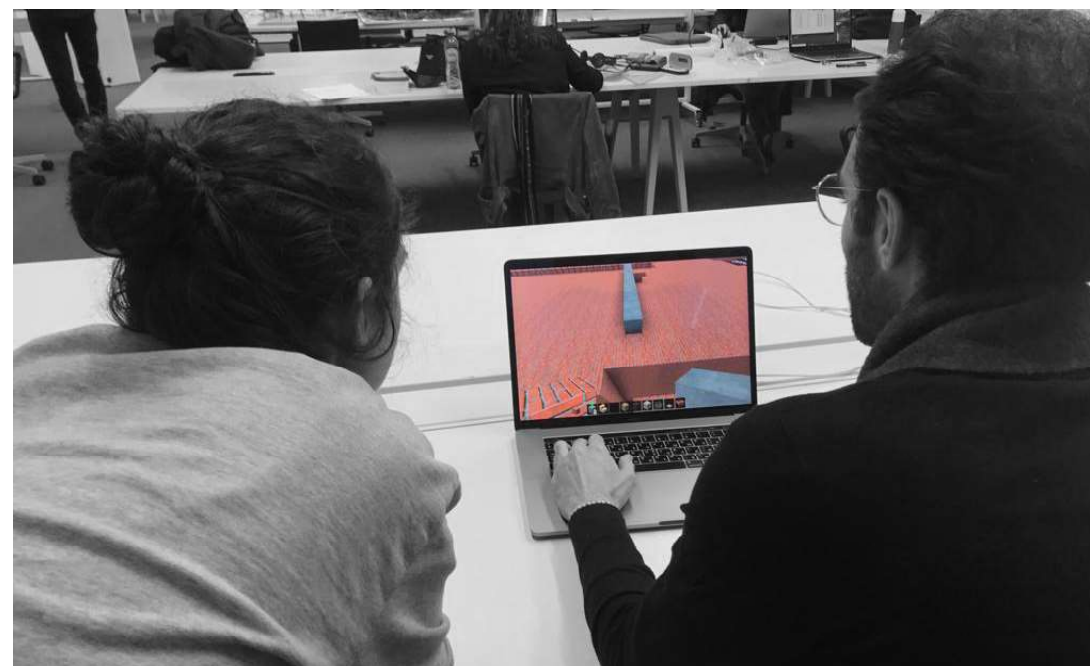

Figure 109, 110 & 111. Civic engagement during the trial workshop. (Tol, 2020)

1. Link to the introduction video https://www.youtube.com/watch?v=5BSQPSn4mcs&feature=youtu.be

Furthermore as a part of the learning process the trial workshops of the two other master students, Diana Ugnat and Mick Bloemendal, were attended and helped facilitating. Remarkable were the well detailed models of the trial workshop of Mick Bloemendal. This can be related to the fact that the participants were well experienced with the game already. Next to this which is notable, is that architecture master students, participants of the trial workshop of the Kabelfabriek II, are used to digital 3D modelling programs. As one of the participants said: "It's comparable to changing from Revit to Rhino. You just have to get used to it." Another participant said to have a preference for using the tracing paper to represent graphically and share design concept and ideas. The main reason for referring to the tracing paper can be related to the education of architecture students, who are trained to work with this method.

For the final workshop it was decided to give the participants, who are also inexperienced and of an older generation, more time to explore and get used to the game Minecraft. Furthermore, the feedback was given to start with the values and attributes assessment in order to get to know the game and the Kabelfabriek II in a playful way. Lastly, the library of Minecraft was seen as an inspirational tool for their design ideas.
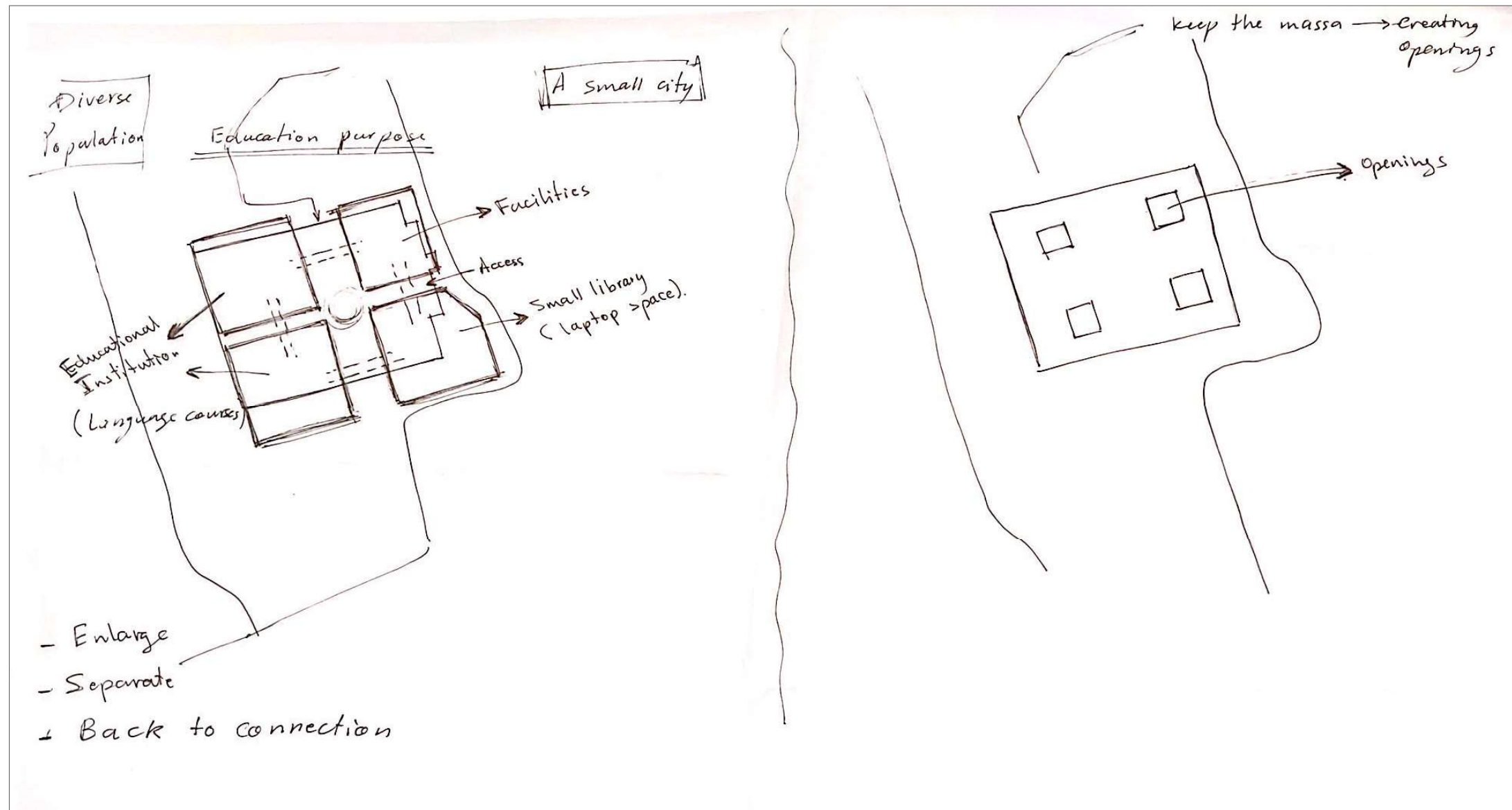

Figure 112. Tracing paper of one of the master students (Tol, 2020)

Final workshop
On the 4th of December the final workshop was held at the design studio area of faculty of Architecture of the Technical University Delft from 13.30 to 16.40, whilst all safety measures concerning the COVID-19 pandemic were taken. The following participants were present:

o A current user of the Kabelfabriek
o A neighbour and former inhabitant of the Kruithuis
o A professor at the TU Delft, Management of the Built Environment
o A member of Delfia Batavorum, Historical Association of Delft
o The city architect ("stadsbouwmeester") of Delft and architect

The program of the workshop is explained chronologically, in the next sub chapter the outcome and results of the workshop are shown.

13.30 - 14.00 h - Welcome & Info
14:00 - 14:30 h - "Explore the game" + Values & Attributes survey
14:30 - 15:20 h - Round 1
15:20 - 15:30 h - Break
15:30 - 15:50 h - Presentation Round 1.
15:50 - 16:30 h - Round 2 + open discussion
16:30 - 16:40 h - Minecraft evaluation form

13.30 - 14.00 h - Welcome & Info
The participants were welcomed and introduced to each other. An introduction about the workshop was given. An explanation video[1] about Minecraft was shown to remind them of the potential of the tool for planning and design. The use of the game Minecraft itself was explained. Every stakeholder group was assigned a laptop.

14:00 - 14:30 h - "Explore the game" + "Values & Attributes" survey
The participants started to explore the game and meanwhile a survey on the values and attributes of the Kabelfabriek II was filled out. The attributes should be found in the Minecraft model. In the survey, see chapter eight

"Annex", the choice was given to value the different attributes as an assignment to both encourage them to navigate on the game and start to relate with heritage-based design. Three options were given:
o not valuable - it may be removed
o average valuable - it may be adapted
o valuable - it should be preserved.

The survey used the attributes derived from the values and attributes assessment done by the author previously, as can be read in chapter two 'Research approach'. Next to the obtained attributes, other attributes were presented to find out what really was valued by the stakeholders. At the end of the survey each participant choose a new function for the Kabelfabriek II. During this phase of the workshop the participants, in order to get to know the game and model, were asked to find the attributes and to build and remove building blocks.

14:30 - 15:20 h - Round 1
During this round the participants were asked to make an intervention on the skin, interior and environment according to their own expertise and background in line with their specific stakeholders role. Tracing paper and a floor plan with surroundings were given to support participants processually as a bridge to the digital modelling.

15:20 - 15:30 h - Break

15:30 - 15:50 h – Presentation Round 1.
The different stakeholders presented their ideas, vision, intervention and/ or design for the Kabelfabriek II using the Minecraft model and where needed tracing paper with floor plans as an under-layer. After the presentation the stakeholders were asked with whom they would like to collaborate and with whom not.

15:50 - 16:30 h - Round 2 + open discussion
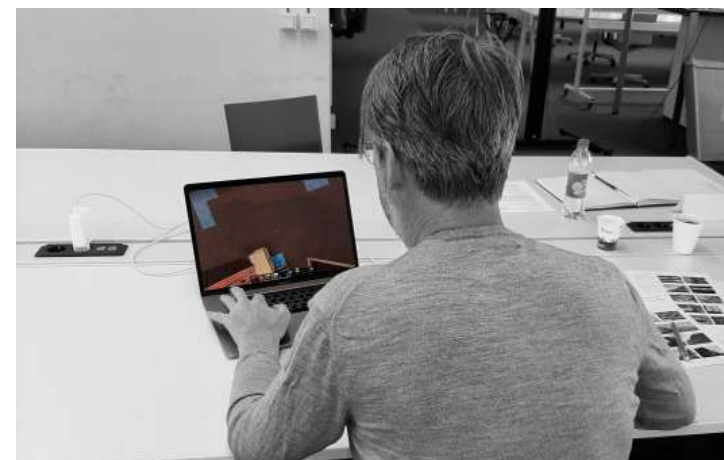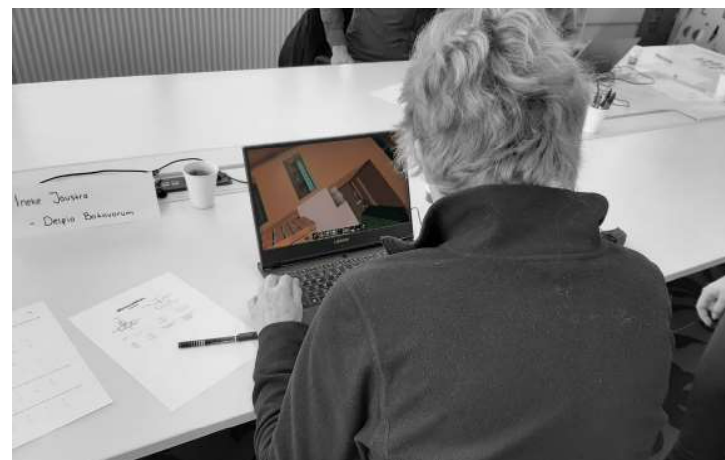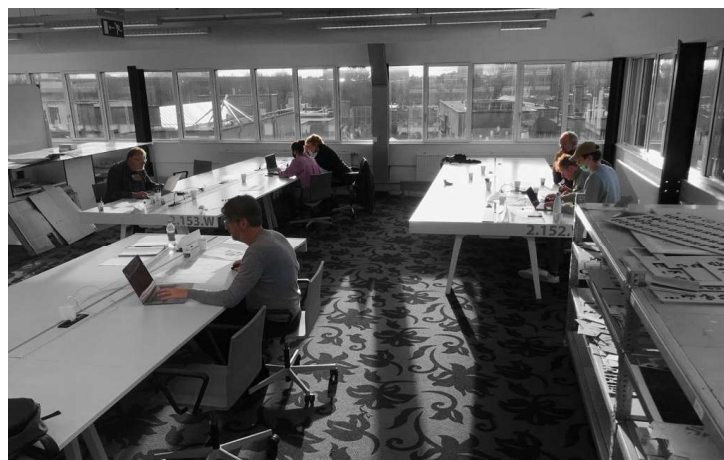During this round all groups had an open discussion on what their vision

Figure 113, 114, 115 & 116. Stakeholders design during the final workshop. (Tol, 2020)

1. Link to the introduction video https://www.youtube.com/watch?v=5BSQPSn4mcs&feature=youtu.be

and ideas are for the Kabelfabriek II. All conflicting design proposals were addressed and discussed. Compromises were negotiated by each side making concessions. Participants were asked to pave ways in the discussions in order to reach a final consensus design.

16:30 - 16:40 h - Minecraft evaluation form
At last the participants were asked to fill out an evaluation form on Minecraft as a tool for this co-creation workshop. The aim of this evaluation is to measure the advantages and disadvantages of the tool in heritage-based design processes.

4.4. WORKSHOP RESULTS

In this sub chapter the results of the workshop are shared by means of the program given in the previous sub chapter.

"Explore the game" + "Values & Attributes" survey
The result of this phase in the workshop is a values and attributes assessment. As mentioned before, the participants were asked to fill out a survey on values and attributes. Three options were given:
o not valuable - it may be removed
o average valuable - it may be adapted
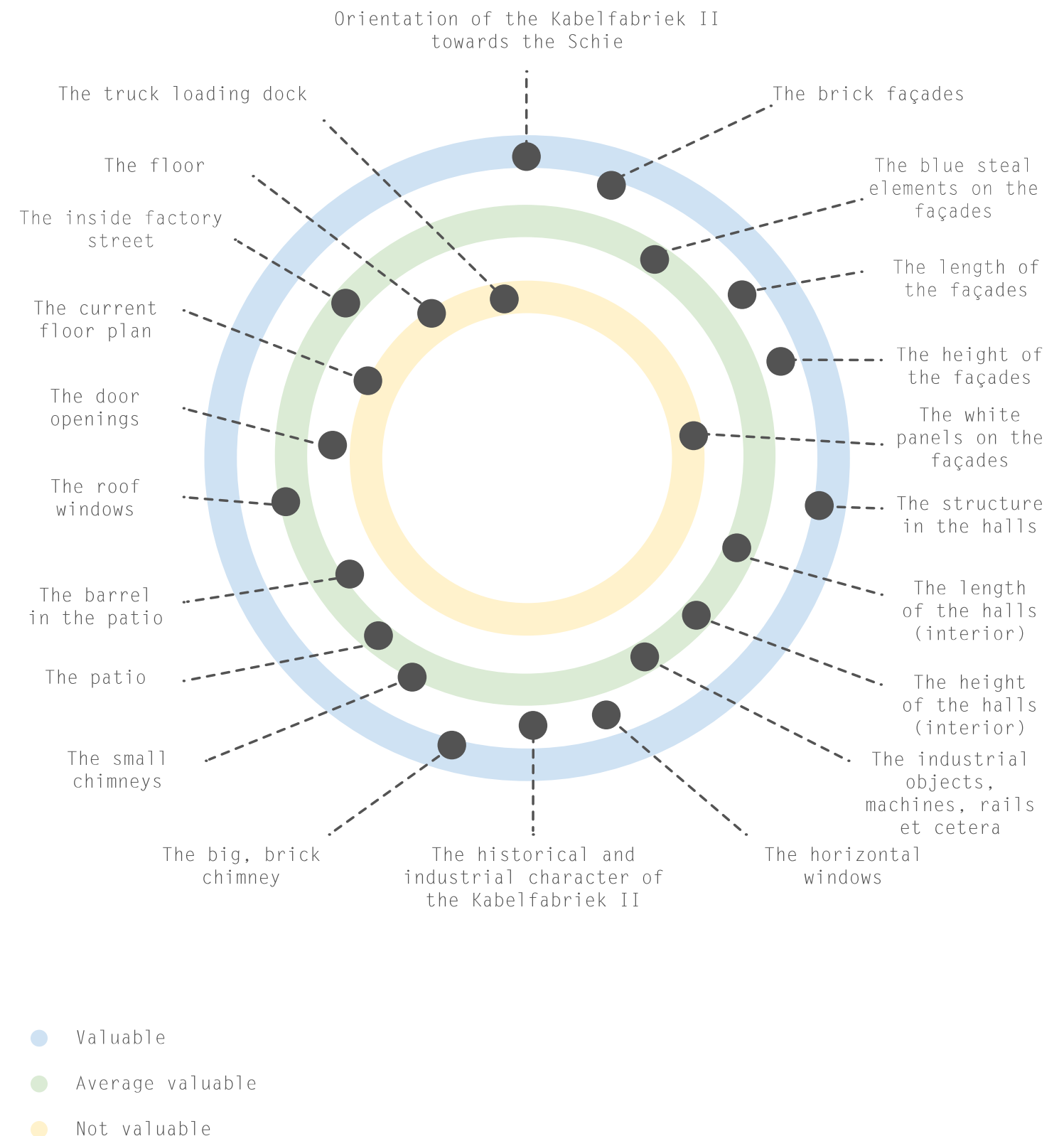o valuable - it should be preserved

All the surveys were collected and processed. At the end of the survey each participant choose a new function for the Kabelfabriek II. This is not part of the values and attributes assessment.

The diagram alongside shows the conclusion of the survey. The coloured circles represent the three different values. Around the circles you see the attributes. On the next page you see more detailed what the percentages and proportions of the valued attributes are according to the different stakeholder. On page ?? the outcome in a values and attributes assessment is shown in a floor plan and facade drawing.
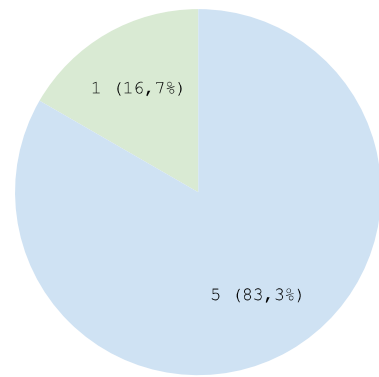
As can be seen in the diagram, the attributes 'Orientation of the Kabelfabriek II towards the Schie', 'The structure in the halls' and 'The big, brick chimney' are valued the most. On the contrary the attributes 'The white panels on the façades', 'The current floor plan', 'The floor' and 'The truck loading dock' are valued the least.

Surprisingly, the outcome of the survey on the attribute 'The structure in the halls' was divided into the neighbour stating that it was not valuable and the other participants stating that it is valuable.
Furthermore, the architect was the only one who stated that the floor is of value. This contradicted the other participants, who stated it was not of value at all.

