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A MULTI-FUNCTIONAL BRIDGE AS AN ACTIVE CONNECTION BETWEEN THE NORTH AND SOUTH OF AMSTERDAM

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KEY WORDS

Multi-use | High density | Bridge design | Amsterdam

PROBLEM STATEMENT

When Amsterdam started to expand during the 19th century, plans were made for a better connection across the IJ river. During this period, numerous designs have been made for a bridge and even one for a tunnel. But none of these designs have ever been realized. Currently however, the municipality is planning to build not one, but three bridges in the east, west and at the central train station of Amsterdam.

One of these bridges is part of the Haven-stad plan of the municipality, which intends to transform the harbor into a city inside the city. More people will move to the cities in the future and Amsterdam will grow the most in the Netherlands with an expected growth of 20% until 2035 (de Jong et al., 2022). Up to 70.000 homes and 58.000 workplaces will be realized during the transformation in order to cope with this growth. The transformation area of this Harbor-city consists of 12 sub-areas in the west and north-west of Amsterdam and will include living, working, sports, stores, healthcare and greenery. With only 1 in 5 households that will have a parking spot, there is a large focus on the bicycle network, of which the new bridge will be an important part.

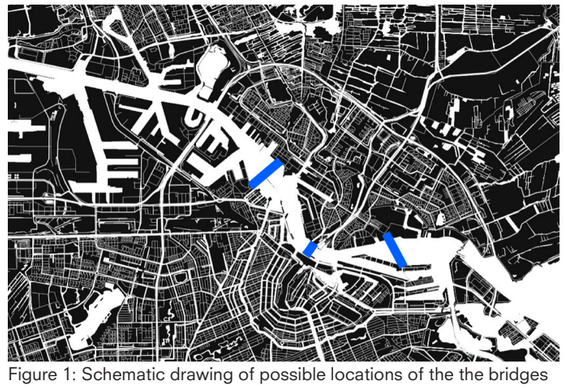

Figure 1: Schematic drawing of possible locations of the the bridges

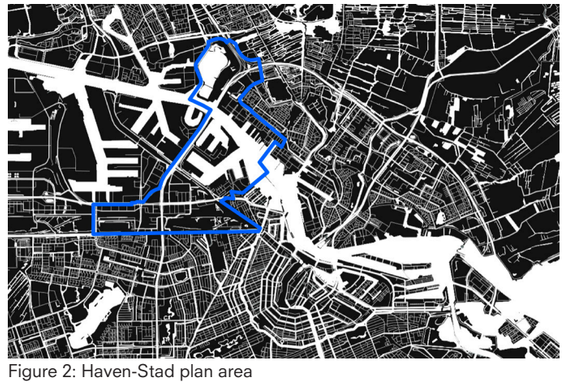

Figure 2: Haven-Stad plan area

The bridge will connect the NSDM-werf in the north to the Minervahaven in the south. The main functions in the Minervahaven are offices and industry, but the municipality intends to transform this area into a mixed-use part of the new harbor-city. As shown below, a lot of homes and other functions have to be added in an area of around 150 ha, which is a very high density for the Netherlands (Gemeente Amsterdam, z.d.).

NOW

Surface area of buildings	364.197 m2
Living	0 homes
Work	7.200 jobs
Schools	0 schools
Healthcare	0 health care centres
Sports	0 m2

FUTURE

Surface area of buildings	960.000 m2
Living	11.620 homes
Work	7.747 jobs
Schools	9 schools
Healthcare	9 health care centres
Sports	58.100 m2

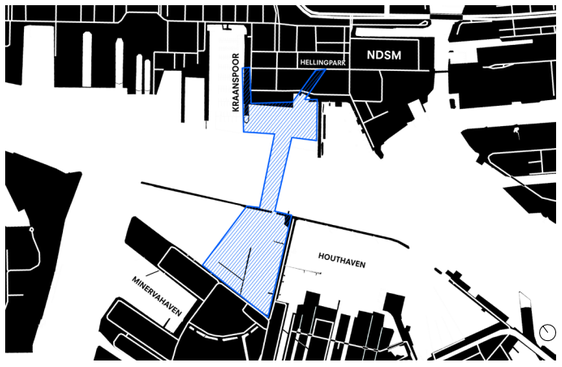

Figure 3: Possible location for the Westbridge, Concept Actualisatie Nota van Uitgangspunten Sprong over het IJ, 2021

Most of the available land in the Minervahaven has already been built on, so this densification will have to be achieved through topping-up and other creative solutions. The new bridge that will be built here offers a great opportunity for this densification. Currently, the vast majority of bridges are only used for one function: getting to the other side. But throughout history there have been bridges that combine different functions. On the Ponte Vecchio in Florence, for example, there are shops on the bridge that turn it into a lively shopping street. Many of the designs that were made for the bridge crossing the IJ river in Amsterdam also included homes and warehouses in the bridge design.