There are six attributes of which the opinions are divided into valuable, average valuable and not valuable: 'The length of the halls (interior)', 'The height of the halls (interior)', 'The industrial objects, machines, rails et cetera', 'The patio', 'The barrel in the patio' and 'The inside factory street'.
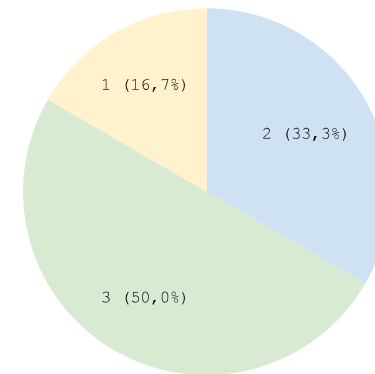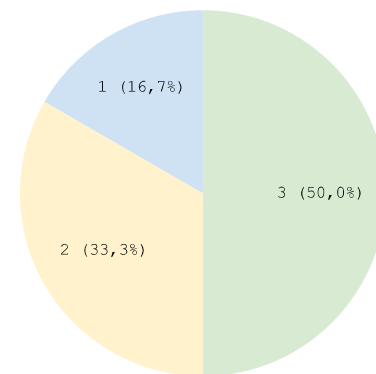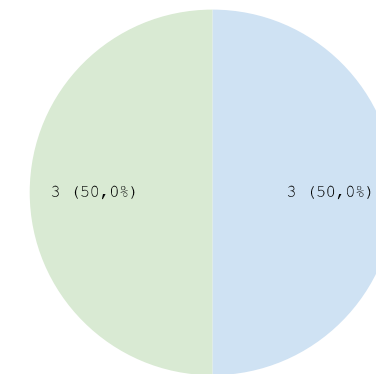
Orientation of the Kabelfabriek II towards the Schie

The truck loading dock

The floor

The inside factory street

The current floor plan

The door openings

The roof windows

The barrel in the patio

The patio

The small chimneys

The big, brick chimney

The historical and industrial character of the Kabelfabriek II

The horizontal windows

The industrial objects, machines, rails et cetera

The height of the halls (interior)

The length of the halls (interior)

The structure in the halls

The white panels on the façades

The height of the façades

The length of the façades

The blue steal elements on the façades

The brick façades

- Valuable
- Average valuable
- Not valuable

Orientation of the Kabelfabriek II towards the Schie

- 1 (16,7%)
- 5 (83,3%)

The brick façades

- 2 (33,3%)
- 4 (66,7%)

The blue steal elements on the façades

- 1 (16,7%)
- 5 (83,3%)

The length of the façades

- 3 (50,0%)
- 3 (50,0%)

The height of the façades

- 3 (50,0%)
- 3 (50,0%)

The white panels on the façades

- 1 (16,7%)
- 5 (83,3%)

The structure in the halls

- 1 (16,7%)
- 5 (83,3%)

The length of the halls (interior)

- 1 (16,7%)
- 2 (33,3%)
- 3 (50,0%)

The height of the halls (interior)

- 1 (16,7%)
- 2 (33,3%)
- 3 (50,0%)

The industrial objects, machines, rails et cetera

- 1 (16,7%)
- 2 (33,3%)
- 3 (50,0%)

The horizontal windows

- 3 (50,0%)
- 3 (50,0%)

The historical and industrial character of the Kabelfabriek IIW

- 3 (50,0%)
- 3 (50,0%)

The big, brick chimney

- 1 (16,7%)
- 5 (83,3%)

The small chimneys

- 2 (33,3%)
- 4 (66,7%)

The patio

- 1 (16,7%)
- 2 (33,3%)
- 1 (16,7%)
- 2 (33,3%)

The barrel in the patio

- 1 (16,7%)
- 2 (33,3%)
- 3 (50,0%)

The roof windows

- 2 (33,3%)
- 4 (66,7%)

The door openings

- 3 (50,0%)
- 3 (50,0%)

The current floor plan

- 2 (33,3%)
- 4 (66,7%)

The inside factory street

- 1 (16,7%)
- 2 (33,3%)
- 3 (50,0%)

The floor

- 1 (16,7%)
- 1 (16,7%)
- 4 (66,7%)

The truck loading dock

- 6 (100,0%)

Legend
- High value
- Average value
- Low value
- Not filled in

58
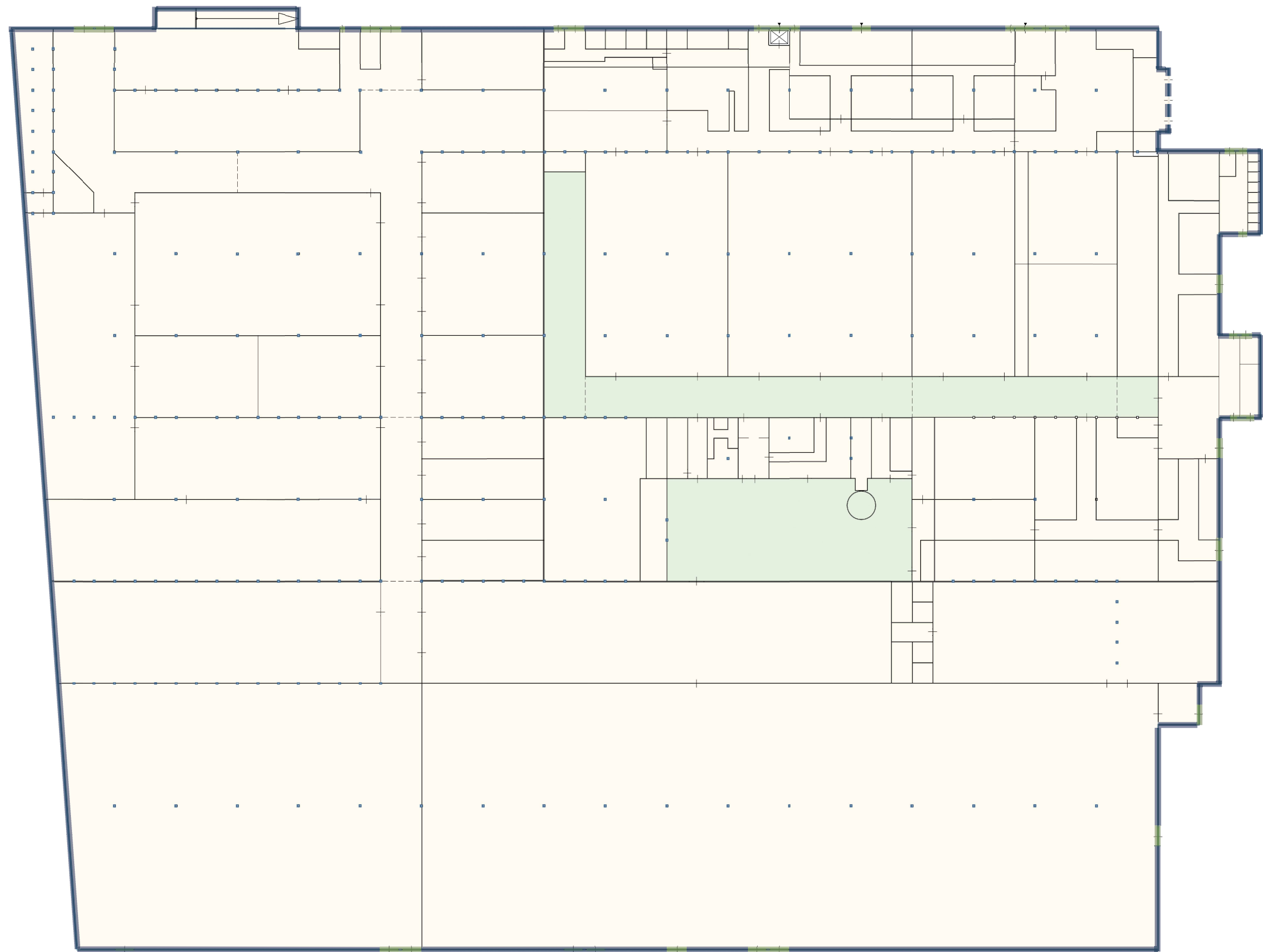
Figure 117. Outcome Values & Attributes survey floor plan 1:1000 (Tol, 2020)
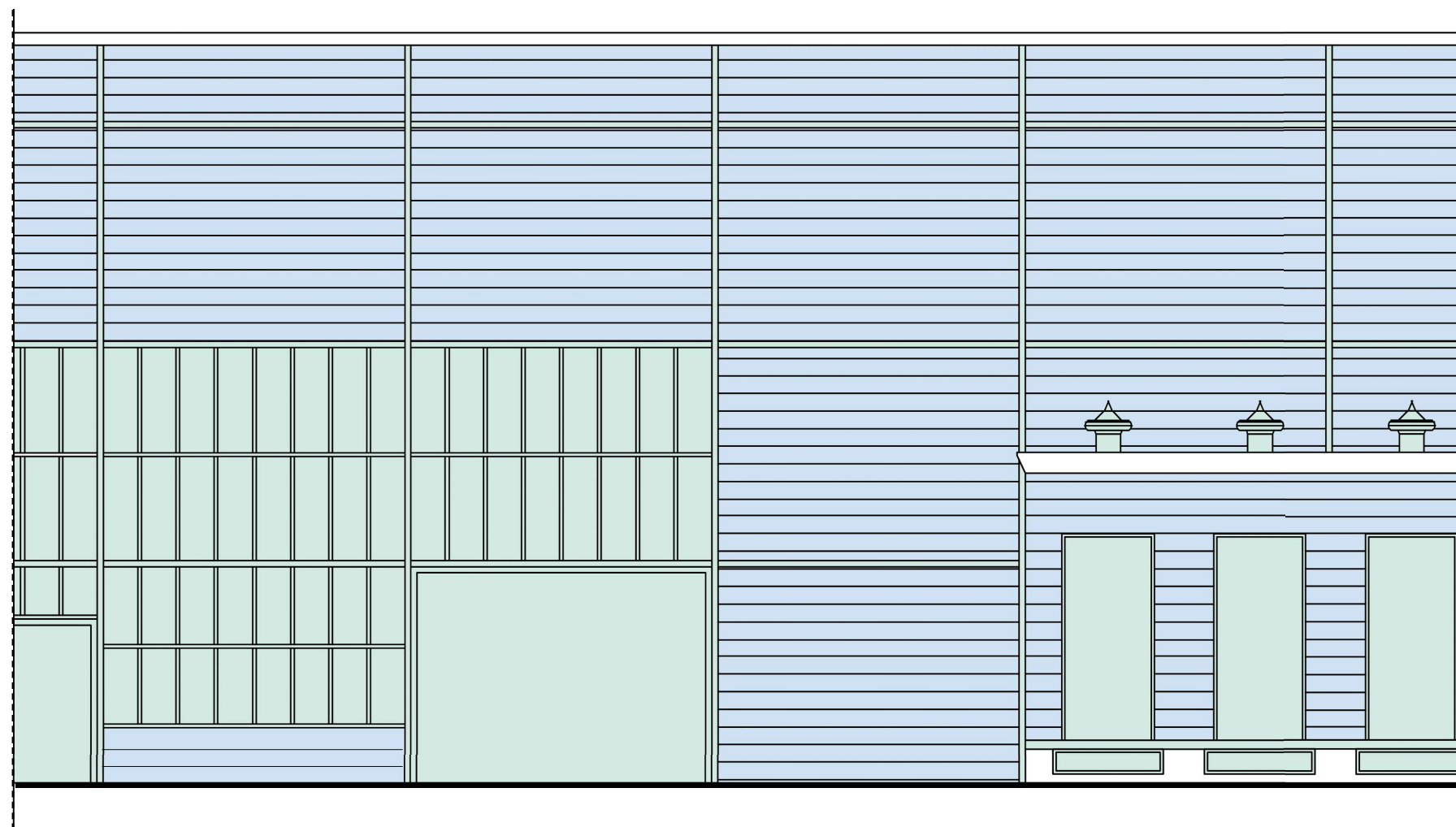
Figure 118. Outcome Values & Attributes survey 1:100 East Facade (Tol, 2020)

14:30 - 15:20 - "Round 1"
The first round, which comprised making an intervention on the Kabelfabriek II, gave insight in the wishes, needs and ideas for the Kabelfabriek II. These were presented in the following phase 'Presentation Round 1'. Additionally this phase clarified the level of use of the tool Minecraft. Two of the five participants tried making an intervention in the Minecraft model. The others were helped by the present master students. It became clear that the older generation needed more time to get used to the game tools, compared to the younger students of the trial workshop. Therefore it is expected that this tool will be used more often in the future.

Mostly Minecraft is used as a visualising tool and the model is used to come to a consensus building. Especially for non experts Minecraft is a pleasant tool to visualise. The tool of building and removing is easy to use and to understand. However the game Minecraft is too slow in building and removing parts for larger interventions. Therefore the computer program Sketchup could be more useful for building and removing larger building sections. Furthermore, Minecraft only has the option of building and removing instead of moving blocks. This could be a contribution to solve the realization of sustainability. It could be a contribution to heritage preservation in general. In order to make their ideas visible at a faster pace, instead of using Sketchup, tracing paper and a floor plan was now used in combination with Minecraft.

15:30 - 15:50 - Presentation Round 1.
Delfia Batavorum
Delfia Batavorum stated that there are two important topics to address. Firstly, one should feel to be invited to go inside when standing outside. Secondly, one should see or know what happens inside. This resulted in a clear entrance and more transparency. Besides, it was stated that the Kabelfabriek II should be opened up, while maintaining the history and the solid, strong industrial character of the building.

Figure 120. East facade should have a clear and transparent entrance. (Tol, 2020)

Figure 121. More openness but still maintaining the solid, strong industrial character. (Tol, 2020)

User/neighbour
The user and neighbour stated that the enormous scale of the Kabelfabriek II is difficult to work with. They would like to see the human scale in more patios with a path through the Kabelfabriek II. Furthermore, they wanted to break through the monotony of the long Schieweg and therefore created the 'Schiebeach'.
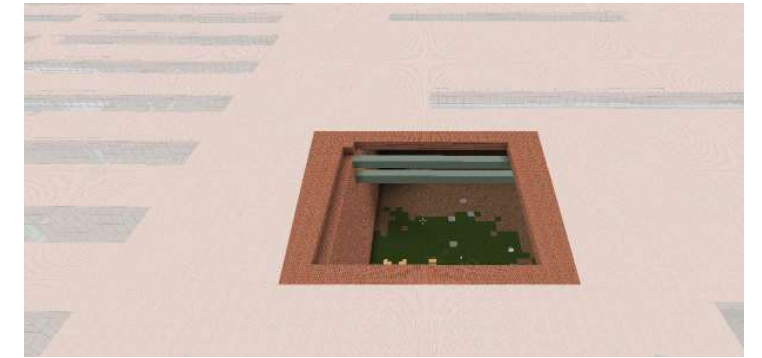
Figure 122. A path through the factory. (Tol, 2020)
Figure 123. Human scale in more patios. (Tol, 2020)
Figure 124. 'Schiebeach' (Tol, 2020)

TU Delft Campus
Professor in the Management in Built Environment stated that when developing the Kabelfabriek II it is important to make a better connection with the train station Delft Campus. The road connecting could be a colonnade and have a pavilion.

Figure 125. A pavilion to create a better connection between the Kabelfabriek II and the train station Delft Campus. (Tol, 2020)

Architect
The architect stated that the high rise should contain working and living sections. Additionally it was stated that green should be added in many places. For example a green indoor street, instead of the current existing indoor factory street or for instance a "green air-bridge" for the inhabitants of the high rise buildings.

Figure 126. High rise containing working (below) and living (above). (Tol, 2020)

Figure 127. Green should be added for example in the patio. (Tol, 2020)

15:50 - 16:30 - "Round 2 + open discussion"
At first sight it seemed that there were no conflicts in any of the design ideas. Therefore, an extra round, where the stakeholders would have worked together in groups of two, was skipped. All the design ideas of the stakeholders were situated at another place in the Kabelfabriek II. However a closer analysis of the discussion reveals that below the surface indeed there were differences of opinion.

The first issue that was debated relates to the way the Kabelfabriek II should be developed. On the one hand it was argued that should be "a free state", meaning the future users and tenants of the working section should be free in developing their own working area. On the other hand, a need for a more rigid approach was felt through a framework well planned in advance.

The second discussion started with the statement made by the professor at the TU Delft, Management of the Built Environment, who said that the design challenges lies in applying the human scale versus preserving the industrial character of the Kabelfabriek II. The city architect argued that the intangible (e.g. use and spaces of the Kabelfabriek II) should also be considered and preserved, next to the tangible attributes. There is a conflict between running a business, the increasingly strict norms imposed by the government, and the desire to create a working and living environment as diverse as possible in the Kabeldistrict. The question, as part of the discussion, raised was to what extend it is possible to set up making industry with a production clean enough to be based in a living environment.

The third point of discussion focussed on the high rise designed by Mei Architects and Planners (2020). A current user of the Kabelfabriek II reasoned that high rise, as high as seventy metres, would be detrimental to the industrial character of the Kabelfabriek II and its environment. Delfia Batavorum argued the opposite by giving the example of the revamping of the Katendrecht neighbourhood in Rotterdam, where old and new blend together perfectly. At the same time it was argued that to make the project financial feasible building high rise is inevitable. The down side of such an upgrade are the inherent rising costs for the tenants of the making industry, especially start-ups who are typically strapped for cash.

The final discussion was about where to locate the high rise. On the one hand, Delfia Batavorum and the city architect, were in favour of placing high rise at the waterfront. On the other hand, the current user stated that the high rise should be located near the railway in order to maintain character of the original facade at the waterfront. The former inhabitant of the Kruithuis, a monument next to the Kabelfabriek II, loathes the idea of the Kruithuis being overshadowed by high rise, at the same time harming the monumental status of this 17th century building.

16:30 - 16:40 - Minecraft evaluation form
The evaluation form consisted of six closed questions, to asses between one and five, and four open questions. With respect to the closed questions, the participants were asked to rate the quality characteristics of their play experience with Minecraft, one being the lowest rating and five the highest.

The first closed question was about the game design: this refers to the appeal and artistic visual design on how a game is designed. Four participants rated this characteristic at four and one participant graded this a one.

The second closed question was about usability: this refers to how quick and easy it is to accomplish the tasks in the game. Three participants rated this characteristic at four and two participants graded this a three.

The third closed question was about engagement: this refers to how the game impacts and affects the user's motivation, and whether it encourages to use the game out of curiosity, interest and desire for challenge. Four participants rated this characteristic at four and one participant graded this a five.

The fourth closed question was about playability: this refers to how the functionality linked with the usable tools supported an effective and pleasant interaction with the game. Three participants rated this characteristic at four and two participants graded this a three.

The fifth closed question was about the learning outcomes: this refers to the knowledge gained by the users after interacting with the game. Four participants rated this characteristic at four and one participant graded this a five.

The last and sixth closed question was about social interactions: this refers to how the game impact or influence the user to socialise with other users.

Three participants rated this characteristic at four, one participant graded this a five and the other participant graded this a three.

The open questions were not filled out by all participants. Of the five participants two answered all three open questions, two persons one or two questions and one person did not answer any question. However the main conclusion of the closed questions is that the game Minecraft is considered to be a great tool in terms of game design, engagement, learning outcomes and social interactions. There is room for improvement for the characteristics, usability and playability. The conclusion of the open questions is that the scale of the Kabelfabriek II is too big for the game. However the visualization was considered to be adequate and suited for public participation.

4.5 CONCLUSION

The first sub question is:
How can heritage games support the value assessment of stakeholders for the redesign of the Kabelfabriek II in Delft? (Digital heritage)

This question can be answered through the research on the heritage game Minecraft. One can state that the game Minecraft is a proper simulation tool to communicate with the stakeholders. Especially the visualization in the game contributes largely to the civic participation and engagement, especially for non-experts. However the game is too slow for the scope of the project the Kabelfabriek II, since you can only add and remove blocks of $1m^3$. New modifications on Minecraft point to new possibilities of removing and adding more blocks at once. This should be incorporated in future workshops. Therefore a program like Sketchup is a better alternative. Minecraft serves as a basis enabling the participants to form a well founded judgement on how the Kabelfabriek II should be redesigned. It is a powerful tool to communicate design ideas and to negotiate with different stakeholders.

Figure 128. Final Minecraft model with all stakeholders' desires. (Tol, 2020)
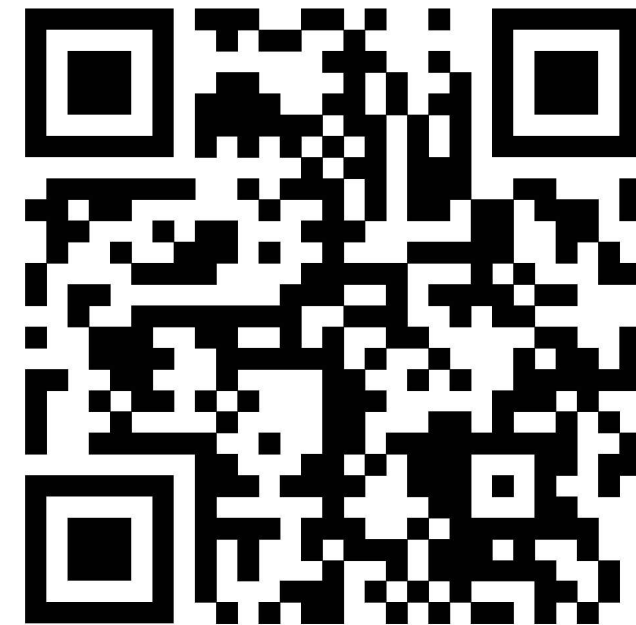
QR-code to a film of the Kabelfabriek II in the Minecraft game.
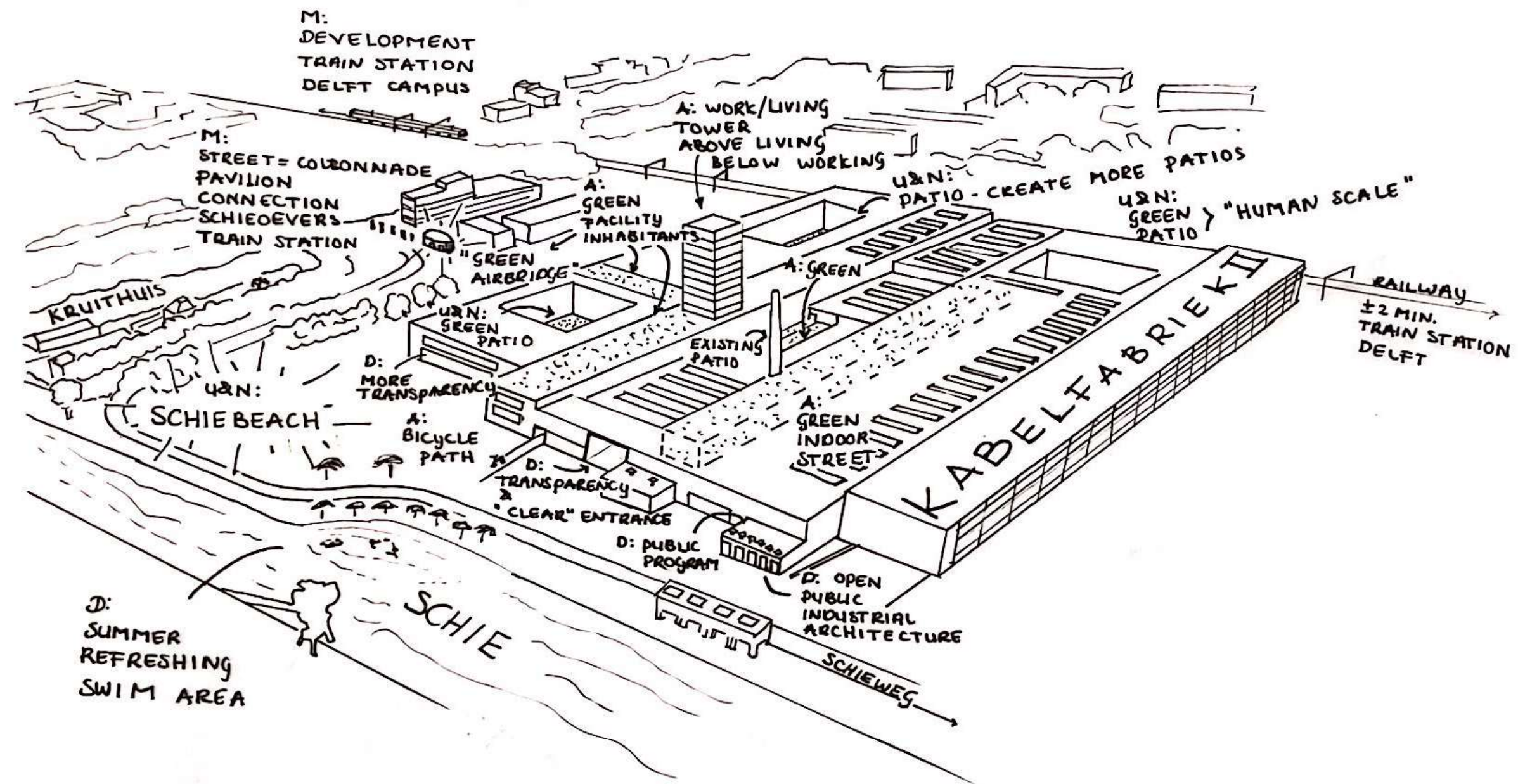
Figure 129. This drawing made shows the design ideas of the stakeholders. The drawing is based on the famous drawings of Jan Rothuizen. (Tol, 2020)

05   DESIGN, STRATEGY & SUSTAINABILITY

5.1. ANALYSING THE PROGRAM

What design relation with the TU Delft Campus and the city of Delft could be supported by the Kabelfabriek II? (Univer-Cities)

To answer this sub question historic research is done on the city of Delft, the TU Delft Campus and the Kabelfabriek II to find the relations between these parties. Part of this research was the interview with expert Ilse Rijneveld, monument advisor at the municipality of Delft. Next to this the current relation between of the above is researched, in which the expert interview with Anne-Lize Hoftijzer, manager real estate development TU Delft Campus, was of great influence. On top of that the stakeholders of the workshop, as described in the previous chapter, were asked to give their opinion on a program for the Kabelfabriek II.
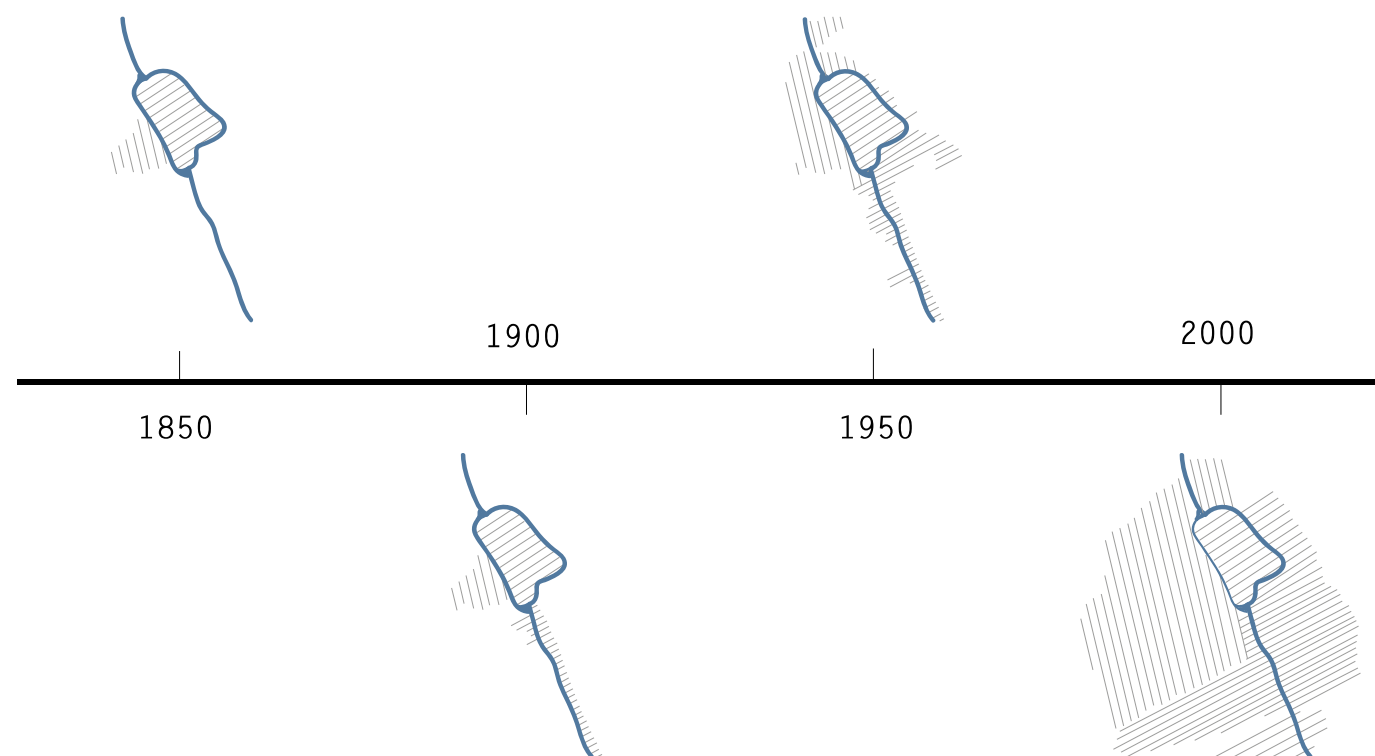
Figure 130. Timeline the city of Delft. (Tol, 2020)

A brief summary of the city of Delft and the TU Delft Campus is the following:
Around 1850 the walled city Delft is a small market city with a function for the agrarian area, with some factories like 'vijlenfabriek' and 'glazfabriek'.
Around 1900 Delft has become a real so called industrial city. The industry is mainly situated next to the canal Schie. Even the 'Polytechnische School' grew enormously.
In 1905 the 'Polytechnische School' changed into the 'Technische Hogeschool'.
In 1950 the industry had recovered from the Second World War. Moreover, the 'Technische Hogeschool' had grown again.
Around 2000 Delft is no longer an industrial city and can be seen as a city of knowledge. The 'Technische Hogeschool' changed its name into the 'Technische Universiteit'. The industry together with the university, and

its predecessors, created the city of Delft over the past two centuries. (Van Walsum, 2001)

Next to the historie of Delft Van Walsum (2001) describes how the university and the industry were connected at the end of the 19th century. The contact between industry and the technical education was via people; developers and persons contributing their expertise. Professors of the Poly-technical School were asked for their advice. A good example was the agreement between the machine factory Reineveld and prof. J. Grundel, professor mechanical engineering of the Poly-technical School. He supervised the production of pumps for the Dutch East Indies, especially for the Java sugar industry. Furthermore, after the Second World War the duty of the Technical High-school was to deliver as many engineers as needed for the post-war reconstruction period. (Van Walsum, 2001)

As Van Walsum concludes (2001) that companies, which are situated nearby a Technical University, have the opportunity to easily connect with the university and benefit from the new developments at the university. Moreover, the other way around, the Technical University can make use of the possibilities which a company can offer (e.g. internships, part-time jobs and doctoral students). As said before, Van Walsum states that the industry together with the university, and its predecessors, created the city of Delft over the past two centuries. (Van Walsum, 2001)

This is in line with the slogan of the city of Delft, 'Delft Creating History', and the interview with Ilse Rijneveld. She states that the Kabelfabriek II is a fantastic site with an unique, industrial character and that nowadays when developing a city a diverse living area is needed. A mix of housing with workspaces creates a multifunctional area. Furthermore according to Ilse Rijneveld, Delft has a historic centre with the city grown around it. However by developing the Kabelfabriek II a new city centre arises between the train station Delft Campus and the Technical University. This will result in the city of Delft being a poly centre city. Referring to this, she expresses her concerns about the traditional historic skyline of Delft with its old church as a reference.

According to Anne-Lize Hoftijzer the Kabeldistrict is the perfect place for companies, which do clean production. She quotes Theun Baller, dean of the faculty of 3ME at the TU Campus Delft, who said the following a few years ago: "Wouldn't it be nice if we could relocate production that is now in China, move it to Schieoevers, integrated in an housing area by using knowledge of TU Delft of silence and clean and very efficient production." Furthermore, she cites the ambition of 'Bedrijvenkring Schieoevers'(Companies Association Schieoevers) as follows: "Wat TU Delft bedenkt, maken we op Schieoevers" ("What TU Delft invents, we create it on Schieoevers") Concluding she states that the meaningfulness of the identities both locations is acknowledged. On top of that, the physical connection, for example a bridge, is of high importance to create this symbiosis between TU Delft Campus and the companies. Recapitulating one can state that using the knowledge of the university

becoming production at Schieoevers is a clear ambition.

In line with this, is the document called 'Concept - Advies van de kwartiermakers - Ecosysteem voor kennis en economie' ('Concept - Advice of the quartermasters - Ecosystem for knowledge and economy') (Baller et al., n.d.). It consists of a common vision of the TU Delft Campus and the municipality on the theme of knowledge and economy. The document states that the Technical University is a continuous source of innovation and start-up enterprises. However the current situation, when these start-ups keep growing and expanding, is that they leave Delft. Facilities for production in Delft are scarce. Since production is becoming cleaner and more quiet and almost starts to be like prototyping, it is possible to situate this smart manufacturing in the city. This will result in an interaction and cross-pollination between technological innovation and production. On top of that, this will create more jobs and asking for a continuous curricular in line with the needs of business community. (Baller et al., n.d.)

In this report the Schieoevers is described as an area with a large economic potential. It used to be a mono-functional business area and should be transformed to a mixed area of living, working and recreation. These developments of smart manufacturing make it possible to create a complete economic chain from research, to design and prototype, till production. The combination of living and working in a clean and quiet way, will create a totally new and experimental work-living-environment. (Baller et al., n.d.)

As a result of the workshop the participants all agreed on the fact that the Kabelfabriek II should contain housing and working. Other functions as horeca facilities, shops and art galleries were suggested by all five participants.

What design relation with the TU Delft Campus and the city of Delft could be supported by the Kabelfabriek II? (Univer-Cities)

Concluding and answering the above sub question, the design relation between the Tu Delft Campus, the city of Delft and the Kabelfabriek II should include functional aspects. The Kabelfabriek II should make use of the knowledge of the university as was already happening in the 19th century. Therefore a combination of housing (e.g. student housing) and working will create a relation with the TU Delft Campus and will reinforce the city of Delft.

5.2. SUSTAINABILITY

How to redesign Kabelfabriek II Delft on sustainable attributes while preserving cultural values?

This sub question refers to the subject of sustaianaibility, which has been a hot topic during the past thirty years. The Universal Declaration on Cultural Diversity divided it into "four pillars: economic prosperity, cultural vitality, social equity and environmental sustainability." (UNESCO, 2001) For the second sub research question case studies are investigated. A list of design solutions is created looking at environmental sustainability, for example systems to control the climate in the building or layers to be added for insulation. Concluding, the focus of this research with regard to sustainability lies in energy efficiency and social inclusivity.

This sub research question focusses on the theme of sustainability. To answer this question the PhD thesis, titled 'Control Shift - European Industrial Heritage Reuse in Review', of Theodora Chatzi Rodopoulou (2020) is analysed and some relevant case studies are selected to integrate this research as good design practices. An interview with Theodora Chatzi Rodopoulou herself took place. Moreover, Benno Schepers of CE Delft, senior researcher/advisor and leader of the sector sustainable cities, has been interviewed as well. This provides an overview of sustainable design solutions of different case studies.

The chosen case studies of 'Control Shift - European Industrial Heritage Reuse in Review' (Chatzi Rodopoulou, 2020) are the following:
- Westergasfabriek, Amsterdam The Netherlands (Chatzi Rodopoulou, T., 2020)
- DRU Industriepark, Ulft The Netherlands (Chatzi Rodopoulou, T., 2020)
- Energiehuis Dordrecht (Chatzi Rodopoulou, T., 2020)
- Stanley Mills, Perthshire Scotland (Chatzi Rodopoulou, T., 2020)
- King's Cross, London England (Chatzi Rodopoulou, T., 2020)
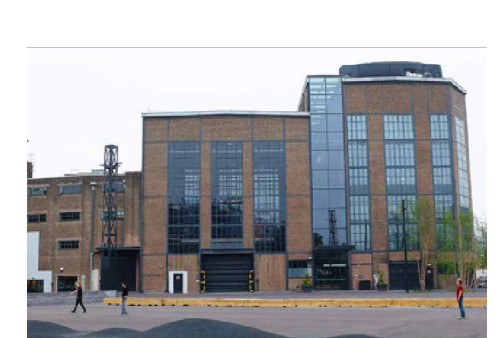- The Tobacco factory of Madrid, Madrid Spain (Chatzi Rodopoulou, T., 2020)

Figure 131, 132, 133, 134, 135, 136, 137. Westergasfabriek, DRU Industriepark, Energiehuis Dordre-cht, Stanley Mills, King's Cross, The Tobacco factory of Madrid. (Chatzi Rodopoulou, 2020).

The mentioned case studies are chosen either because the relevant buildings have been restored recently or because of similarities in their historic and/or new use or because of the size of the project. The case studies can be divided into three Dutch adaptive reuse projects and three abroad, England, Scotland and Spain. This provides a comparison between adaptive reuse in The Netherlands and abroad.

Chatzi Rodopoulou (2020) states several times that adaptive reuse embodies sustainability. It reduces 'high material use, transport energy, energy consumption and pollution resulting from new construction'; not forgetting social, functional, physical, financial and aesthetic sustainable solutions. (Chatzi Rodopoulou, 2020) The above results in the growing awareness that it is better to adapt buildings instead of demolishing and building new. Therefore one can state that adaptive reuse is an act of sustainability on its own.

Let's have a closer look at the case studies chosen. All three Dutch case studies, Westergasfabriek, DRU Industriepark and Energiehuis Dordrecht, and The Tobacco factory of Madrid have a problem with the inner climate. It is striking to see that the latter has no cooling nor heating.
Another issue for the three Dutch projects is economic viability. For example for this reason the Westergasfabriek is focussing more on profit which goes at the expense of cultural identity.
All projects have an important social added value except Stanley Mills and King's Cross because of its lack of community spirit or the creation of high-end flats. For instance DRU Industriepark provides a strong social function and is nicknamed "the living room of the area" (De huiskamer van de streek).

Figure 137. Stakeholders' consultation process (Liesbeth Jansen) (Chatzi Rodopoulou, 2020).

It is interesting to note that, in case of all three Dutch projects, stakeholders were involved, which had a positive effect on preserving cultural values. An example to the contrary is King's Cross, where a minimum transfer of power to stakeholders took place. "The ultimate decisions were in the hands of those holding financial and property power. Preservation of historic values is only partly achieved. Intangible heritage was preserved poorly" (Chatzi Rodopoulou, 2020).

In her research Chatzi Rodopoulou (2020) states that in botch case studies, Westergasfabriek and the Tabacco Factory of Madrid, maintenance is a major problem. The Westergasfabriek is trying to solve this with a sustainable update, whilst the Tabacco Factory is burdened by operational (e.g. cleanliness) problems. No explanation is given in 'Control Shift - European Industrial Heritage Reuse in Review' (Chatzi Rodopoulou, 2020), what this sustainable update consists of.

Concluding one can say that the concept of adaptive reuse is sustainable. However Chatzi Rodopoulou (2020) doesn't exhibit sustainable attributes or design solutions for preserving cultural values. Therefore the interview with expert Benno Schepers is of importance for answering this sub question.

Benno Schepers of CE Delft, senior researcher/advisor and leader of the sector sustainable cities, has been interviewed to gain knowledge on sustainability, his expertise. His interview can be read in chapter 8 "Annex".

The first important statement he makes, is the difference of a building being listed as a monument or not. As for the Kabelfabriek II, not listed as a monument, this means that the architect has more freedom in designing. However the BENG ("Bijna Energie Neutraal Gebouw"/Almost Energy Neutral Building) norms, at the moment the most stringent regulations, have to be complied with. This means that the amount of primary energy use per square meter is limited and that a certain amount of renewable energy for the building or premises has to be produced. Therefore one has to seek for a method either to reduce the energy demands of the building and to produce renewable energy.

Another important statement made by Benno Schepers in terms of heating and cooling, is that at the moment most designs are based on the situation in which the heat demand is larger than the cooling demand. Schepers argues that it should be the other way around, due to the climate change. To create an overview of sustainable design solutions this theme is divided into the following subjects:

- Insulation
- Sun
- Water
- Wind
- Green
- Function
- Waste
- Heating
- Cooling

Insulation
The most obvious and well-known method to reduce the energy demands of the building is by insulating the building well. Concerning the Kabelfabriek II the exterior brick façades are valuable in terms of heritage conservation. Therefore an extra wall with insulation should be added on the inside of the façades. The more expensive part of insulating the building will be to modify the glass of the current windows. Finally, the floor and roof should be insulated as well. Summarizing, an extra layer should be attached to the whole skin of the Kabelfabriek II.

Figure 138. Insulation and brick facade (Wavlo - Isolatiebedrijf, n.d.)