Would it be possible to bring back this old typology of buildings on a bridge and turn it into an active connection between the north and south of Amsterdam, which at the same time contributes to the densification of the Minervahaven? And what other values would this typology bring to Amsterdam and the Minervahaven?

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RESEARCH

RESEARCH QUESTION

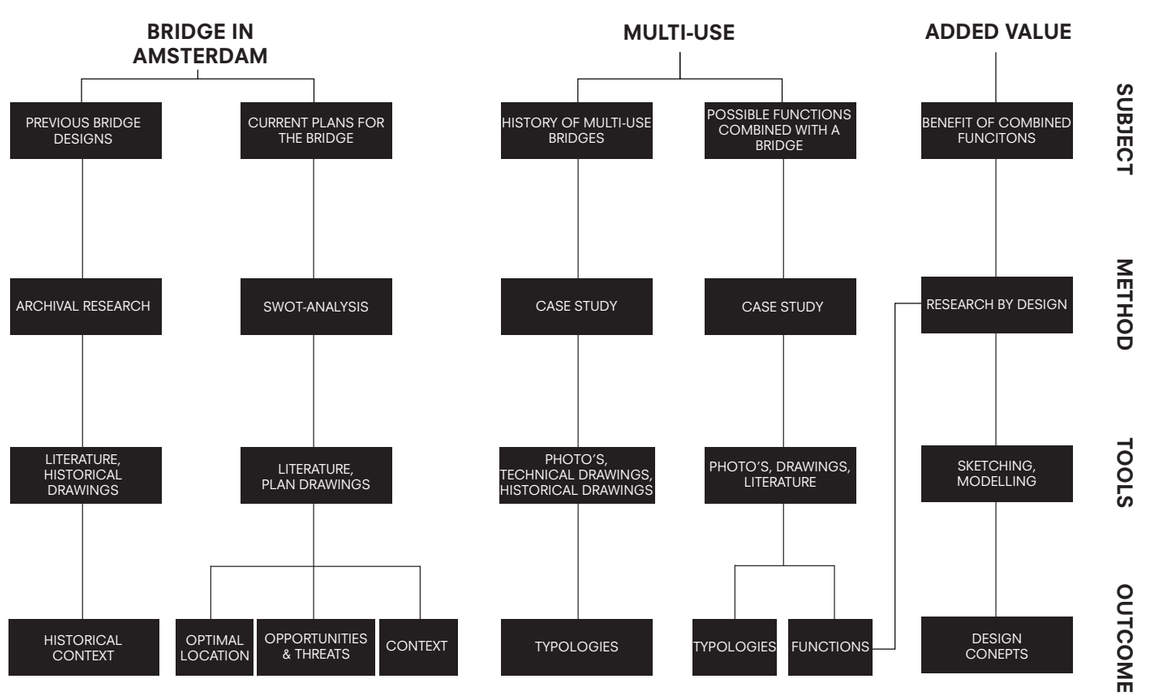
How can a bridge crossing the IJ river in Amsterdam serve as a multifunctional space that contributes to the urban density and creates an active connection between the north and south of the city?

SUBQUESTIONS

1_Story of the bridge in Amsterdam
a. Why were previous designs for a bridge crossing the IJ river in Amsterdam rejected?
b. Why is now the right time for a bridge in Amsterdam?

2_Multi-use
c. Multifunctional use of bridges in history
d. What functions can be combined with a bridge?

3_Added value
e. How can different programs on a bridge benefit from each other?