Sun
Sun is a hot topic in terms of sustainability. First of all, as mentioned before, the cooling demand is larger than the heating demand due to climate change. Therefore it is necessary to keep the sun out in summer in order to maintain a comfortable living climate inside the building. This can be done by adding sunshades and the type of glass you choose for the windows. Special glass exists with a sun-shading coating, which reverberates or absorbs the sunlight, resulting in reducing the heat of the sun whilst the light of the sun is still coming through.

Figure 139. Sunshades (DUCO, n.d.)

Figure 140. Sunshades (Crown, 2013)

The opposite of to keeping the sun out, is utilizing the renewable energy provided by the rays of the sun. The most well-known method is placing solar panels on the roof. Therefore, the more surface you have the more you can produce. Nowadays more innovative ways, other than placing solar panels on the roof, are possible. For example by using vertically placed solar panels and solar collectors attached to the façades or photovoltaic cells in window glass. Schepers argues referring to the plans of Mei Architects and Planners, that the high rise will create a lot of shades, less surface for placing horizontal solar panels and the square footage of vertical solar panels is limited.

Water
The canal the Schie, next to the Kabelfabriek II, can be of benefit in two ways. On the one hand it can be used for cooling in the summer. However since it is a canal the amount of usable cool water is limited, compared to a large lake or river, which are deeper. On the other hand, the Schie can be used as a heat source to collect the heat in summer. Subsequently the heat will be put in an aquifer in order to be used in winter together with a heat pump, which is called aqua thermal energy. Yet it is more favourable to use a higher, all year around available, heat of a data centre that is close by.

Another sustainable aspect referring to water is a grey water system. This means that wastewater (grey water), except from the toilet, is filtered and used for flushing toilets or used in the garden. In this way it is a circular system.
Similar to this system is the rainwater-system. A system where rainwater is collected and filtered to be used for cleaning, flushing toilets, washing machines and personal hygiene.

Furthermore water of ponds, fountains and ditches contribute to a cooler climate in the city.

Referring to the Schie en the Kabelfabriek II, the use of water power is not feasible.
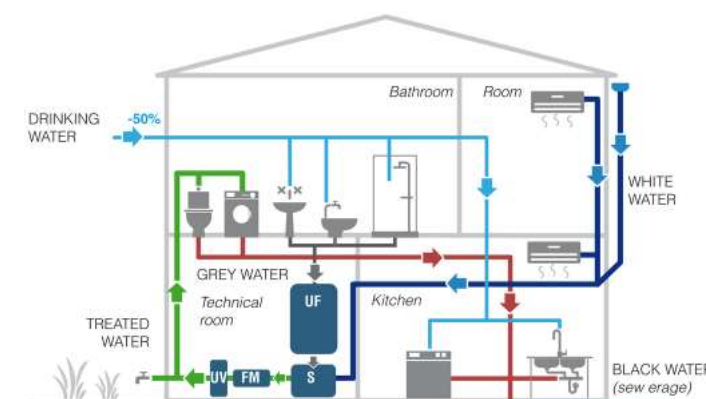

Figure 141. Water-systems (Aliaxis, n.d.)

Figure 142. Fountain for cooling at King's Cross (Shutterstock, 2019)

Wind

Wind can be used for renewable energy. According to Schepers using wind energy is not feasible. Wind mills will cause to much discomfort in an urban environment. On top of that, other wind turbines are still very experimental.

Figure 143 & 144. Wind turbines (WIND POWER, n.d.) (Sagrillo, 2017)

Green

By using the term 'green' one can think of green roofs for collecting rainwater and cooling in summer. Since the roof itself, except the roof windows, is not valuable in terms of heritage conservation, a green roof could be a sustainable attribute whilst preserving the cultural values will. Not only the roofs can be covered with green for absorbing water, also placing more green on ground level is sustainable (e.g. parks, plants and less pavement). Coming back to the green roofs, various types are available nowadays. The combination of a green roof with solar panels could be applied on the Kabelfabriek II. There is also an important positive side effect relating to human nature. There is scientific prove that people are attracted to 'green', which even has a healing effect (Van den Berg & Van Winsum-Westra, 2006).

Figure 145. Green roof (Yoneda, 2014)

Figure 146. Less pavement (Michele & Miquel arquitectes & pasaitgistes, n.d.)

Function

A mix of programs can be of benefit in terms of sustainability. Different users, different types of family and different companies can use each others energy and it will lead to an even energy use during the entire day. "The more divers, the more you can use from each other" according to Schepers.

Waste

In terms of circular waste or waste reuse, the Netherlands already have a good recycling system. Therefore a local system is not necessary according to Schepers. However one suggestion given, is the use of a sink garbage disposal unit. To achieve this, the whole neighbourhood should have such a grinder in their sink in order to maintain a large amount of biomass in the sewage system. This biomass will be burned producing heat which is used as a source for bio-energy.

Figure 147. Sink garbage disposal unit (2021 Recycling.com, 2021)

Heating and cooling

For heating and cooling different methods are already mentioned. Additionally to these, other methods are suitable for the Kabeldistrict. Firstly it needs to be mentioned that old buildings, like the Kabelfabriek II, are difficult to heat with water with a temperature lower than 70 degrees Celsius. For heating the building there are two methods:

Firstly, connect the Kabeldistrict to the "Warmterotonde" (Dutch for heat roundabout). This is a large project that is being developed as we speak. Heat is transported from the harbour of Rotterdam via Delft to The Hague and Leiden. In the ideal situation the geothermal energy of the horticulture in Westland is connected to this transport system to among others Delft. This is heat of 70 degrees Celcius. The neighbourhood Tanthof and the Technical University Delft most lilkely be connected to the geothermal source. The Kabelfabriek II, situated exactly in the middle, could be a linking pin between the two neighbourhoods.

Secondly, is the use of a heat pump together with aquifer thermal energy storage (ATES) (WKO in Dutch). Next to heating in winter, this system also provides cooling in summer. Moreover, the soil of Delft is very suitable for such systems. However to produce enough heat for all the building sections, a

large set of heat pumps is necessary. Furthermore this system can be connected to another heat source, for example a near by data centre. Most data centres provide water at a temperature 30 degrees Celsius. In order to use it for heating an old building, like the Kabelfabriek II, a heat pump is needed. For this purpose, two ways of warming up the water to 70 degrees Celsius are possible. On one hand, the distribution of water at a temperature of 30 degrees Celsius requires a lot of individual heat pumps. On the other hand, the economically most viable option is to heat the water at the data centre with huge heat pump. Albeit both options are applicable for the Kabelfabriek II, the heat of the data centre is more efficient for use in newly built buildings, as said before. Nevertheless the use of aquifer thermal energy storage (ATES) together with a cooling system, that extracts heat from the building, is a good suggestion.

By preserving the cultural values of the Kabelfabriek II, the identity of the neighbourhood is maintained, which contributes to social inclusivity.
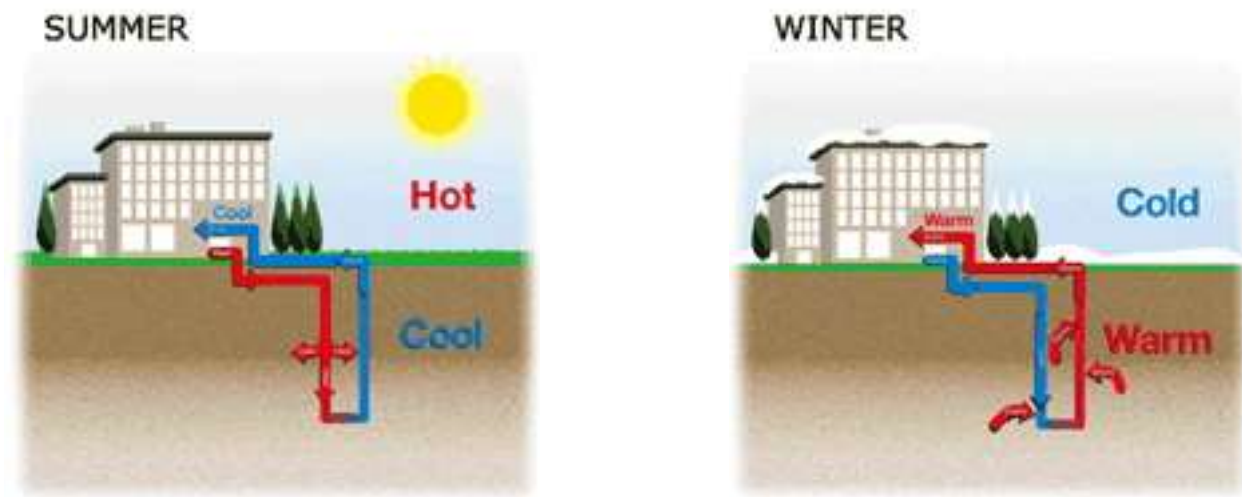
Figure 148. The use of ATES and heat pump in summer and winter (Hoffman, 2013)

How to redesign Kabelfabriek II Delft on sustainable attributes while preserving cultural values?

Concluding and answering the sub question, one could state that designing adaptive reuse for the Kabelfabriek II is sustainable on its own. To do this different methods can be applied. Firstly, the skin of the Kabelfabriek II should be insulated from the inside. Secondly, renewable energy can be produced by placing solar panels and collectors on the roof and façades and/or photovoltaic cells in the window glasses. With respect to water, green roofs can be placed to collect rainwater, together with a grey water system. The public space should be designed with facilities for collecting rainwater for cooling down the public space. A mixed, diverse program of functions should be placed in the Kabelfabriek II in order to create a sustainable energy use during the entire day. Aquifer thermal energy storage together with the 'Warmterotonde' will ensure a sustainable way of heating and cooling the Kabelfabriek II whilst the cultural values are preserved. Using green will enhance the social inclusive sustainability.

BASIS
Since the municipality of Delft already described its vision for Schieoevers Noord and assigned the square meters for dwellings and workspaces in the Kabeldistrict, the urban plan of Mei Architects and Planners is used as the basis for the preliminary design, Kabelfabriek 2.0.

+ POSITIVE POINTS

o Preservation of the structure

o Preservation of the skin

o Schieweg turning into a green park

o Street pattern North - South

o Schieweg moved to the West side of the Kabelfabriek II
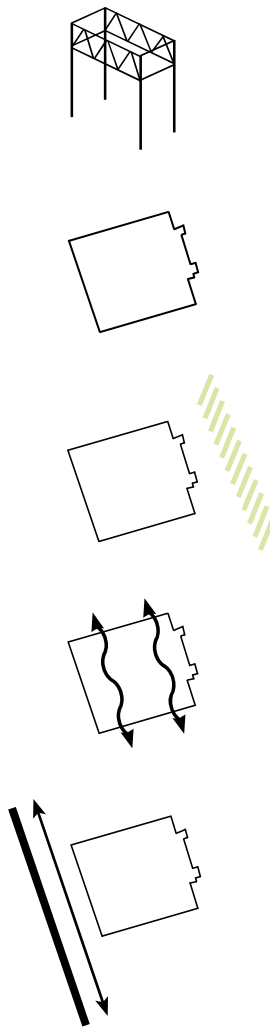
— POINTS TO IMPROVE

o Visible length of the Kabelfabriek II

o Positioning of the high rise, Kabelfabriek II patio "pit" not tangible/visible

o Too much high rise and too high

Figure 149. Urban plan (Mei Architects and Planners, 2020)

VALUES & WISHES
In a simplistic way this drawing shows the outcome of the involvement of the stakeholders. Their wishes combined with the author's wishes can be summarized as follows:

o Preserve the skin

o Preserve the length of the halls

o Preserve the orientation of the Kabelfabriek II towards the Schie

o Preserve the big brick chimney

o Adaptation (no removal) is possible for the small chimneys and other industrial objects, which refer to the historical and industrial character

o Adaptation (no removal) is possible for the patio with its barrel

o No need to preserve the current floor plan

o Less high rise

Figure 150. Values Kabelfabriek II (Tol, 2020)

BOTTLE NECKS
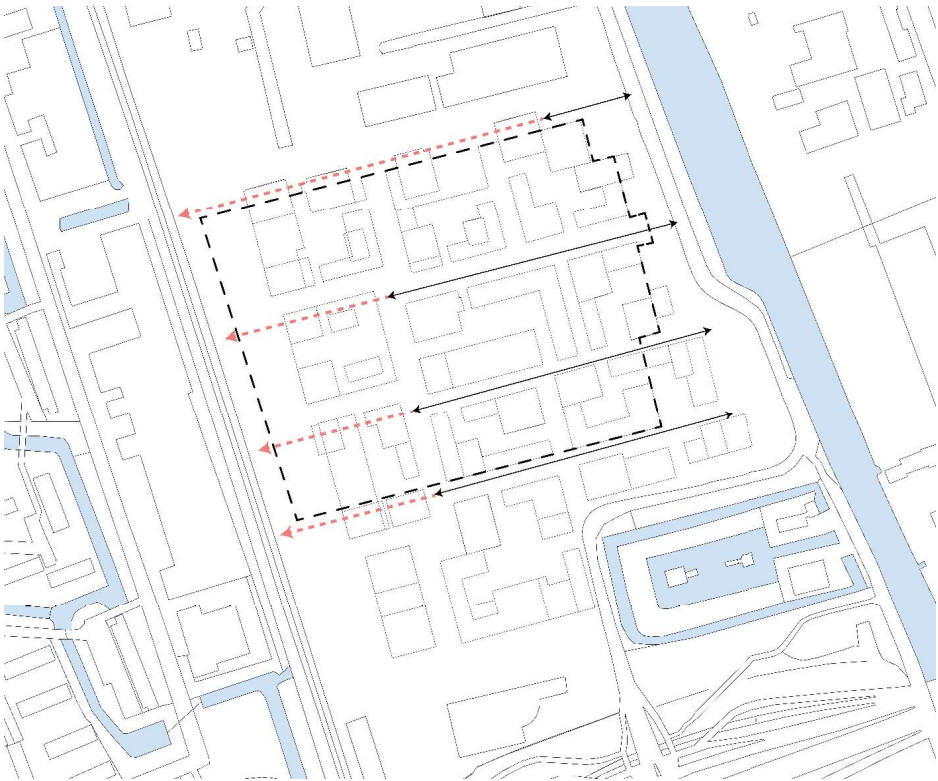
Length of the Kabelfabriek II not visible
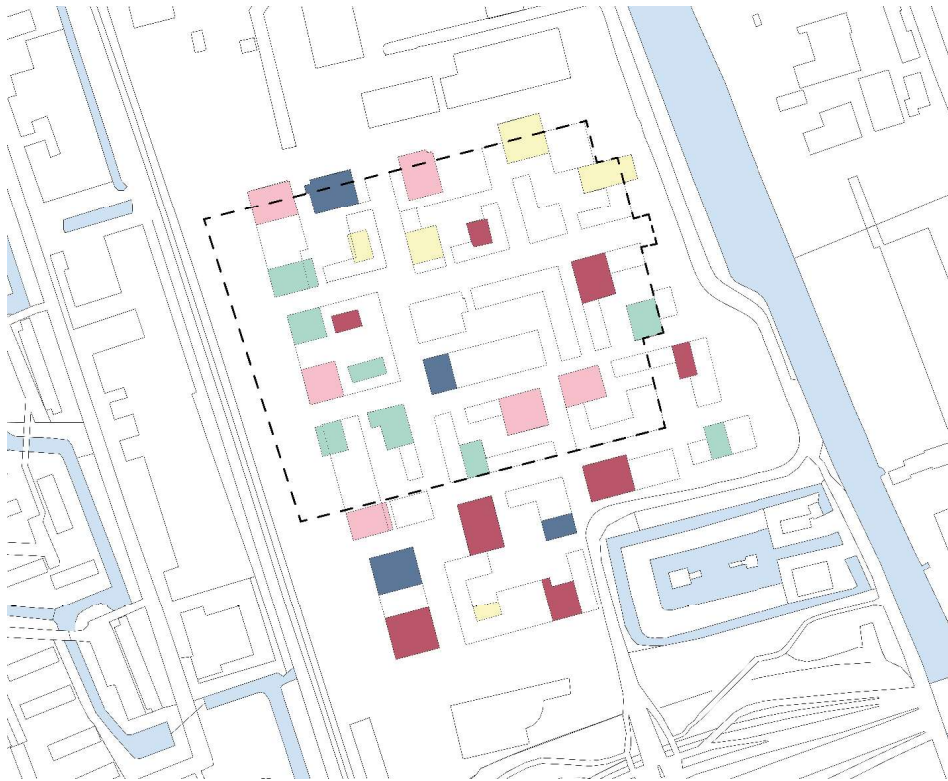
Positioning of the high rise: Kabelfabriek II patio "pit" not visible. Too close to monument, Kruithuis. A lot of high rise.

■ (dark red)	90 m or higher
■ (pink)	70 m
■ (yellow)	60 m
■ (green)	45 m
■ (blue)	30 m
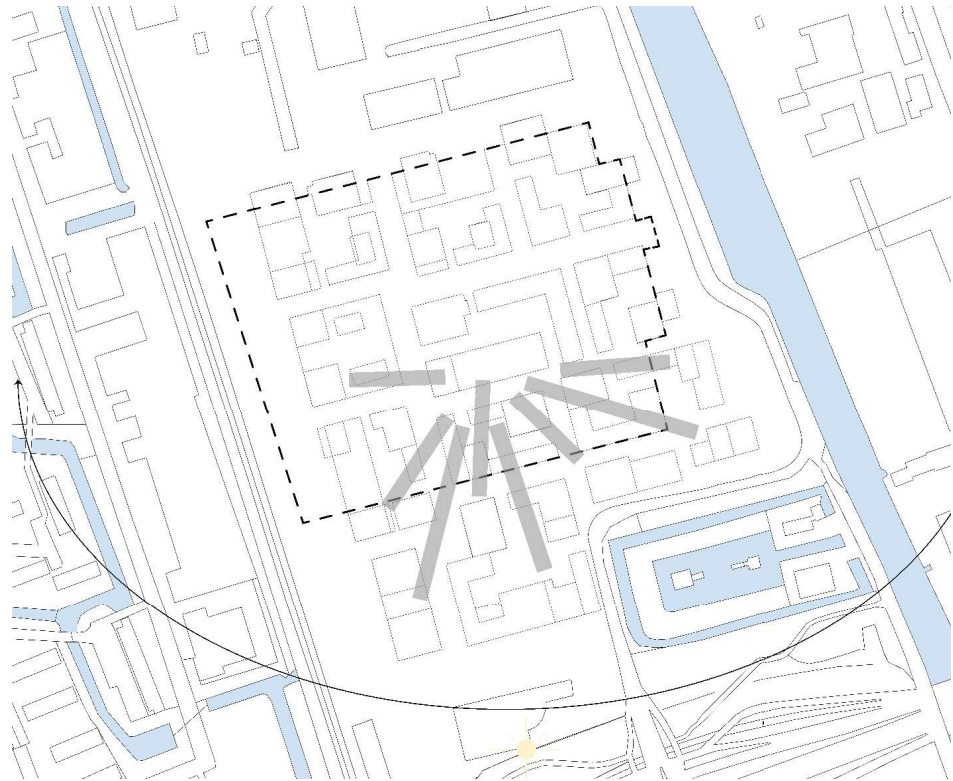
High rise creates a lot of shadow.

STARTING POINTS
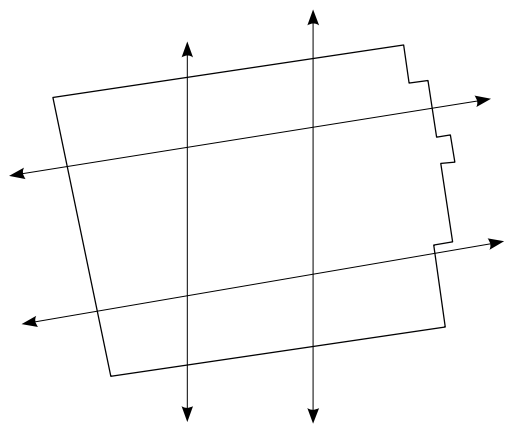
Street pattern:
North - South
East - West
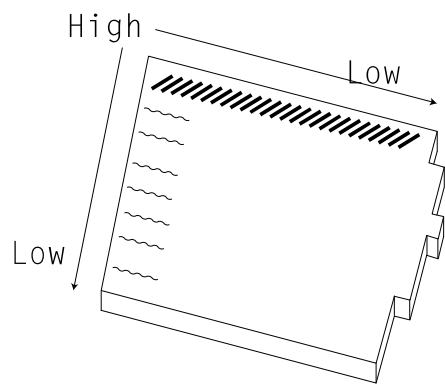
High
Low
Low

Hierarchy: from high to low
in order to keep the east
facade 'free'.
Zoning high rise and
medium rise; North side
and East side as barrier
for railways.