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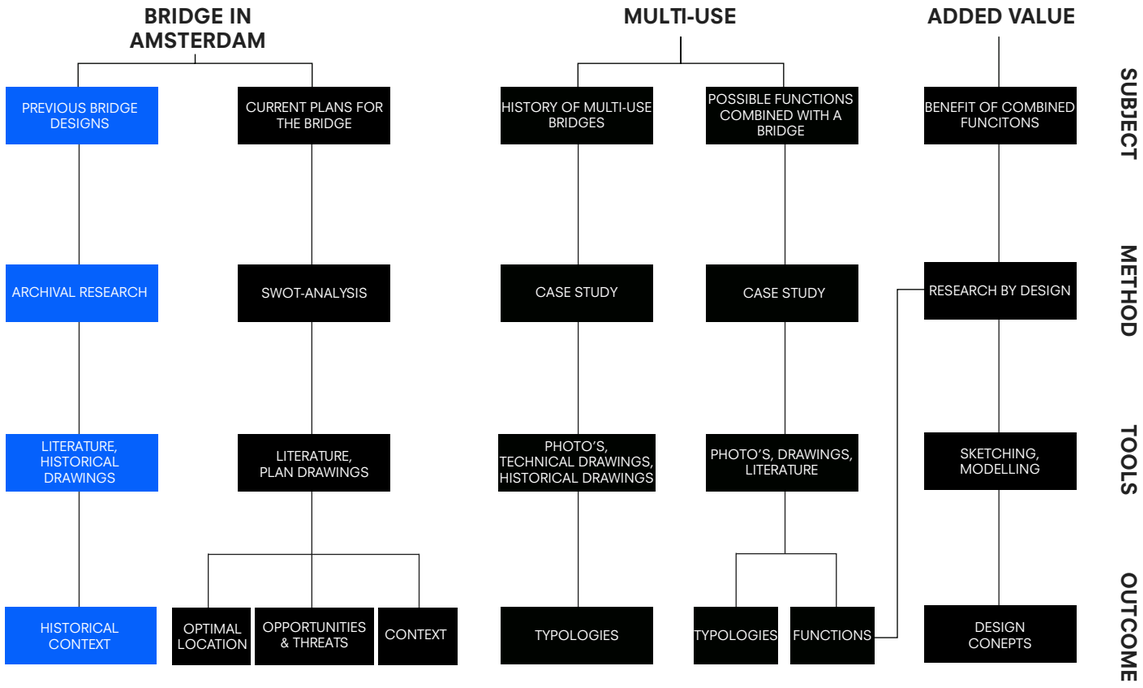

1_STORY OF THE BRIDGE IN AMSTERDAM

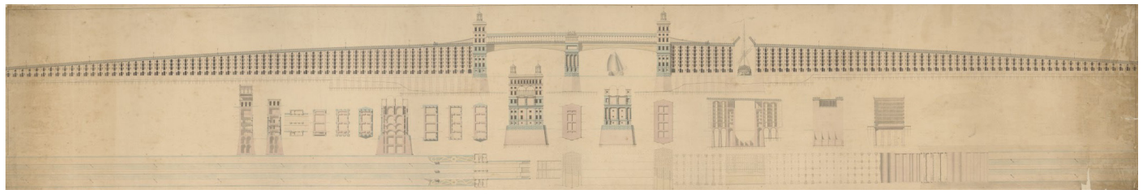

Figure 4: Elevation drawing of the first bridge design by Jan Galman, 1852

Figure 5: Impression drawing of the first bridge design by Jan Galman, 1852

A. Why were previous designs for a bridge crossing the IJ river in Amsterdam rejected?

The first design for a bridge crossing the IJ river was made in 1844 by Tijmon Kater, contractor of national road and hydraulic engineering works (Smit et al., 1996). Following his lead, multiple contactors and engineers started making designs for a bridge. Jan Galman born in 1807 made 36 designs for a bridge and even a tunnel between the years 1851 and 1886. But the municipality declined all of the designs made. Why we're none of the bridges built and why did Jan Galman keep making new designs for the bridge?

METHOD

This part of the research will be done through archival and literature research. A book was made about the designs of Jan Galman by historians and archivists in cooperation with the Amsterdam municipal archive. This book contains technical drawings, the discussion about the plans for the bridge in context with the urban development during the 19th century, the ongoing discussion of the bridge and the IJ-tunnel during the 20th century and finally the story of Jan Galman himself and his battle against the municipality.

OUTCOME

Researching these historical drawings and literature will help to uncover the technical, financial and social factors that led to the rejection of the bridge designs. The historical context resulting from this chapter might also help to understand why the municipality currently is planning a bridge, which will be discussed in the next chapter.