Living
Public/'active'
plinth
Semi-public
Public
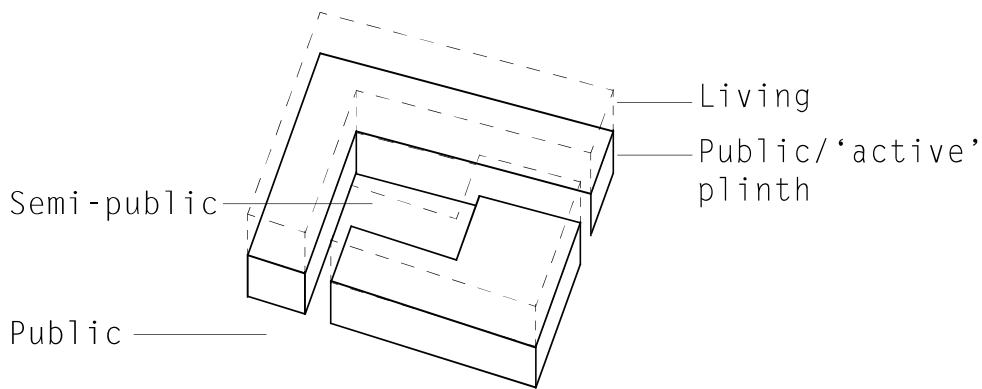
Program:
semi-public versus public
living versus 'active' plinth
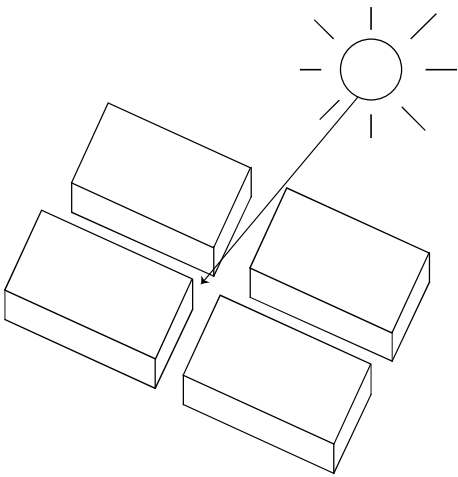
Day-light, air, space, openness.

DESIGN SOLUTIONS
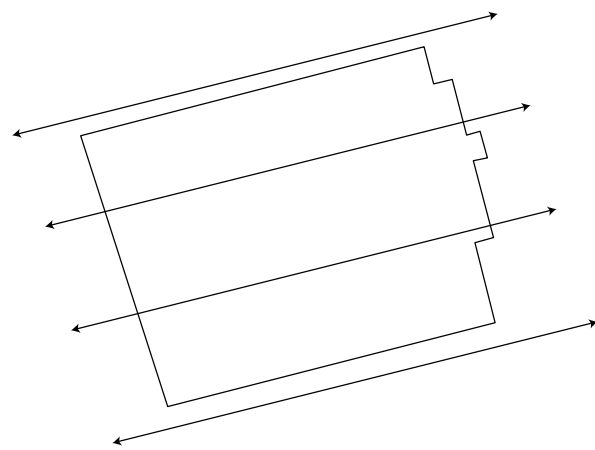
Create visible sight lines in length
of the Kabelfabriek II.
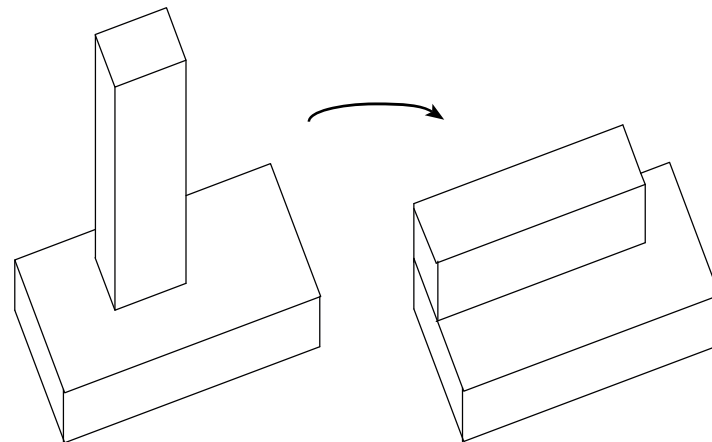
Flip the high rise to medium rise.
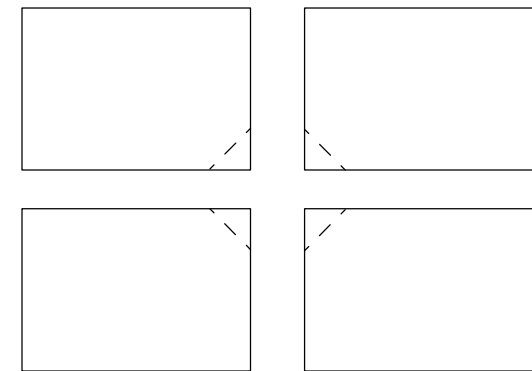
Cut off the corners to create openness,
squares, light and air similar to the
Plan Cerda in Barcelona.

NEW URBAN CONCEPT
Scale 1:2000

This drawing shows
the new urban
concept with its
starting points and
design solutions.
The dotted line
is the existing
factory.

N
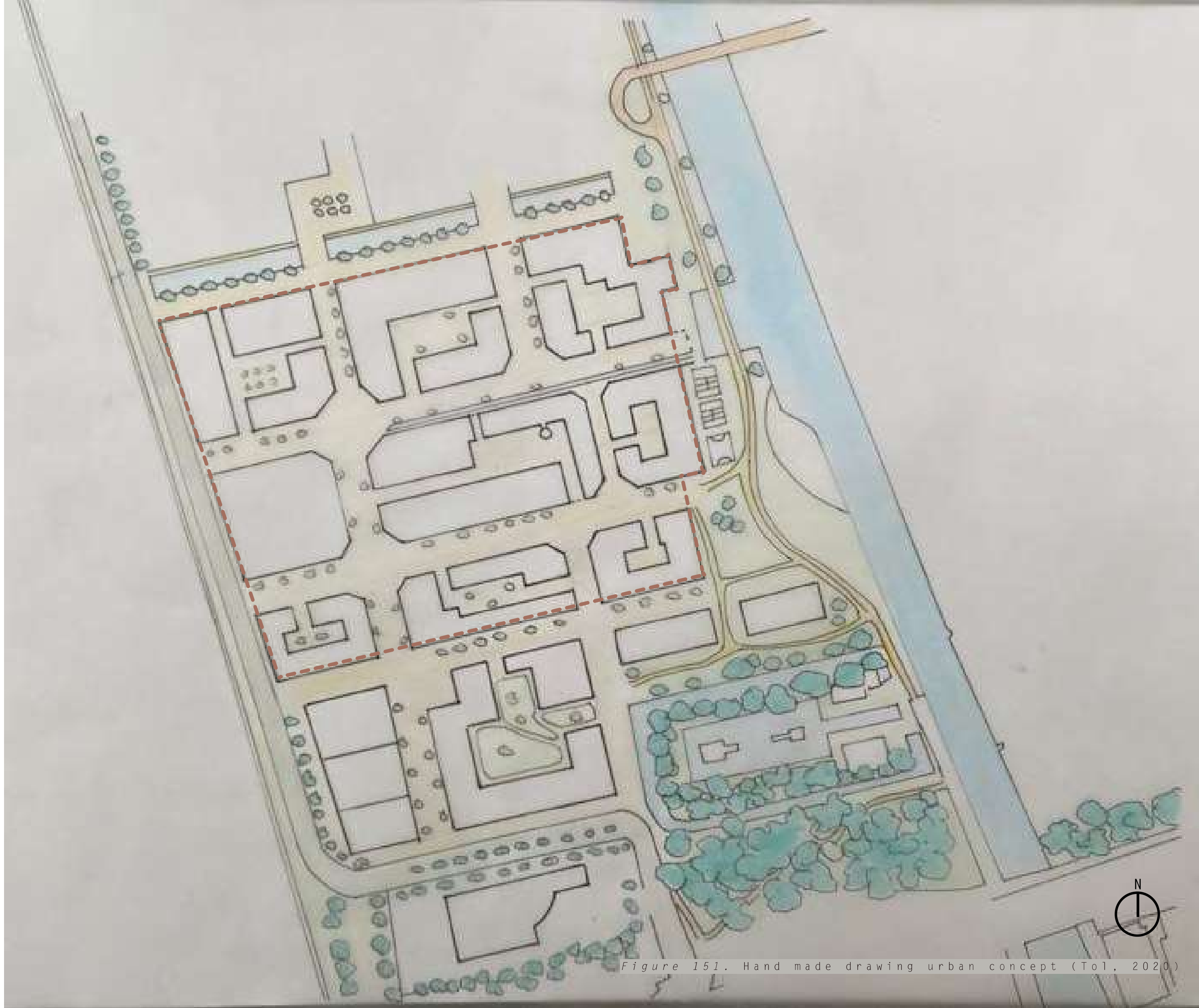
Figure 151. Hand made drawing urban concept (Tol, 2020)

NEW URBAN CONCEPT SHAPE
Axonometry
This axonometry shows how the high and
medium rise could be divided, whilst
the starting points were adhered to.
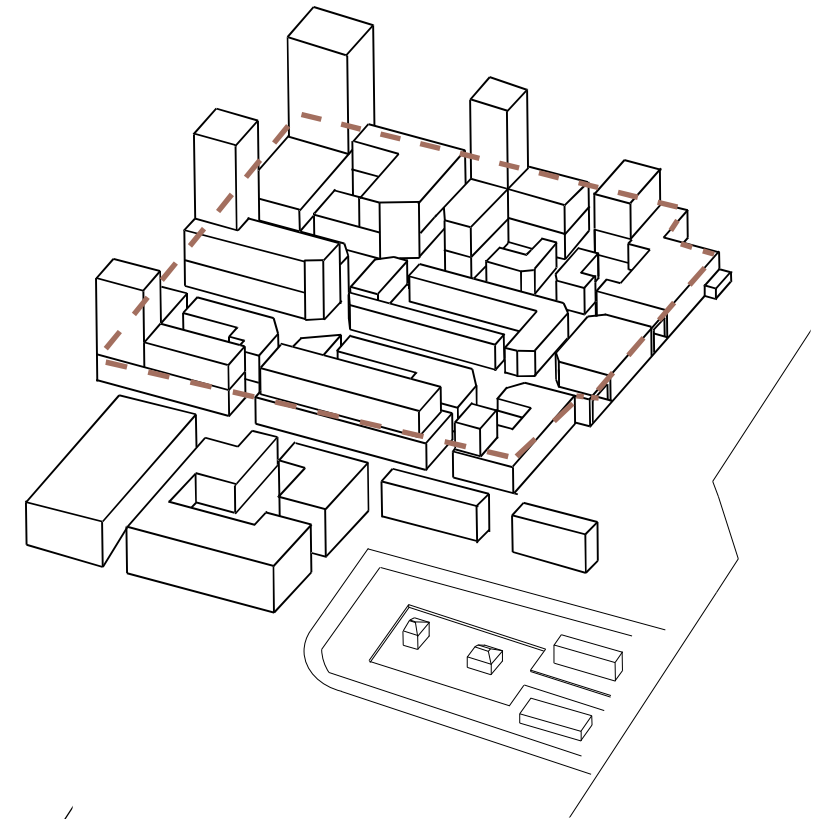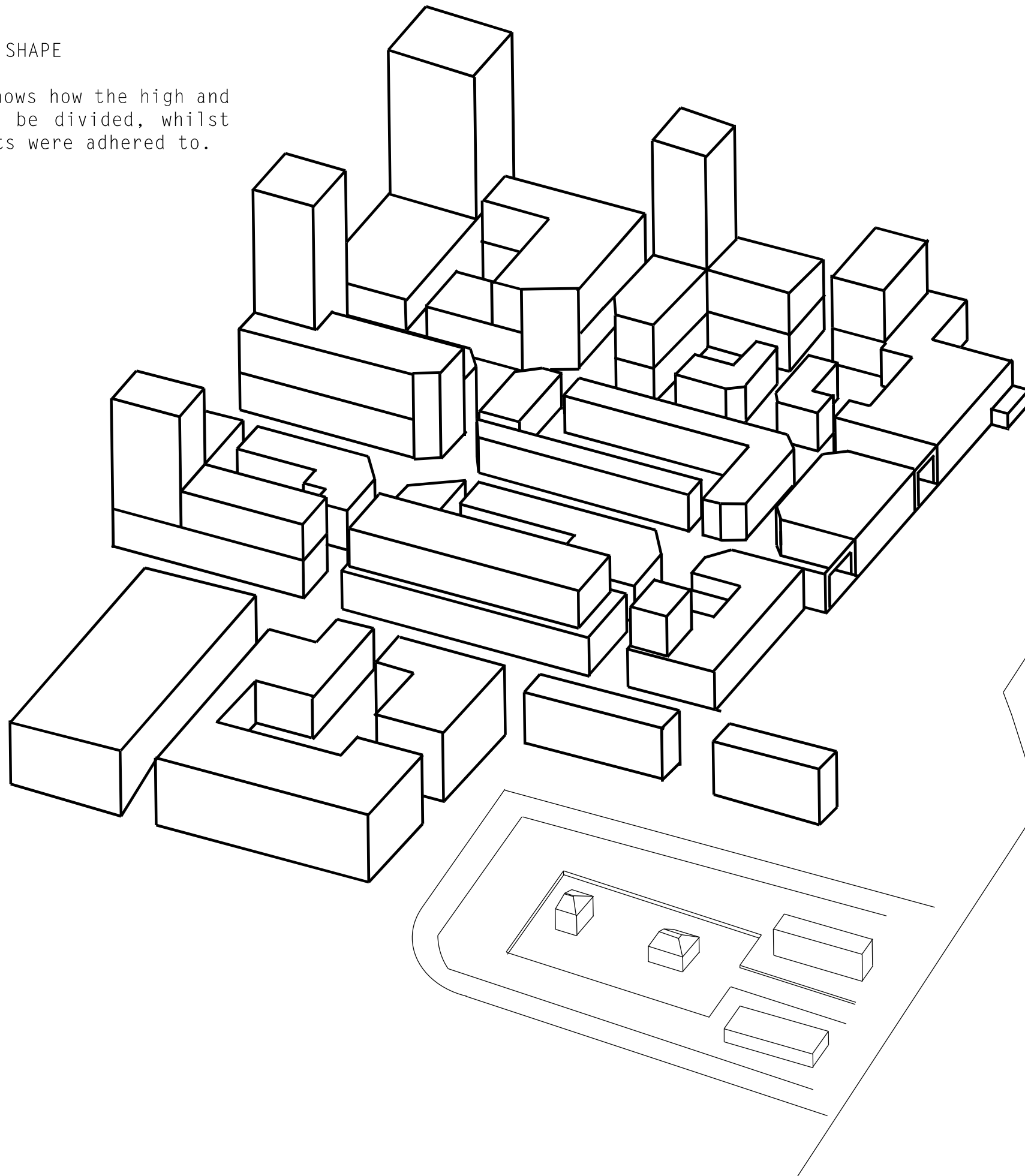
Figure 152. Urban concept axonometry (Tol, 2020)

NEW URBAN CONCEPT
Section 1:1000
This section shows among others the structure of the factory, which will be
visible in public space and inside the buildings. Furthermore, the 'indoor'
factory streets are shown.
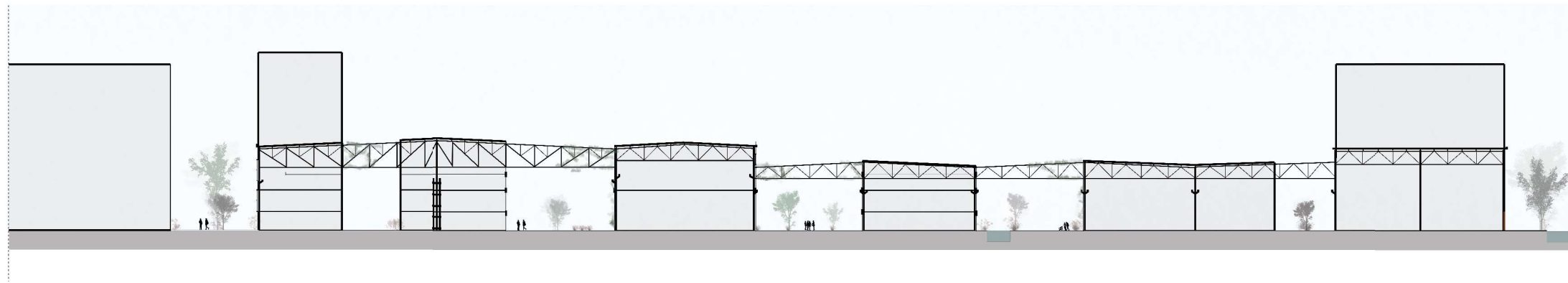
Figure 153. Section urban concept (Tol, 2020)

NEW URBAN CONCEPT
Scale 1:2000

Program

The neighbourhood will be a mix of
working and living. It will consist of
dwellings for families, students and
(young) professionals. Furthermore,
residential work homes will be realized.
Next to this, start-ups, part of the
creative industry, and other facilities
will be realized.

◻ Living

◻ Residential work homes

◻ Creative industry, start-ups

◻ Horeca/Shops facilities

Figure 154. Program urban concept (Tol, 2020)   80

SUGGESTION FOR ZOOMING IN
Scale 1:500

This page shows the suggestion to work on during the next, design, phase.
This part of the factory will consist of new and old parts, where a dialogue
should be created. Furthermore, the challenge lies in mixing the programs.

New topping up

Horeca facility
Connection Schie

Collective/Semi-public

Old Facade

Residential work homes

Public

Old facade
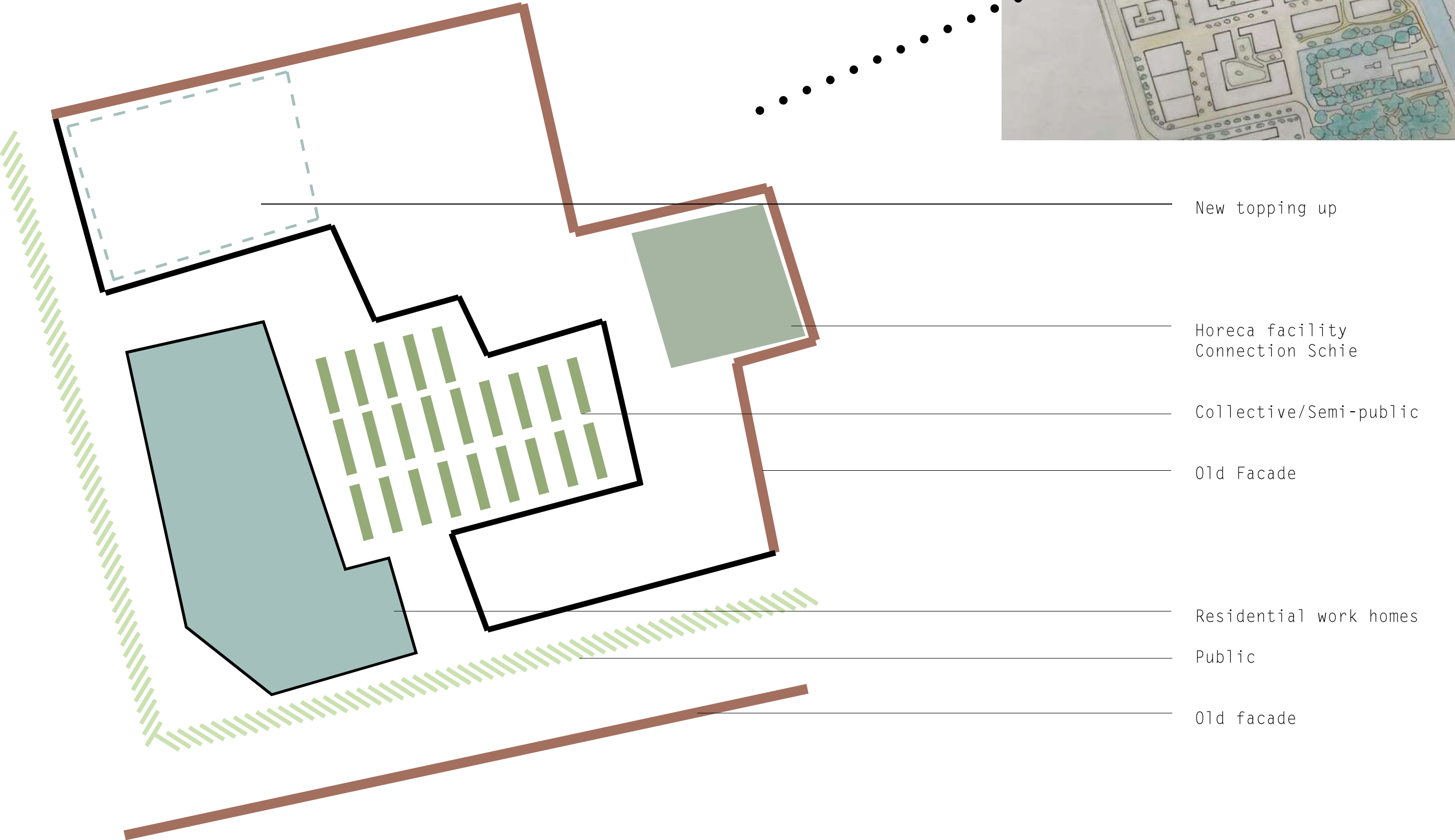
06 CONCLUSION

How can a co-creation approach be applied for redesigning 20th century Industrial Heritage factories for adaptive reuse together with stakeholders?

This chapter answers the research question, formulated at the beginning of the research process. However to answer the main research question it is necessary to first answer the sub research questions.

- How can heritage games support the value assessment of stakeholders for the redesign of the Kabelfabriek II in Delft?

- What design relation with the TU Delft Campus and the city of Delft could be supported by the Kabelfabriek II?

- How to redesign Kabelfabriek II Delft on sustainable attributes while preserving cultural values?

The first sub question is related to the theme, of the graduation studio, digital heritage. For this research question the heritage game Minecraft was chosen. A research was done by means of a workshop, which was held with the stakeholders of the Kabelfabriek II. The full research can be found in chapter 04 'Digital Heritage and Co-creation'.

The main communication and simulation tool used was the game Minecraft supported by a values and attributes survey and a floor plan with tracing paper. One can state that the game Minecraft is a proper simulation tool to communicate with the stakeholders. Especially the visualization in the game contributes largely to the civic participation and engagement, especially for non-experts. However the game is too slow for the scope of the project the Kabelfabriek II, since you can only add and remove blocks of $1m^3$. New modifications on Minecraft point to new possibilities of removing and adding more blocks at once. This should be incorporated in future workshops. Therefore a program like Sketchup is a better alternative. Minecraft serves as a basis enabling the participants to form a well founded judgement on how the Kabelfabriek II should be redesigned. It is a powerful tool to communicate design ideas and to negotiate with different stakeholders.

The second sub question is related to the second theme, of the graduation studio, 'Univer-cities'. For this research experts Ilse Rijneveld and Anne-Lize Hoftijzer were interviewed. The annual report of Delfia Batavorum (Van Walsum, 2001) and the document called 'Concept - Advies van de kwartiermakers - Ecosysteem voor kennis en economie' ('Concept - Advice of the quartermasters - Ecosystem for knowledge and economy') of municipality of Delft and the TU Campus Delft (Baller et al., n.d.) were used to come to a conclusion.

Concluding and answering the sub question, the design relation between the Tu Delft Campus, the city of Delft and the Kabelfabriek II should include functional aspects. The Kabelfabriek II should make use of the knowledge of the university as was already happening in the 19th century. Therefore a combination of housing (e.g. student housing) and working will create a

relation with the TU Delft Campus and will reinforce the city of Delft.

This sub research question focusses on the theme of sustainability. To answer this question the PhD thesis, titled 'Control Shift – European Industrial Heritage Reuse in Review', of Theodora Chatzi Rodopoulou (2020) is analysed and some relevant case studies are selected to integrate this research as good design practices. Moreover, Benno Schepers of CE Delft, senior researcher/advisor and leader of the sector sustainable cities, has been interviewed.

Concluding and answering the sub question, one could state that designing adaptive reuse for the Kabelfabriek II is sustainable on its own. To do this different methods can be applied.

Firstly, the skin of the Kabelfabriek II should be insulated from the inside. Secondly, renewable energy can be produced by placing solar panels and collectors on the roof and façades and/or photovoltaic cells in the window glasses.

With respect to water, green roofs can be placed to collect rainwater, together with a grey water system. The public space should be designed with facilities for collecting rainwater for cooling down the public space.

A mixed, diverse program of functions should be placed in the Kabelfabriek II in order to create a sustainable energy use during the entire day. Aquifer thermal energy storage together with the 'Warmterotonde' will ensure a sustainable way of heating and cooling the Kabelfabriek II whilst the cultural values are preserved. Using green will enhance the social inclusive sustainability.

By preserving the cultural values of the Kabelfabriek II, the identity of the neighbourhood is maintained, which contributes to social inclusivity.

How can a co-creation approach be applied for redesigning 20th century Industrial Heritage factories for adaptive reuse together with stakeholders?

The Kabelfabriek II is used as a case study to answer the main research question. This research booklet illustrates how the co-creation approach can be applied for adaptive reuse for the Kabelfabriek II. This factory can be seen as a typical example of 20th century industrial heritage factories considering its sheer size, its materials, its structure and location at the former city limits. The municipality of Delft has drawn up a development plan in which it states that a total of 3.200 dwellings and 1.250 extra jobs is to be created. This clearly influences the scope of the project as it limits the architectural freedom. For example one may wonder if the requirement for creating this number of dwellings and jobs matches the industrial and historical character of the factory. It complicates the design assignment at the expense of the preservation of the industrial heritage.

This raises the question whether by giving the design assignment to an architectural bureau before involving stakeholders, is what Chatzi Rodopoulou (2020) in her PhD thesis, titled 'Control Shift – European Industrial Heritage Reuse in Review', describes as a top-down rather than a bottum-up approach. Although a participation trajectory is initiated to take place in January 2021, one could ask if this is not too late in the day?

Chatzi Rodopoulou (2020) argues that "bottom-up involvement can turn the decision-making process to a far more democratic and inclusive procedure that satisfies the needs of both prospective users and the community." Inherent to this is that involvement of stakeholders should take place at the beginning of the process.

A co-creation approach is not limited to one method. There are various ways to involve stakeholders: interviews, surveys, questionnaires and workshops, with or without heritage games. For this research a combination of the above was chosen: interviews, surveys and a workshop with Minecraft. More elaborated, first sixteen different stakeholders, each with their own background and relation to the Kabelfabriek II, were interviewed. Subsequently, five different stakeholders attended the workshop and filled out the survey. This led to a values and attributes assessment. These values were taken into account when drafting the new design, Kabelfabriek 2.0, and will be taken into consideration during the next phase of the design. It goes without saying that in real projects it is necessary to obtain stakeholders' feedback after completing the design.

A final answer on the main research question can only be given after the above mentioned process has been finalized. An important aspect to note is what Chatzi Rodopoulou (2020) says: "The divergent agendas of stakeholders is one of the greatest challenges in a Reuse project to deal with and if not properly managed it can lead to failure or a dead end." Therefore it is the skill of the architect, the mediator, to find a balance in all the wishes of the various stakeholders.

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126. Tol, P (2020.). Final workshop Minecraft model. [Figure]

127. Tol, P (2020.). Final workshop Minecraft model. [Figure]

128. Tol, P (2020.). Final workshop Minecraft model. [Figure]

129. Tol, P (2020.). This drawing made shows the design ideas of the stakeholders. The drawing is based on the famous drawings of Jan Rothuizen. [Figure]

130. Tol, P. (2020.). Timeline Delft. [Figure]

131. Chatzi Rodopoulou, T. (2020). Control Shift European Industrial Heritage
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     6f7a2?collection=research [Photo]

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     delft.nl/islandora/object/uuid%3Ab11a2e72-eb71-4720-bd9b-c0d926
     6f7a2?collection=research [Photo]

133. Chatzi Rodopoulou, T. (2020). Control Shift European Industrial Heritage
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     6f7a2?collection=research [Photo]

134. Chatzi Rodopoulou, T. (2020). Control Shift European Industrial Heritage
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     delft.nl/islandora/object/uuid%3Ab11a2e72-eb71-4720-bd9b-c0d926
     6f7a2?collection=research [Photo]

135. Chatzi Rodopoulou, T. (2020). Control Shift European Industrial Heritage
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150. Tol, P. (2020). Values Kabelfabriek II. [Figure]

151. Tol, P. (2020). Urban concept. [Figure]

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A P P E N D I X   A   -   V A L U E S   &   A T T R I B U T E S   A S S E S S M E N T

During the workshop a 'Values & Attributes' survey is given to the stakeholders as a supportive tool to get to a values and attributes assessment of the stakeholders. The outcome of this workshop and the survey is discussed in chapter 4 "Digital heritage & Co-creation". The 'Values & Attributes' survey is mainly based on the outcome of value and attributes assessment by the author, shown here. The method of Pereira Roders and Tarrafa Silva (2012) is chosen to follow to get to a values and attributes assessment and to select attributes for the survey. Concluding one can state that the Kabelfabriek II has many attributes with various values which contribute to the fact that the Kabelfabriek II is heritage even though it is not listed as a monument. As the following pages make clear, different indicators (value x attribute) are present in the Kabelfabriek II.

The values and attributes assessment done by the author is based on available sources (e.g. report of Mei Architects and Planners and previous graduation papers). These reports and pictures are being coded as described by Pereira Roders and Tarrafa Silva (2012). Important to mention is that the report of the city archive Delft, see below, shows that not much investigation has been done on the Kabelfabriek II in Delft. This is confirmed by Ilse Rijneveld, monument advisor at the municipality of Delft. The only description is the document below, which states the following:

"Complicated files, many rebuildings. The Nederlandsche Kabelfabriek were founded in 1914. The main office was built in 1918. Between 1949 en 1952 a completely new factory was realised."

Therefore the values and attributes assessment of the author is based on only a few available resources.

As mentioned before, the attributes emerged from this assessment are being used for the 'Values & Attributes' survey. Next to these attributes, other attributes were added in the survey to investigate if they are valued by others, since they were not obtained from the available resources.

NUMMER:	SCH11	SCH11
WIJK:	Bedrijventerrein Schieoevers	
NAAM:	Bedrijfscomplex NKF	
ADRES:	Schieweg 15	
POSTCODE:	2627 AN	
OORSPRONKELIJKE NAAM:	Bedrijfscomplex NKF	
HUIDIGE NAAM:	Kantoorgebouw Pirelli	
OORSPRONKELIJKE FUNCTIE:	bedrijfsgebouw - categorie RDZM: XIV-1	
HUIDIGE FUNCTIE:	bedrijfsgebouw	
ARCHITECT:	onbekend (complex bouwdossier) mogelijk bouwbureau NKF of Lucas & Niemeijer	
MEDEWERKERS:		
BOUWJAAR:	1949 - 1952	
OPDRACHTGEVER:	NKF	
STAAT:	diverse malen uitgebreid	
BOUWAANVRAAG:	14759-14773	
GOEDKEURING:		
GEVELS:	metselwerk	
VENSTERS / DEUREN:	stalen kozijnen	
DAKVORM:	plat	
CONSTRUCTIE:	staalconstructie	

BESCHRIJVING:
Ingewikkelde dossiers, vele verbouwingen.
De Nederlandsche Kabelfabrieken NKF zijn in 1914 opgericht. In 1918 werd het hoofdkantoor gebouwd.
Tussen 1949 en 1952 werd een compleet nieuwe fabriek gerealiseerd.

WAARDERING:
• Standaard architectonische kwaliteit.

LITERATUUR:

387

Type   Document
Source   Report (stadsarchief - in
            ventarisatie van wederop
            bouwarchitectuur)
            Primary, qualitative
Year   ?

Mei architects and planners

Criterion (i):
Kabeldistrict Delft is een *onderscheidende eigentijdse* stadsuitbreiding waarin een bedrijventerrein op grote schaal wordt *getransformeerd* tot een *bruisende* woon-werkomgeving. Het Kabeldistrict bouwt voort op *aanwezige kwaliteiten*, *bedrijvigheid* en het *industrieel verleden* van de *bestaande omvangrijke* Kabelfabriek.

Criterion (ii):
In 1914 wordt de Nederlandse Kabelfabriek (NKF) geopend aan de Schieoevers van Delft. Na de oorlog groeit de NKF uit tot de *grootste* Kabelfabriek van Europa. Omstreeks 1975 staat de NKF aan zijn *top* en behoort het *technisch tot de meest toonaangevende* Kabelfabrieken ter wereld.

Criterion (iii):
De Kabelfabriek is onderdeel van het *industrieel verleden* waar Delft *trots* op is. Bij de transformatie van dit gebied wordt voortgebouwd op deze *aanwezige kwaliteit* door betekenis te geven aan *drie verschillende* tijdlagen. De eerste laag staat voor *het oude werken*, *zichtbaar* met het behoud van de Kabelfabriek. *Eindeloos lange* fabriekshallen waar vroeger de kabels voor heel Nederland werden *geassembleerd* en *opgerold*. Deze *historische* tijdlaag raakt verweven met de *eigentijdse* laag: de nieuwbouw van nieuwe architectuur voor nieuwe mensen die zich in het gebied gaan vestigen als ondernemer of bewoner. De derde laag is die van *morgen*.

Criterion (iv):
In het hart van het Kabeldistrict komt een *kleinschalig* centrum met voorzieningen en cultuur, waarbij een *bestaand* opslagvat en schoorsteen van de Kabelfabriek worden *behouden*. Langs de Schie volgt een *groots openbaar* park met een aan de fabriekzijde gelegen waterplein voorzien van horeca in de *avondzon*. Het park sluit aan op de *monumentale* enclave van het Kruithuis.

Criterion (v):
De *ontwikkeling* van het Kabeldistrict *omarmt* en *versterkt* het karakter van de oude fabriek en krijgt een *typische Delftse sfeer met compacte*, *autovrije* straatjes en *groene* hoven. De structuur van de bestaande fabriek is als uitgangspunt genomen voor het nieuwe district. Het dak wordt van de fabriek *afgenomen*. De *karakteristieke* stalen vakwerkliggers en gevels worden *gehandhaafd* en *vormen typerende inrichtingselementen* in de gebouwen en in de openbare ruimte. Hierdoor ontstaat een structuur van vakwerkliggers en lange bakstenen gevels met bandramen. Binnen deze constructie worden grondgebonden woon/werkwoningen gerealiseerd voorzien van *dakterrassen* gecombineerd met een *fijnmazig stratenpatroon*.

Type	Photograph	Type	Photograph	Type	Photograph	Type	Photograph
Source	Report	Source	Report	Source	Report	Source	Report
	Primary, qualitative		Primary, qualitative		Primary, qualitative		Primary, qualitative
Year	2020	Year	2020	Year	2020	Year	2020
Attributes	steel roofbeams	Attributes	Indoor street (space plan)	Attributes	Factory halls	Attributes	Masonry
Values	scientific, aesthetical, industrial	Values	aesthetical, industrial, long, height	Values	aesthetical, industrial, long, height	Values	Age (existential), used

structure x scientific (technological/conceptual)
skin x aesthetical (conceptual)

bandramen
typerende inrichtingselementen   stalen vakwerkliggers ⎫
lange, bakstenen   gevels   ⎬ constructie
uitgangspunt   structuur   ⎭

nieuwe district

space plan x aesthetical (conceptual)

monumentale   enclave van het Kruithuis

waterplein   *avondzon*

park   *groots openbaar*

                                                              onderscheidende
stadsuitbreiding   *eigentijdse*

skin/services x historic

bestaand   opslagvat
                                       schoorsteen

woon-werkomgeving   *bruisend*

Time
1914 - future

centrum met voorzieningen
en cultuur

                                       bedrijventerrein

voortgebouwd op aanwezige
kwaliteiten

(Bestaande NKF)   (Nieuwe NKF)

straatjes   *typisch Delfste sfeer*
                              met compacte, autovrije
aanwezige kwaliteiten   hoven   *groen*

bedrijvigheid

industrieel verleden   Kabeldistrict   *transformatie*   woon/werkwoningen   *dakterrassen*
                                                                                                               fijmazig stratenpatroon
bestaande omvangrijke ontiwkkeling

Influence
Kabeldistrict Delft, Nederland,
Europa, Wereld

oud

grootste   laag   *eigentijds*
top   nieuwbouw   *nieuw*
                                       Kabelfabriek

technisch meest toonaangevende

industriel verleden   laag   *derde*
                                                                                                               morgen
trots

spirit of place x historic

oude   eerste tijdslaag
werken   behoud Kabelfabriek
eindeloos   fabriekshallen
lange

historische   tijdlaag

94
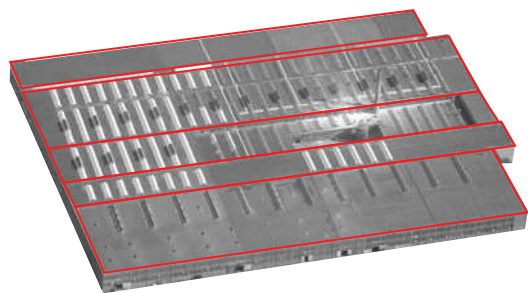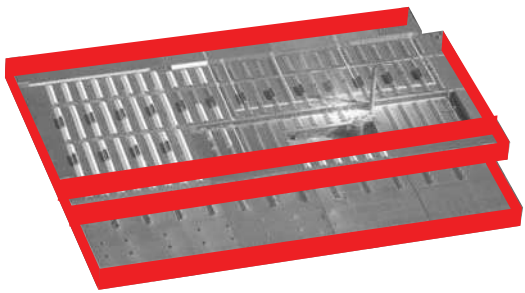
(Waal van der, 2011)

(Waal van der, 2011)
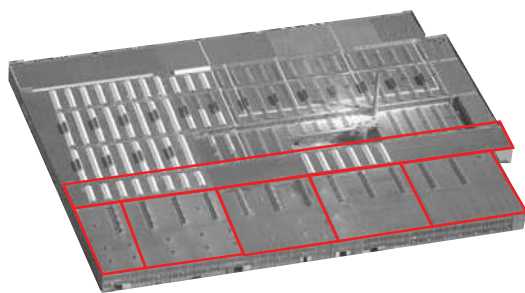
(Waal van der, 2011)

Type   Photograph
Source   Report
            Primary, qualitative
Year   2011
Attributes Space plan 'strokes',
            structure, indoor factory
            street
Values   Industrial, aesthetical

Type   Photograph
Source   Report
            Primary, qualitative
Year   2011
Attributes Facades
Values   aesthetical

Type   Photograph
Source   Report
            Primary, qualitative
Year   2011
Attributes South side
Values   Economic

1. Rusty barrel and chimney
2. Indoor factory street
3. Big entrance
4. Steal structure and typical industrial elements
5. Horizontal windows
6. Roof windows
7. Long facades
8. Masonry and steel structure
9. Roof windows and horizontal windows
10. Height factory halls
11. Length factory halls
12. Steel structure and horizontal windows

van der Waal, C. J. (2011). Schieoevers: A new future
in a postindustrial world - Creatieve economie en
stedelijke herontwikkeling. Retrieved from https://
repository.tudelft.nl/islandora/object/uuid%3A44fffe1b-
9735-4e4e-b8d4-485aecea7202?collection=education

Pictures retrieved from Waal, 2011

hallenstructuur   oost-west vlakken   constructieveld   patio: schaal en licht   gevel als regenjas   industriële relikwieën

(Weijden van der, 2014)
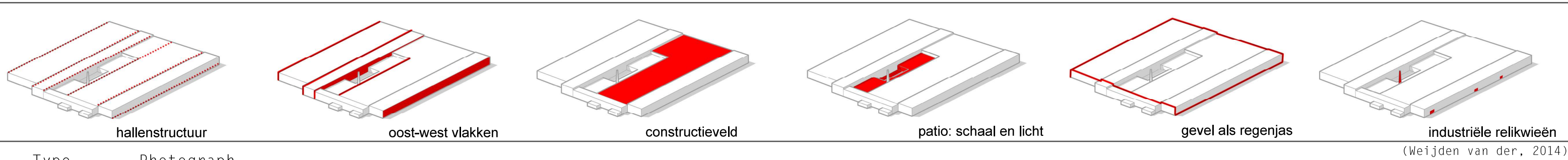
```
Type        Photograph
Source      Report
            Primary, qualitative
Year        2011
Attributes  factory halls plan, east-west planes, structure, patio, facades, industrial relics
Values      Industrial, aesthetical, scientific, historic, economic
```


1. Rusty barrel and chimney
2. Factory door
3. Roof windows
4. Steal structure and typical industrial elements
5. Brick walls
6. Lattice girder

van der Weijden, P. (2014). A Living Factory. Retrieved from https://repository.tudelft.nl/islandora/object/uuid%3Ad84c9c5a-9342-4619-94c2-7496e877d0be?collection=education

(Weijden van der, 2014)

APPENDIX B – INTERVIEW PROTOCOL CURRENT USER OF THE KABELFABRIEK II

The purpose of this interview is to explore the experience and opinion of the stakeholders. Besides it explores if they have been involved in the future plans of the Kabelfabriek and what their influence of the involvement on the plans are. The outcomes of the interviews will be used for the redesign of the Kabelfabriek.
This protocol is translated by the author of this research (P. Tol), since the interviews were done in Dutch.
Dear sir/lady ___. Thank you in advance for willing to cooperate on my research of my graduation project the Kabelfabriek. The final product of this graduation year will be a redesign of the Kabelfabriek, in which I involve stakeholders in the process of redesigning. I would like to talk to you about your vision on de Kabelfabriek, how do you perceive the Kabelfabriek, what do you appreciate and what do you dislike? The purpose of this interview is to take your answers along in the redesigning process, in order to get to a redesign where the opinion of stakeholders is taken into account. Would you mind if I record this interview, so I can listen to it again afterwards? It goes without saying that recording will be confidential and will not be shared with others. It will only be used for my research. Besides you can choose anytime during the interview to stop the interview or the recordings. Do you have any question before we start?