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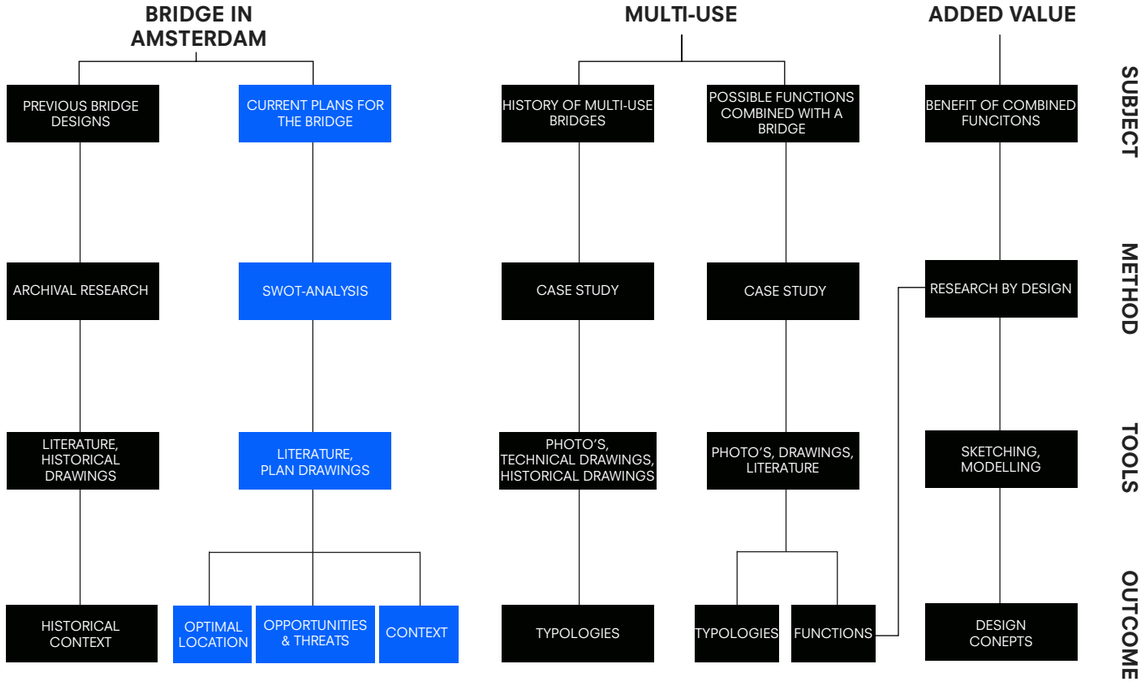


B. Why is now the right time for a bridge in Amsterdam?

Recent development plans of the municipality of Amsterdam include three bridges crossing the IJ river. For one of the bridges in the east of the city, the financing has been completed and the construction is planned to start in 2031. This raises the question why after all these years, the municipality does plan to build not one, but three bridges. With a focus on the bridge in the west which is part of the Haven-Stad transformation plan, what are the opportunities and threats of this bridge, how will it impact the Minervahaven, the NDSM-werf and Amsterdam as a whole?

METHOD

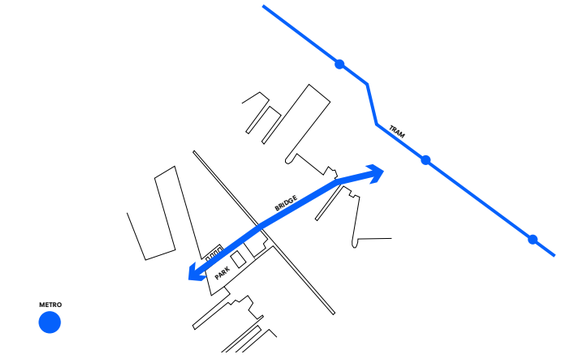
Analysing the Haven-Stad transformation plans of the municipality for the bridge will give insight into the reasoning for it. To dig deeper into the impact of the bridge on Amsterdam, I will do a location analysis that includes SWOT-analysis. Looking into opportunities, threats, strengths and weaknesses, will show both the positive and negative influence the bridge will have on different scales.

Subjects that will be part of this analysis are:

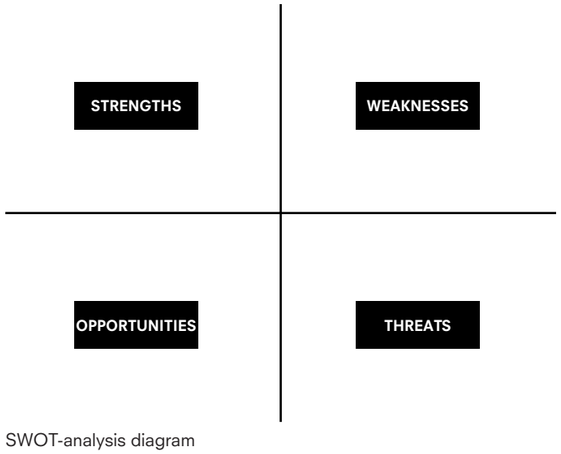
Connection
How it will improve the connection between the neighbourhoods and the city
Accessibility
Where and how the bridge will connect to land
Mobility
Effect on travel time
Use
How many people and who will use the bridge
Port
The influence on port operations
Image
Impact on the city's image
Stakeholders
Apart from its direct users, who else may or may not benefit from the bridge?

OUTCOME

Apart from the reasoning of the municipality for building the bridge I can derive from this research what the optimal location for the bridge could be and the overall influence, both positive and negative, of the bridge on the city.



Location research diagram



SWOT-analysis diagram

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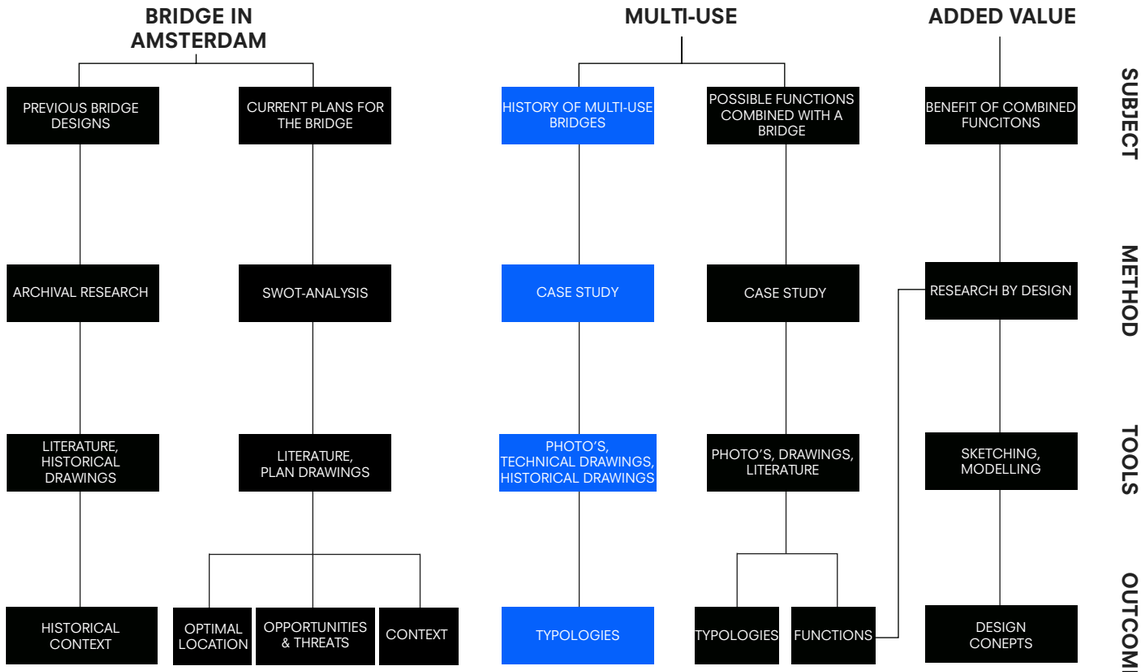

2_MULTI-USE

C. Multifunctional use of bridges in history

Currently the majority of bridges have one function: getting across. But throughout history there have been bridges with buildings on top to house multiple functions. This chapter will look into these typologies, including how these bridges were used and how the programs come together. By comparing these bridges to each other, I can identify similarities and differences across different time periods and cultures. The bridges that still exist today make it possible to also investigate whether the use of these bridges has changed over the years.

METHOD
The research will consist of a case study into four historical bridges that featured buildings on top:

- Rialto bridge, Venice, Italy, 1588
- Ponte Vecchio, Florence, Italy, 1345
- Old London bridge, London, United Kingdom, 1176
- Irgandi Bazar bridge, Bursa, Turkey, 1442

The case study will focus on:

Historical context
Why were these bridges built and what cultural factors played a role in this?
Program and use
What functions are placed on the bridge and how were they used?
Architectural design
What design elements facilitate the multifunctional use, including structural elements and spatial arrangement
Evolution over time
How did the use of the bridge change overtime?