A.   Interviewee's profile

Date:

-    Name:
-    Profession:
-    Affiliation with the building:
-    Years of affiliation:

B.   Question for the interviewee

1.   How long have you been working in the Kabelfabriek?

2.   Why did you choose to work in the Kabelfabriek at that time?

3.   What do you appreciate/value about/on the Kabelfabriek?

4.   What do you appreciate/value less about/on the Kabelfabriek?

5.   If you could redevelop or redesign the Kabelfabriek, what would you do?

6.   What would you preserve?

7.   What would you demolish?

8.   What kind of program would fit the Kabelfabriek?

9.   Have you been involved with the new plans for the Kabelfabriek?
    If yes, how? If not, how would you like to have been involved?

10.   What do you think of the new plans?
    If necessary explain the new plans of Mei Architects and Planners.

11.   What should be taken into account when redesigning the Kabelfabriek?

12.   What do you think of the fact that the Kabelfabriek is not listed as a monument?

13.   With what means of transport do you reach the Kabelfabriek?

14.   How is the connection with the TU Campus and the centre of Delft?

15.   Do you experience any inconveniences? (E.g. noice pollution of the train, loiterers)

16.   Do you have a connection with other users of the Kabelfabriek?

17.   Who visits the Kabelfabriek?

18.   Would you like to participate in mine Minecraft workshop?

APPENDIX C – INTERVIEW PROTOCOL NEIGHBOURS OF THE KABELFABRIEK II

The purpose of this interview is to explore the experience and opinion of the stakeholders. Besides it explores if they have been involved in the future plans of the Kabelfabriek and what their influence of the involvement on the plans are. The outcomes of the interviews will be used for the redesign of the Kabelfabriek.
This protocol is translated by the author of this research (P. Tol), since the interviews were done in Dutch.
Dear sir/lady ___. Thank you in advance for willing to cooperate on my research of my graduation project the Kabelfabriek. The final product of this graduation year will be a redesign of the Kabelfabriek, in which I involve stakeholders in the process of redesigning. I would like to talk to you about your vision on de Kabelfabriek, how do you perceive the Kabelfabriek, what do you appreciate and what do you dislike? The purpose of this interview is to take your answers along in the redesigning process, in order to get to a redesign where the opinion of stakeholders is taken into account. Would you mind if I record this interview, so I can listen to it again afterwards? It goes without saying that recording will be confidential and will not be shared with others. It will only be used for my research. Besides you can choose anytime during the interview to stop the interview or the recordings. Do you have any question before we start?

A.   Interviewee's profile

Date:

-   Name:
-   Profession:
-   Affiliation with the building:
-   Years of affiliation:

B.   Question for the interviewee

1.   How long have you lived next to the Kabelfabriek?

2.   Why did you choose to live there that time?

3.   Do you see the Kabelfabriek as industrial heritage?

4.   What are the qualities of the Schieoevers Noord?

5.   What needs to better in Schieoevers Noord?

6.   What do you appreciate/value about/on the Kabelfabriek?

7.   Did you have a connection with the Kabelfabriek? If yes, how?

8.   What do you appreciate/value less about/on the Kabelfabriek?

9.   If you could redevelop or redesign the Kabelfabriek, what would you do?

10.   What would you preserve?

11.   What would you demolish?

12.   What kind of program would fit the Kabelfabriek?

13.   Have you been involved with the new plans for the Kabelfabriek?
      If yes, how? If not, how would you like to have been involved?

14.   What do you think of the new plans?
      If necessary explain the new plans of Mei Architects and Planners.

15.   What should be taken into account when redesigning the Kabelfabriek?

16.   What do you think of the fact that the Kabelfabriek is not listed as a monument?

17.   With what means of transport do you reach the Kabelfabriek?

18.   How is the connection with the TU Campus and the centre of Delft?

19.   Do you experience any inconveniences? (E.g. noice pollution of the train, loiterers)

20.   Do you have a connection with other users of the Kabelfabriek?

21.   Who visits the Kabelfabriek?

22.   Would you like to participate in mine Minecraft workshop?

APPENDIX D – INTERVIEW PROTOCOL MEI ARCHITECTS AND PLANNERS AND DEVELOPERS

The purpose of this interview is to explore the experience and opinion of the stakeholders. Besides it explores if they have been involved in the future plans of the Kabelfabriek and what their influence of the involvement on the plans are. The outcomes of the interviews will be used for the redesign of the Kabelfabriek.
This protocol is translated by the author of this research (P. Tol), since the interviews were done in Dutch.
Dear sir/lady ___. Thank you in advance for willing to cooperate on my research of my graduation project the Kabelfabriek. The final product of this graduation year will be a redesign of the Kabelfabriek, in which I involve stakeholders in the process of redesigning. I would like to talk to you about your vision on de Kabelfabriek, how do you perceive the Kabelfabriek, what do you appreciate and what do you dislike? The purpose of this interview is to take your answers along in the redesigning process, in order to get to a redesign where the opinion of stakeholders is taken into account. Would you mind if I record this interview, so I can listen to it again afterwards? It goes without saying that recording will be confidential and will not be shared with others. It will only be used for my research. Besides you can choose anytime during the interview to stop the interview or the recordings. Do you have any question before we start?

A.   Interviewee's profile
Date:
-    Name:
-    Profession:
-    Affiliation with the building:
-    Years of affiliation:

B.   Question for the interviewee

1.   How long have you been working in the Kabelfabriek?

2.   Can you tell me about the desicion making proces of Kondor Wessels Vastgoed to hire you for this project?

3.   Did you make a values assessment before redesigning?
    If yes, how? If no, why not?

4.   What do you appreciate/value about/on the Kabelfabriek?

5.   What do you appreciate/value less about/on the Kabelfabriek?

6.   If you could redevelop or redesign the Kabelfabriek, what would you do?

7.   What would you preserve?

8.   What would you demolish?

9.   How would you design it?

10.   What do you think of the design?

11.   What kind of program would fit the Kabelfabriek? How was the program decided?

12.   What is the reason for making high rise?

13.   How is this redesign/high rise specific for this location? Could the high rise also be realized somewhere else?

14.   Can you tell me what is done to make the project sustainability?

15.   Is there a connection with the city centre?

16.   What are relation is there between the Kabelfabriek II and the TU Campus, next to start-ups and student housing?

17.   How is the combination of the different types of dwellings arranged?

18.   Is there a difference between the east and the west side of the district?

19.   What were the dilemma's during the redesign process?

20.   Were stakeholders involved during this process?
    If yes, how were they involved and were their desires taken along in the redesign? If not, why not?

21.   Do you think the history of the Kabelfabriek II is preserved in the redesign?

22.   High rise is not typically for Delft, do you think the image of the city will change?

23.   What are the plans across the Schie?

24.   What kind of companies will be situated in the Kabelfabriek II? And how are they connected to the TU Campus?

25.   What is 'creatieve maakindustry'?

26.   What should be taken into account when redesigning the Kabelfabriek?

27.   What do you think of the fact that the Kabelfabriek is not listed as a monument?

28.   Would you like to participate in mine Minecraft workshop?

Interviewer: Pien Tol
Interviewee: Ilse Rijneveld, monument advisor at the municipality of Delft.
Attendees: Bruno de Andrade, Alexander de Ridder, Diana Ugnat and Mick Bloemdal
Date: 01/10/2020
Topic: Ilse Rijneveld was interviewed to gain knowledge on heritage since that is here expertise and to gain knowledge on the (history of the) Kabelfabriek, Schieoevers and the newly plans.

Questions to Ilse Rijneveld:

What is the city planning for this area?

What is the role of the Kabelfactory in the development of the city in the city?

How do you see the connection with the City centre and Tu campus?

How will the historic industrial character be kept? Since it is not listed as a monument but it is heritage.

Are there any other problems already solved over the past?

On what are the new plans based? For example the plans of Mei Architects and planners, how did they value the area?

Were there stakeholders involved in this development?

And if there was any process to list the building as heritage?

Ilse Rijneveld
To talk about Schieoevers: Schieoevers is located in between the train station, Delft Campus, as it is called nowadays, and the Technical University. When you look at the development of Delft, the Technical University of Delft has grown rapidly over the years. The number of students was rising. At the same time when you look at the total of Delft in the 19th century, Delft used to be an industrial city. That means that around 1900 most of the income of Delft was based on factory works. And all these factories were more or less located around the Schie canal and the Vliet in the North. So there was an industrial area in the North and then along the borders of the Schie there were a lot of factories. Most of these factories have been demolished. Most of them have been changed into housing. Most of these sites has been into housing. For example the 'Verf fabriek', a paint factory, South of the city centre, nowadays it is a housing area. You can not see anything leftover of this factory. The Bacinol 2 (Huzar) building used to be the main office of the Braat factory. Braat was a factory of making steal windows for example. All the factory buildings themselves has been demolished, this is what you often see with factories. But the main office, with the most luxurious architecture and the most representative buildings have been kept. For example you see a little bit the same with the DSM factory. It used to be the former Gist factory in the North of Delft. There you see this beautiful office building that is abandoned and empty nowadays. It is not used anymore. And there are also some factory buildings around it, that are empty as well, but you see when you look at the protection; the main office is national listed monument and the other buildings are locally listed protected buildings. So you always see that when you have a factory site, we keep the office as a listed building and the rest is demolished. So we only see the luxurious part of the industry that we keep in history. In the old days these worker areas were not architecturally interesting. Or maybe they were but in general we don't value them very highly. We usually keep the more expensive buildings. So this image of Delft as an industrial city, you can see it disappearing along the way. Because everywhere we want to build housing, houses and no industry anymore. And in this history of industrialization, that the Kabelfabriek became very big in the 50s. Around 1900/1920 they started to invent electric cables. So when there was electricity in the Netherlands, people started to invent electric cables and the cable factory had a very innovative position in it. So they were the first and they had all the patent to develop cables. They were very innovative and growing rapidly. So in the cable factory, you can still see the old main offices. They were located more to the north. So there're not on the side of the cable factory itself. But more to the north along the Schie. There's this statue of a cable worker. This is where the oldest offices of the cable factory were. And then they expanded rapidly in the 50s. Also because there was a building explosion in the 50s, after the Second World War, and everybody wanted electricity. So they were producing a lot of electric cables. And then they constructed the cable factory as your site is near the Kruithuis and near the Kruithuisweg. So the whole Schie on both parts was full of metal related industry. And a cable factory is huge hall of the 50s was only one part of it. This was a small summary of the story of the industrialization of this area.

Maybe it's interesting now to talk about Bruno's question, the process of listing heritage. Because in Delft, we started listing heritage in a quite early stage. And it was mainly in the inner city. Because all the very beautiful houses in the inner city were early recognized as very valuable. So most people think of Delft and history, they think of the inner city. Nevertheless, we did make an architectural research for the entire city area, until 1970. So all the buildings until 1970 have been researched for their architectonic value. Nevertheless, we have much more very old listed buildings, and we have a few modernist listed buildings. And in this selection of modernist buildings, the cable factory is not in it. And this is important to realize, because it gives us as a municipality, a different position in the negotiation with the developers and the future plans for the cable factory. Nevertheless, despite the fact that it's not a listed heritage building, the development of the "wet of the ruimtelijke ordening", so our law in spatial development says that you should consider heritage in every spatial development that you do. So the law says we have to consider heri-

tage, but it doesn't say what how to consider it, and what is a good call to consideration and what is not. This leads to the conclusion for us that we say what is important is this industrial character, because it's really typical for this location. And it created the character of the site. But at the same time, we more or less said, we are not going to protect it as a listed building. Because we compared it to many industrial sites, all through Netherlands. And then the conclusion was, there are a lot of these industrial sites and it's very mainstream industrial, this has been the conclusion. Well, I did not do this research. So I cannot go into detail for this. But the general opinion is its mainstream industrial. Nevertheless, we say it's a fantastic site, and it's a unique character for the site. So this is more or less how it is valued from an architectural historical point of view.

And then the question was, what is the city planning, what is the goal of the cable factory developing a city in a city centre. The city is planning a lot of houses. But at the same time, I think in planning history, we want to get rid of this mono functional housing areas as we have in Delft Zuid. So, a lot of high rise you have in Delft Zuid and a lot of apartment buildings, all low class apartment buildings. And we say, if we want to develop a city, we need more diverse living area. So, now, this concept of an industrial area is transformed into a concept of a mixture of working and housing area. So, we say we want to mix housing with workspace and to have a multifunctional place to live. And I like your question that you asked what is the relation to the city centre? Because in my point of view, this is a very difficult question to respond to. Because traditionally, Delft is this historic centre with a city grown around it. But now, by developing this cable factory as a new site in between Delft campus and the Technical University, almost a new city centre is arising. We grow towards a more poly central view on city life. And I do think that this is a difficult concept in planning, especially if you look to the height of the buildings. In the traditional view on high rise in Delft, people always said we want to protect the historic cityscape and historic line of the city. So everywhere you come, you can see the old church and towers and everything. But now if you look to the urban ambition in this and density in these spots, the skyline of Delft will change forever. So, this is a quite a debate that is going on the site. The Kruithuis, where scouting is housed, this is a listed building and monuments. And this was where the gunpowder was stored during the 18th century. At that time it was far out of the city centre. So if something would go wrong, or if it would explode, not too many people would be hurt. But nowadays, we see that this historic site is almost drowning in this huge plan of high density, high rise buildings. For me an example is, Schieland Huis in Rotterdam. I don't know if you know it. But this is a very tiny historic house in the middle of a lot of high rise. And I don't know if this will be the future for the Kruithuis, but it is kind of under discussion how it will end. And the same thing if we talk about older history, the canal Schie itself, also a historic line. And what is important for us as well, that we don't only develop the sides, Schieoevers, the side cable factory itself. But also if you still cycle from Delft to Rotterdam along the Schie, that you have one continuing architectural and historical experience and not that it's cut out from this long line of infrastructure.

What is the goal of the cable factory developing the city in a city centre? Now, what more I can tell you about it is something that we see a lot in modern development plans is that heritage is used as a temporary value maker. And this is something that I, well, that hurts a little bit if you are working like me in heritage protection. Because we have to admit that the use of that heritage is temporary. And the outcome of it, what will be kept for the future is not so clear anymore in this project. So we say we do all this nice, small enterprises that can use the space very cheaply. But once we start building, we know that the rent of the places will go up. And then the question is, if the rent has to go up, will we still use this cable factory spaces, will we still value the cheap construction of the cable factory halls? So how does the current industrial architecture combine with the high income and high profits that are expected in the future? And I think, for a city of Delft for the municipality, something that I have to be very keen on in relationship to the developer. Because a developer has a very different interest in this location as the city has. I think the city has the responsibility to create a sustainable environment with good urban planning. And of course a developer has this goal as well. But a developer is a commercial investor.

Bruno de Andrade
Ilse, can you just address a little bit more the stakeholders nowadays, involve it in this debate around the cable factory so that we have a clue on how to engage in the workshops?

Ilse Rijneveld
This is a very good question, because maybe it's good if you want more information about this, to contacted the project leader. So I will inform him and ask him to give his contact information. So far, I didn't do it. But I will. And this is because, of course the most obvious stakeholders are the developer and the one that buys all the land and is making the plans and the city of Delft as the one who has to give the permission to build and develop. But since I'm not the first one involved in this stakeholder debate, I think it's more easy to involve him.

Bruno de Andrade.
And just a last question, how can we access this inventory that you made on architectural value by 1970?
Ilse Rijneveld.
Good question. It is a report. What might be a good opportunity for all of the students is to visit the 'Stadsarchief'. The city archive is a kind of library and archive of the history of Delft. And there, we have the reports of this heritage inventory and research. It's called 'Wederopbouwonderzoek' about on the show or something. But the thing is, it is in our office, but we cannot go to the office right now. So, anyway, the city archive

is a very interesting place for students to visit, you have access to older building permits of the past. So you can find historic building drawings, and they have archives of historic images. So they usually are willing to help and to show you how the archive works. And I'm sure that they have also these reports, you can see them there and you can scan them.
Bruno de Andrade
Oh, my God, a lot of rich information for us. And I want to go with them to the archive. I've never been there. It's a beautiful building.
Ilse Rijneveld
They just won a price actually.
Alexander de Ridder
I will join also I've never visited so I'm curious also looks like.
Bruno de Andrade
Let's do a field trip together.
Alexander de Ridder
Yes, we have many trips. This is the first one we will do.
Pien, do you still have another question for Ilse?
Pien Tol
No, thank you. This was perfect!
Alexander de Ridder
Okay, then we continue with Diana.
Well, sorry. I maybe still have a small question to Ilse. That is, the edge of the plots next to the railroad station. Is there some vision how to solve that? It is a dead end of the plot. To the canal and the water, I can imagine. But how are you going to end such a plot?
Ilse Rijneveld
Sorry, but I don't get it exactly. I don't have a map.
Alexander de Ridder
You have the capital factory? It's a rectangular; one side situated at the canal, at the waterline, which gives a view and the other side, the back, you could say of the plot is next to the railroads. You cannot cross there. So I was curious. Normally, if you have an urban block, we have a street. So the surrounding is continuing and related with the surrounding. But with this the railroad track is really a border. And I was curious if you have some conditions for the developer to take into consideration when you have such a strange plot with at one side a railroad.
Ilse Rijneveld
Well, they're constructing a bicycle tunnel right now. So there are some constructions going to improve the connection from the living area on the one side of the railroad and the cable factory area. And for the road they construct a cycle bridge over the canal Schie. So at least for bicycles, they try to improve this connection from one side of the railroad to the Technical University. I think this is the biggest and most important thing they do. But in general, the infrastructure in Delft is very much oriented south to north. So also the new plot will have this orientation very much North out.
Alexander de Ridder
When you take the train from Rotterdam to Delft, actually at the last part you always have these factories. This is really the backside of plots. It's an alienating atmosphere. You don't think 'Oh, how nice to go there.' I think for Pien, if you develop this plot, I think you should need a vision on how this connection with the railroad should be developed. With the waterline it is perfect first class, everybody wants to have a view on the river, there's no problem, but the other side is more sensitive.