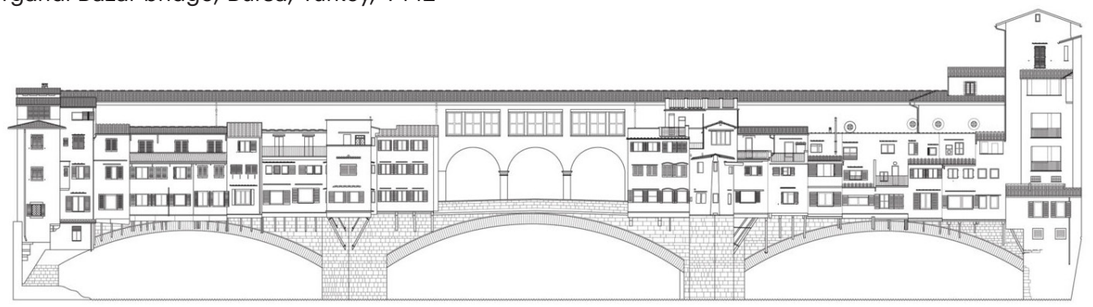

Figure 6: Elevation drawing of the Ponte Vecchio (Archweb, n.d.)

Figure 7: Painting of the old London bridge (English Heritage, n.d.)

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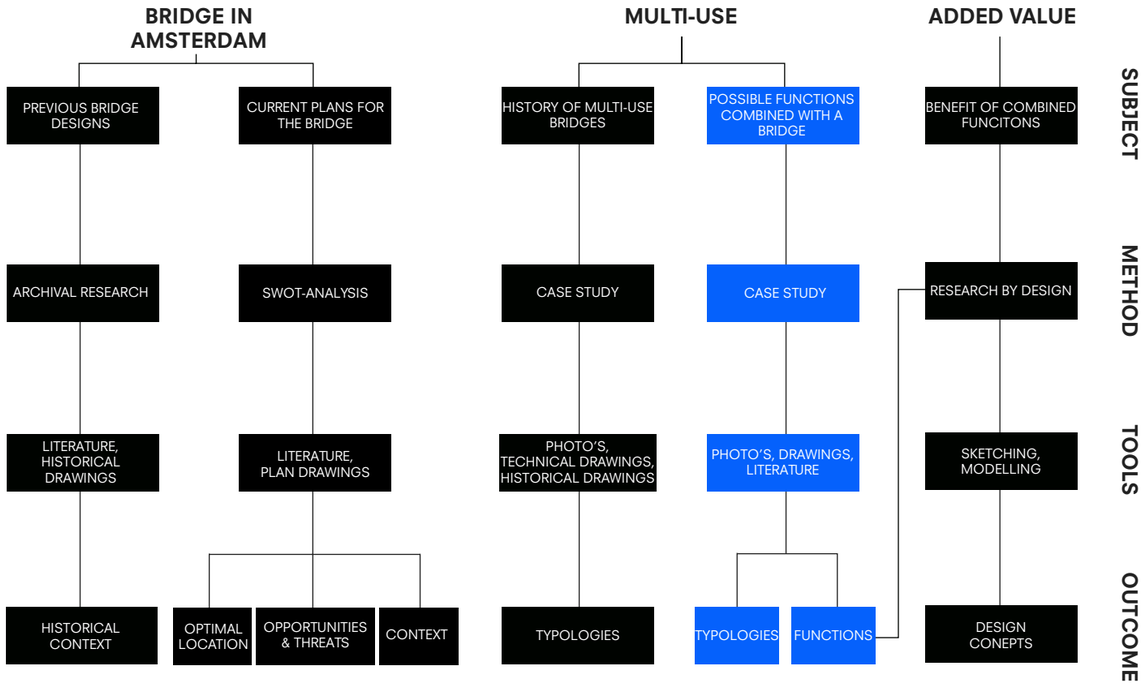

D. What functions can be combined with a bridge?

Even though most bridges currently have one function, there are a few examples that do integrate multiple functions into one bridge design. Compared to the previous chapter, these bridges are built more recently, which will help identifying functions which align with the current urban landscape and use.

METHOD

The research will be done through a series of case studies, researching bridges that include multiple types of functions, such as dwellings, recreational space and cultural space.

The case studies will focus on:

Layout
How is the program arranged?
Space
How much space is used for each part of the program?
Functionality
How do the different functions operate together?
Accessibility
How is every part of the program accessible?
Integration
How does the multifunctional bridge interact with its surroundings?

OUTCOME

Through this case study I aim to find a large range of functions and typologies that can be combined with a bridge. These findings can then be used for the next chapter which is about the benefit these combined programs can have from each other.

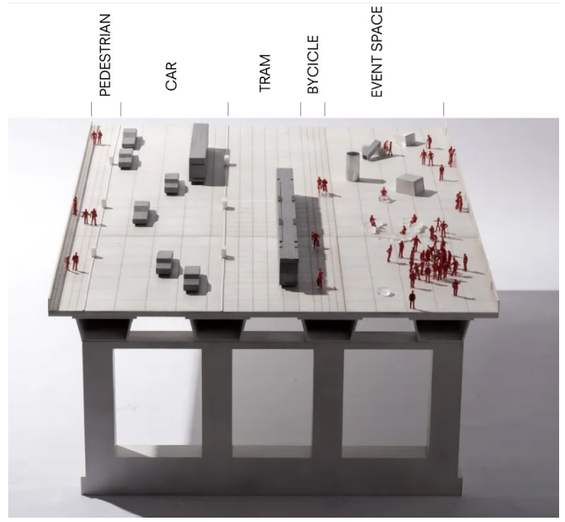

Figure 8: Example of case study research focusing on use of space. Simone Veil bridge, OMA

Figure 9: Combining a bridge with a park, Highline, New York, DS+R

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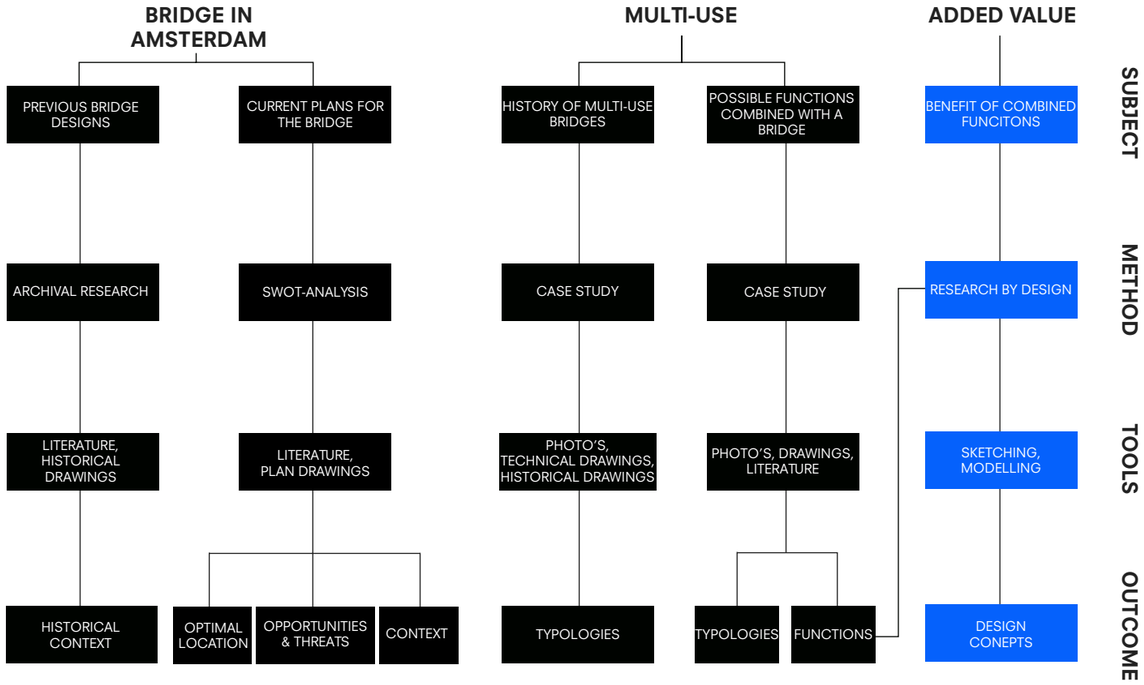


3_ADDED VALUE

E. How can different programs on a bridge benefit from each other?

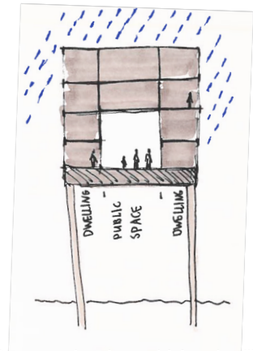
When researching the typology of a multifunctional bridge, it is important to find out what the added value is of the functions that are combined. This involves a symbiosis of the functions instead of parasitic architecture. How can the functions benefit from each other and how do they give each other and the city extra value?