Interviewer: Pien Tol
Interviewee: Anne-Lize Hoftijzer, manager real estate development TU Delft Campus.
Attendees: Bruno de Andrade, Alexander de Ridder, Diana Ugnat and Mick Bloemdal
Date: 15/10/2020
Topic: Anne-Lize Hoftijzer was interviewed to gain knowledge on the relation between the Schieoevers, Kabelfabriek and the TU Campus.

Pien Tol
I was wondering how do you see the relation between the campus and the Schieoevers and/or the Kabelfabriek? How can they support each other? Because I heard an extra bridge between the Schieoevers and the campus will be made, but would that be enough, also if we add functions like student housing? What is your point of view on this?
Anne-Lize Hoftijzer
So, if we would be in a drone above Delft, looking at the city, you could divide the city into areas with a specific reason for existence. So in general and maybe it's a little bit black and white, it's TU Delft campus, where research is being done. So bringing research from the university, to companies who develop further. And then the next step, getting into producing new products, we think that TU Delft campus in the first place is meant to connect between researchers from to Delft and researchers from companies. And then we think that Schieoevers is the perfect place to get to production. So developers of TU Delft Campus are in close contact with the city, with owners of buildings and plots on Schieoevers to make sure that we are not competitors, but work together in developing the general idea on what activity where. And of course, it's not the ideal world. So sometimes we are more or less competitors, but in general, the idea is TU Delft Campus is for research, development, proof of concept. And then from proof of concept to production, Schieoevers would be the perfect place. So Kabeldistrict in our idea is a perfect place for companies that do clean production, so not production where with big machines, a lot of noise, but more cleaner production. That matches with the other ambition, which is in the first base ambition of the city of Delft, but in the end has a lot of relevance for TU Delft. The ambition is that the northern part of Schieoevers, especially north of the Kruithuisweg, will transform in a more housing area. So what happens on Gele Scheikunde, what happens in Kabeldistrict, should work well together in a dense housing area. Theun Baller, dean of the faculty of 3ME explained it few years ago as: Wouldn't it be nice if we could relocate production that is now in China, move it to Schieoevers, integrated in an housing area by using knowledge of TU Delft of silence and clean and very efficient production. I think that's a really ambitious goal. But still, I think the idea is very worthwhile exploring and 'Bedrijvenkring Schieoevers' present themselves with: "Wat TU Delft bedenkt, maken we op Schieoevers"/"What TU Delft invents, we create it on Schieoevers." So that explains that we acknowledge the meaningfulness of the identities of both locations. And I think that you should explore yourself with people from Kondor Wessels Amvest, I

think they acknowledge that idea as well. Of course, we are sometimes competitors because it's very ambitious to combine production, light industry, with a dense housing area. And also it's common sense that you make less money with light industry production then when you do very upscale production of offices. So in the business case, there's a conflict. So we need to see what will happen in the next few years but what I explain is what the ambitions are of Kondor Wessels Amvest, what ambitious TU Delft Campus and the city of Delft. What you explain about the bridge; the new bridge Gelantinebrug is a pedestrian and cyclist bridge to connect between the both sides of Schieoevers and TU Delft Campus and also with the housing area on the other side of Schoenmakerstraat. Now everybody needs to cycle up to Abtswoudsebrug or even more North. So those routes are very dense. So it's not only a bridge across the Schie. The ideas is to create on both sides of the bridge an extra fast lane for cyclists to connect both parts of Delft. The ambition is to connect the bridge with Station Delft Campus. The bridge does not have the ideal location for really connecting that station. Especially it has not the ideal location if you would connect that station with especially the southern part of TU Delft campus. There are also a set of rules from Rijkswaterstaat, who is responsible for the navigational route and the route along the Schie for big frightening cargo ships. Of course they don't want bridges too close to each other; they have to open up, it's logistical nightmare. So there was a compromise I think, that's what it is. So TU Delft Campus, the city of Delft and stakeholders of Schieoevers work together to make the best of the position of the bridge. Also the bridge is high, so you have to go up with your bicycle and go down. So you need quite a long area to really connect the route with the surrounding. It's quite a challenge but, I think, it's in the end very helpful to connect areas like Kabeldistrict with TU Delft Campus. If you want, what TU Delft Campus and companies invent, to being produced in Kabeldistrict, you have to make sure that you can connect quite easily. So the bridge is very important.
Pien Tol
Okay, thank you, really clear.
Anne-Lize Hoftijzer
Already you see that happening, Joost Versluis of Kondor Wessels will explain maybe. There are ideas for temporary housing for start-ups in Kabeldistrict at this moment. So, they are already trying to connect TU Delft Campus community and try to work together
Bruno de Andrade
Thank you Anne-Lize this brilliant, this statement on knowledge becoming production. I think this could be really interesting line for Pien to explore on the design program and definitely this will be surfaced again during the workshops. So you already have a good dip for you to look into.
Anne-Lize Hoftijzer
A few years ago when city of Delft and TU Delft renewed their collaboration, they developed ideas on how to work on the city. And so, the Spatial Plan was about the idea for TU north, where we connect between campus and city. We also made plans for "Kennis en Economie", so on the more economic development of the city. There you can read about the idea what the details

campus events, is in the end produced on Schieoevers. I send you the docu-
ment on 'spatial', but did I also send you the one on "Kennis en Economie"?
Bruno de Andrade
I don't recall that.
Anne-Lize Hoftijzer
Because I think it's important for you.
Pien Tol
I saved five documents; one is called "Concept Advies Thema 1".
Anne-Lize Hoftijzer
Yes, that the spatial one.
Pien Tol
And "Thema plan 3". "Concept Advies Ecosysteem" and "Ruimtelijk Ontwikkel
Perspectief".
Anne-Lize Hoftijzer
Ja in die van 'Ecosysteem' kun je lezen over de rolverdeling TU Delft Cam-
pus. Daar zie je het voorwoord van Theun Baller, die was toen kwartierma-
ker. Dus dan heb je hem.
Pien Tol
Ja, top, super. Dank u wel!

Interviewer: Pien Tol
Interviewee: Benno Schepers, CE Delft, senior researcher/advisor and leader of the sector sustainable cities
Attendees: Bruno de Andrade, Alexander de Ridder, Diana Ugnat and Mick Bloemdal
Topic: Benno Schepers was interviewed to gain knowledge on sustainability since that is his expertise.

Pien Tol
One of my research questions is: how to redesign the Kabelfabriek on sustainable attributes while preserving cultural values." So at the moment I'm seeking design solutions that are sustainable, that don't touch the cultural value of the factory.

Benno Schepers
And what will be the purpose of the building afterwards?

Pien Tol
"Well, that's not really determined yet. We will organize a workshop together with stakeholders, and then hopefully we get a program out of that. But probably student housing, other housing and spaces for start-ups, will be located in the Kabelfabriek.

Benno Schepers
So we mainly residential functions. So the main question is how to incorporate sustainable energy system within the existing building. And the same time probably produce some renewable energy on the building or near the building itself. And this is your question to me. What kind of ideas that are or what kind of options are there? Or just a general suggestion on where to find answers?

Pien Tol
Both actually. Every recommendation is welcome.

Benno Schepers
It is a monument?

Pien Tol
No, it is not listed as a monument.

Benno Schepers
It's on one side easier. On the other side, because it's not listed, you do have to comply to all regulations. That means that, at the moment, the most stringent regulations are the BENG norms, almost energy neutral buildings. Which means that the energy use per square meter is limited. The amount of primary energy that you use is limited, and you have to produce a certain amount of renewable energy on your own building or on premises. That will probably also be a place for Kabelfabriek. And so first of all, you have to

search for a method of reducing the energy demands of the building. So first of all, look at ways to insulate the building. Because the outside is probably the attractive part, you can't touch the outside. So you have to do everything inside. There are a lot of options for that. The most logical option is just to put the extra walls in front of the walls with the insulation. That's quite easy, not that expensive. The most expensive part probably is the glass. All the glass needs to be refitted, probably to the same dimensions of the "rasters". After all the installation of the old parts, then you have to look at the ventilation and eventually of course, to how you need to arrange the heating, the cooling and the hot tap water. And the last one is important because you have to have quite a high temperature of a heating system to arrange the right tap water in case of legionella. For heating in Delft, a very large project is being developed in the entire region here, the "Warmterotonde". It's the "heat roundabout" where heat from Rotterdam, the harbour, is transported via Delft to The Hague and Leiden. Which is a transport system that can also incorporate geothermal energy. For example, all the geothermal plans that are built in the horticulture in Westland. And they can also, in the dream image of the developers, put the geothermal energy from the horticulture, the "glas tuinbouw" into the "warmterotonde" and transport it to Delft, to The Hague, to Leiden and all other cities in between. And it's heat from 70 degrees. And that's important because especially with old buildings, it is quite difficult to get them warm with lower degrees, lower heats. So 70 degrees is excellent for heating, a well-insulated old buildings. And you can get hot tap water from 70 degrees conform the older regulation there. So one of the options is to see if you can connect the building on the large plan, the development of the geothermal energy or the university campus will probably also connect to the large plan. The Kabelfabriek is a exactly in the middle of the university and Tanthof. Both are developing the geothermal source. So you're right in the middle of it, so you can probably be a linking pin between the two developments. Otherwise, you have to look for another heat source. That was likely if it isn't a district heating system like geothermal, then you have to do it electrically. Via a heat pump, and that will be quite a large set of heat pumps to produce enough heat to get all the apartments and all the office buildings hot enough. The extra part is that the heat pumps also can provide cooling in the summer, of course, they are quite good in it. That's just another system, including possibly an aquifer thermal energy storage, a "WKO", which you can also adapt the building providing heating in the winter and cooling in the summer. And the underground in Delft is quite good for such systems. But most likely, because it's a quite an old building, the installation will be a bit hard. The higher temperature of the amount of little that is possibly the most interesting route.
And besides that, you also need to produce your own renewable energy. So you have to think about putting extra solar panels on the roofs. I don't know if the roof is like the glass triangles all around the floor? I don't know if you know the train station Utrecht and Rotterdam as well, they have glass including solar panels. And you can try like more and more innovative ways of introducing solar panels within the building, and not just clamping down on the roof, making a little deviation. And also, of course, there are some extra things like green rooftop, make quite a lot of square meters. And there's

in this region a big problem with all of the rain that is coming. So if you get a green rooftop, it's first of all gets extra cooling in the summer, but it also collects the rain a lot. And I don't know if you are looking at the surrounding of the buildings, but that now it's probably quite some concrete. So very little opportunity to collect rain and green rooftops will help that as well. And there are 10s of different variants of green rooftop. Other ways of producing your own energy, for building in that position are very experimental. So I don't think that it will be really feasible, like the windmills. So horizontal turbines on the rooftops they are not that efficient and they're quite expensive and they do give some discomfort for the habitants because of all the vibration and sound they cause. The most likely route is probably just the solar PV panels and maybe some solar thermal collectors as well which can add to the renewable production

Pien Tol
Clear! Thank you. I also read something about using the heat of the data centre of the TU. Could you use that too?

Benno Schepers
Most data centres provide like 30 degrees heat so you can't heat a building like Kabelfabriek with 30 degrees. So you have to upgrade it to 70 degrees, most likely, so you need a large heat pump to do that. That's not impossible, but it's a bit more expensive. I think that all the university campus itself there are a lot of new buildings which can use 30 degrees much more efficient than residential redevelopment like the Kabelfabriek. It's mainly for the heating of spaces and because it's residential you really need the hot tap water as well.

Alexander de Ridder
Sorry to interrupt. I'm curious of course if 30 degrees system would make a lot of projects more easy to realize. But do you think that in future they will be able with a low temperature water system to heat the building enough? You said with tap water that you cannot make it from 30 to 60 degrees, which I understand, then you maybe need an extra electricity heater to solve that.

Benno Schepers
It possible today, it's not that difficult to upgrade 30 degrees to 70 degrees. It's cheaper to do the upgrade than to insulate the building so you can heat with 30 degrees. Because heat will be scarce. And you can probably apply a 30 degrees heat easier in the newly built buildings on the campus or other newly built buildings near the train station, more easily then completely refitting an existing building.

Alexander de Ridder
That is the criteria than in fact. Is it an existing building or is it a new project? With new projects it is more easy.

Benno Schepers
You need a system that is really slow, floor heating or "Betonkernactivering"

and can keep building continuously warm if you heat it with 30 degrees. It is all possible, there are a lot of examples in the Netherlands which in all buildings which get that but are all very expensive. And they are really hard to execute and deliver.

Alexander de Ridder
It depends also on your source?

Benno Schepers
Yes, of course. At the moment, we are developing the "Transitie visie warmte" for the municipality of Delft. It's the big plan on how to heat all the different suburbs. All different neighbourhoods at Delft with high temperature, medium temperature, low temperature, heat grids, all electric versions, biomass. And in those plants, you look to the all the buildings that are in Delft and try to divide the heat sources that you have over the different neighbourhoods of Delft. Delft has the advantage of having quite a lot of heat in the ground, like geothermal heat and heat from Rotterdam which can be applied. You have something to choose in some other cities where you can't do that you can't choose anything, you just have to grab anything you have. In Delft you can make the decision to transport 30 degrees heat from the data centre to the Kabelfabriek and place like a large heat pump, or place the heat pump at the data centre and transport 70 degrees to the Kabelfabriek, they're both options. I don't know if you know the "Start analyse". The government developed the guidance on what you can do for each neighbourhood. They analyse with their festa model for every neighbourhood in the Netherlands, what is the best option, including the low temperature heat sources. But for all calculations, the best, the economically most viable option is upgrading the low temperature heat sources to 70 degrees. So that you have a 70 degrees distribution, not a 30 degrees distribution that needs an individual upgrading. It's just economical optimization. But it's technically both routes are possible. And if you look at like the "Mine water concept" in Heerle, they work with 30 degrees, a low temperature distribution, and with individual heat pumps. That's the other options. And that's technically an excellent option. But financially, it's a bit more difficult. But everything is possible. It's possible today, there are examples today. But it is just easier to have a 70 degrees distribution grid.

Alexander de Ridder
And the electricity network?

Benno Schepers
There will never be really local networks that are not connected to the main network. Otherwise, we don't have to place all the wind turbines on see of course. The electricity network will be one large integrated network; high voltage, medium voltage and low voltage network. They have to be integrated because if you have a lot of solar panels on the roof and they produce during the day and there's nobody home, you don't use it. So you have to export your production to another level network or have a really large battery pack at your location, which is really expensive and not necessary.

These are items which are very much research at the moment discussed about, trials are taking place, projects are developed on just testing. How does this work? How large does a battery pack need to be to maintain five houses for a year? We don't know, we can calculate it but you still have to test it. So there are a lot of things being researched at the moment. And maybe in five years we think differently.

Pien Tol
Clear. Do you maybe have some reference project for me, which I can look at?

Benno Schepers
"Mine water" in Heerlen. If you just Google it, you can find a lot of information about that. If you Google, there are quite a lot of sustainable redevelopment done the last few years. But I, I don't know what exactly is the plan with the Kabelfabriek. But in Wageningen there's also a large industrial site being redeveloped and what they do is just keep the facade and demolish everything else. So only the front of the building remains and there are completely new buildings are built behind it. So that's not quite, I think, comparable with what you're looking for. The Witte Roos, that's a real monumental building which completely has been stripped and major renewable. "De Kluis" in The Hague. That's an example of "Warm bouwen", a concept which mainly uses the walls to keep a space warm enough. And that's technically an excellent concept but it's quite difficult and quite expensive. And not like a concept for entire areas. You have to redevelop every new building on its own. That makes it quite difficult. And it was it will be much easier to just develop like a high temperature heat source which can already heated into buildings right now.

Pien Tol showing plans of Mei Architects and Planners.

Alexander de Ridder
It's a huge new quarter. If you were advisor for this master plan concerning sustainability aspects. Would it be a good design or not?

Benno Schepers
Your options for solar panels will be diminished. Especially, there are practically no rooftops without any shadow. High rise and solar panels are just very difficult. You can have the vertical ones, but they're not that efficient. And you still have to apply them because of the rules. It's quite hard. I don't know if you know the development of the central innovation district in The Hague, between the three large city stations, central Holland Spoor and Laan van NOI, they're also developing in within that triangle 25,000 extra buildings in the existing city with high rise until 130 meters. And there is also a problem on how to do it renewable, and especially because there's no space for production of own energy.
In Amsterdam, you have the Sluisbuurt, newly produced island in the Ei. It looks like the new Manhattan, extremely densed high rise buildings. What the problem there is, they also need to be sustained renewable. But what the problem is with such dense high rise developments is that also the municipality

of Amsterdam, they demanded that every new building should be low temperature heated. But the problem with that is that you need quite a large dimension of infrastructure in the ground. With lower temperature, you need more volume to transport it. So if you have small streets, then it's more difficult to fit in two or maybe three quite large heat pipes within the street. And also within the building, you need more space to put in the pipes. And you have to put in individual heat pumps, which also take up space. And also a Delft a square meter is quite expensive. So if you take in every building, you use one square meter for a heat pump, for every building, that's another five, maybe 10,000 year of investment that you lose. And so in the Sluisbuurt, it was most logical to have a high temperature heating system in completely well insulated new buildings, because you use less space as well in the street, as in the building itself. And you don't need large buffers inside the building for two or 300 liters for tap water, with just a normal heat pipe. And this development looks somewhat like that, small streets small spaces and high temperature heat is easily distributed i such situation, especially if you go to a high rise. But it's very complicated still, even with high temperatures, with the most logical route would be either a high temperature heat grid or a low temperature, "WKO net". Wheree you have heat pumps in the basement of every building and producing heating and cooling for the building itself. And they are all the buildings are connected then distributing heat and cold with the underground and using the underground as a storage vendor.

Alexander de Ridder
What conditions are there, what is the best composition for high rise?

Benno Schepers
If you can you keep the buildings hot and cool, then it doesn't matter. But if you also have the addition of your own production of electricity, then it does matter. Because then you need surface to put your PV panels, without all the shades of the other buildings.
It's quite destructive for all renewable options, your own production options. And there is no surface for any solar panels. They will probably say we do the vertical ones. But well, people still have to look outside. So you need windows. So it is the square footage of vertical solar panels, is also very limited. And on top of the buildings, you have very small spaces for all the technical room you need. And it's more logical to develop such a terrain with more rooftop area. So if you make everything a bit higher, or make it different shapes, different streets, allowing you to have larger rooftops that you can do more. You can do high rise building but do it only on the Nort side of the area. So you have the Southside area, with square meters for more green, cooling ponds and solar panels. But not evenly distributed the high rise.

Alexander de Ridder
Can the canal Schie be of benefit?

Benno Schepers
You can use it for cooling, a river will be better. You can use this as a heat

source to collect the heat in the summer and put it in an aquifer and use that in the winter again with your heat pump. But if there's a data centre nearby that has a bit higher heat available all year around, it's much more favourable than the aqua thermal energy. The amount of water in Schie is eventually quite small. It's not like the large lake, it's not deep, which is important. The deep lake has much more cooler water in the underneath the canal.

Bruno de Andrade
What would be your recommendation towards waste?

Benno Schepers
We have quite a good recycling system, but it's all based on the on the different collection methods. So the glass, the paper, the tin cans, if you have a system that does that well, then you don't need the local system for it. I think that the most the most the thing that you can do best is think about the sewage. So if you put more biomass in there, you can have more bio gas. And so if you develop a system that can, with the right dimension of piping, can maintain a large amount of biomass in your sewage system. Than it might be interesting. But then everybody has to have such a grinder in its in its sink, and have to put all the chopping waste from cooking in there. But for the other, like, circular waste, or reuse the waste, I don't think it's sensible to do it for just one neighbourhood.

Alexander de Ridder
How can you use the heat of the sun?

Benno Schepers
The climate is changing and it is a problem for new and existing buildings. Design are based on situation in which the heat demand is larger than the cooler demand. But eventually the heating stress will most likely be a bigger problem than the heat demand. Heating is not the problem, but cooling is the problem. You really have to think of keeping the heat in the summer out, like special glass or shutters. Or you really have to have a good cooling system, that can extract the heat from the building and put in an aquifer, like "WKO", with a really high capacity.

Alexander de Ridder
What about the program and sustainability?

Benno Schepers
Different users can benefit from the other. If you mix different types of families and companies and offices, you will get an energy use the entire day. The more divers, the more you can use from eachother. The Minewater project is an excellent example.