METHOD

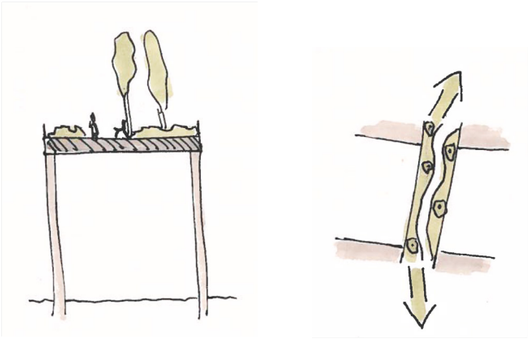
For this chapter I will apply a research-by- design approach. I will make simple concepts of a bridge with multiple functions focusing on form and lay-out. Through these concepts I aim to analyse how different programs, including the programs found in the previous chapter, will interact. Additionally, I will research how different spatial arrangement can influence these programs. By using a combination of sketching, modelmaking and 3D modelling I will visualise the concepts. Sketching will help to quickly make iterations, while modelmaking and 3D modelling will help to move around the program quickly and to get a sense of the scale of the programs.

OUTCOME

This will result in a range of design concepts that explore the different benefits resulting from combined typology. These concepts can serve as the start of the design fase.



Concept sketch combining dwellings with a bridge



Concept sketch combining a green park with a bridge

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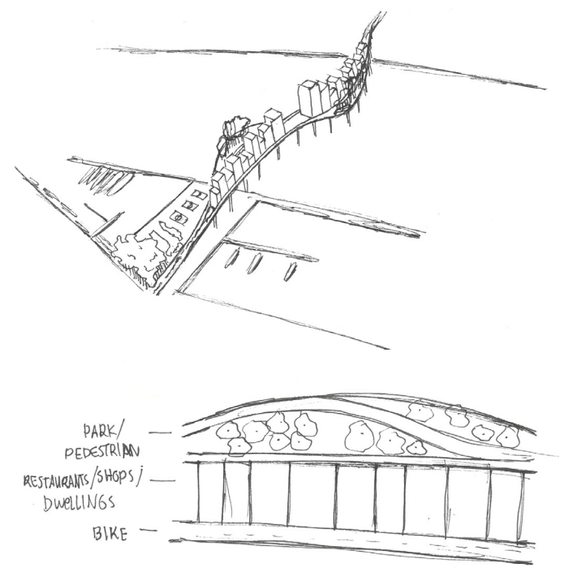
RELEVANCE

The research into the use and the added value of multi-use bridges might result into valuable information on how we can be more creative with the space available in the city. This research focuses on a bridge, but the new insights into multi-use urban space might also be applicable to other typologies or structures, such as roads, train tracks etc. Furthermore, there is a large amount of cities that have bridges in the city centre. This old typology, brought back to life could contribute to the urban density and add new values to cities all over the world.

The first part of the research is specific for Amsterdam, but building a bridge might come with similar issues in other cities as well. The results from SWOT-analysis and even the historical designs of Jan Galman could therefore also help get insight into issues regarding the port operations, technical issues or social opportunities.

RESEARCH TO DESIGN

The research will serve as direct input for the design project. I want to design a multi-functional bridge, which creates an active connection between the Minervahaven and the NDSM-werf. So all the knowledge obtained from the research will be of great value. The designs from Jan Galman can be an inspiration, but also can show me what does and doesn't work in Amsterdam. The analysis of the current plans of the municipality together with the SWOT-analysis will help find the right location for the bridge and will show what aspects, stakeholders etc. I have to pay extra attention to. The case studies and especially design concepts resulting from the second and third part of the research can serve as the starting point for the design process. The next step will be applying and combining the design concepts, and implementing them into the design site. I can then test how these programs work on site with the information I gained from the SWOT-analysis, and find the optimal program for the bridge.



First sketch design

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