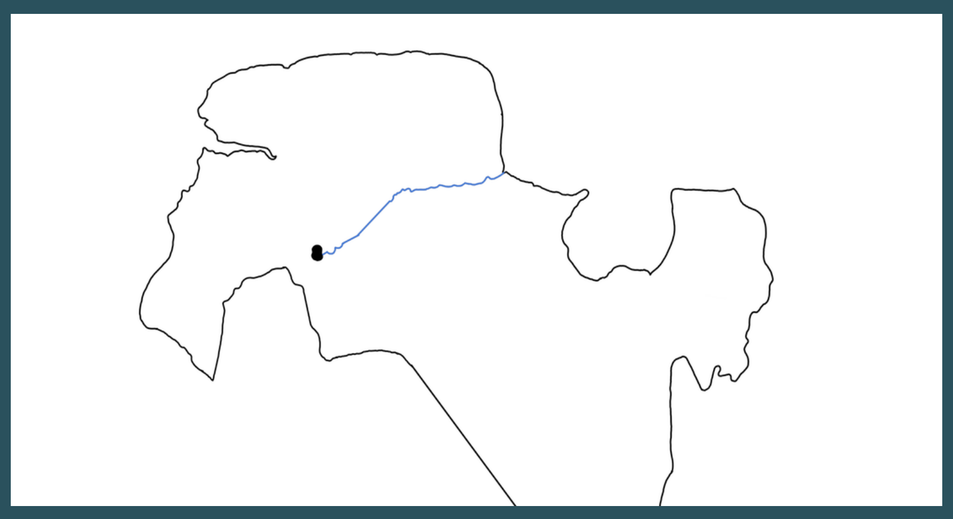
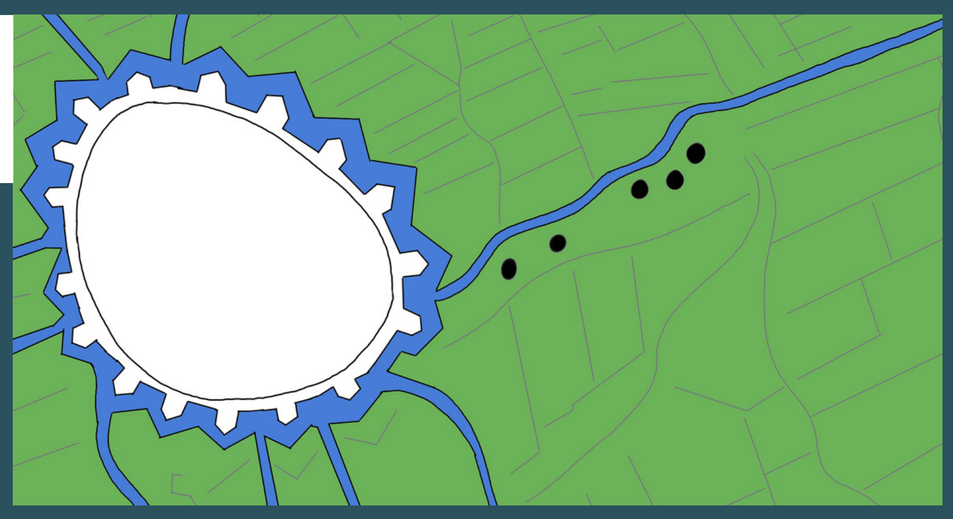
HISTORY OF DAMSTERDIEP

1400



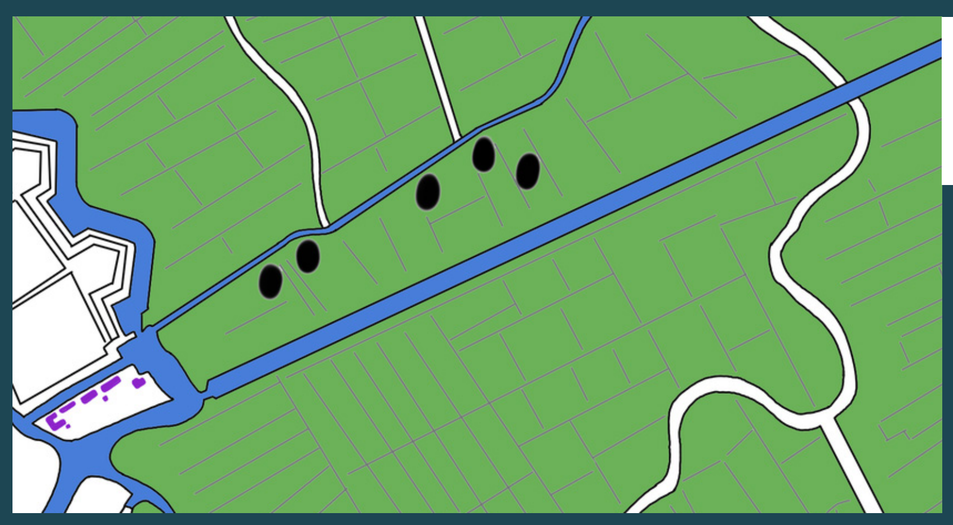
1424. Damsterdiep was dug.

1700

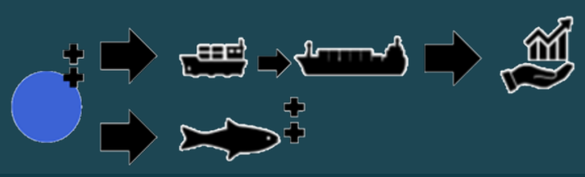


1700. First windmills were built.

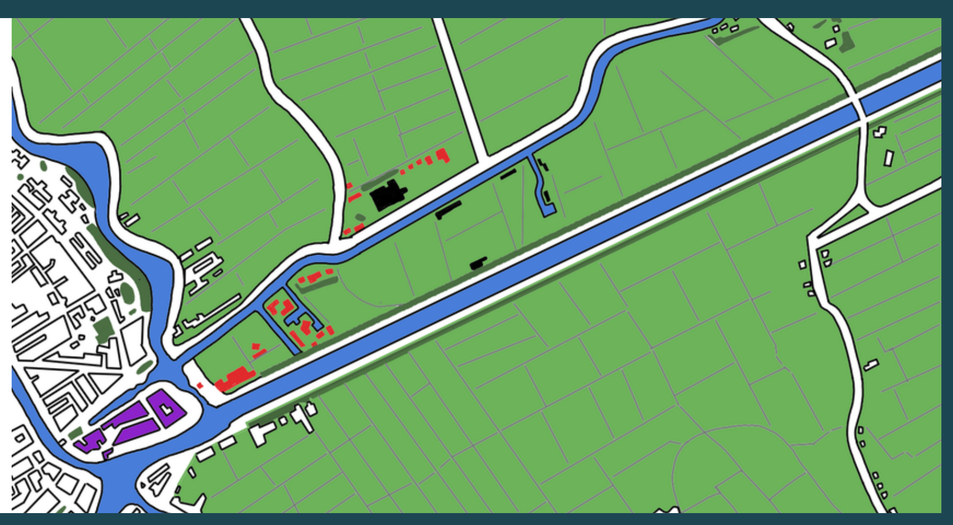
1880



1880. Eemskanaal was dug and city walls were taken down.

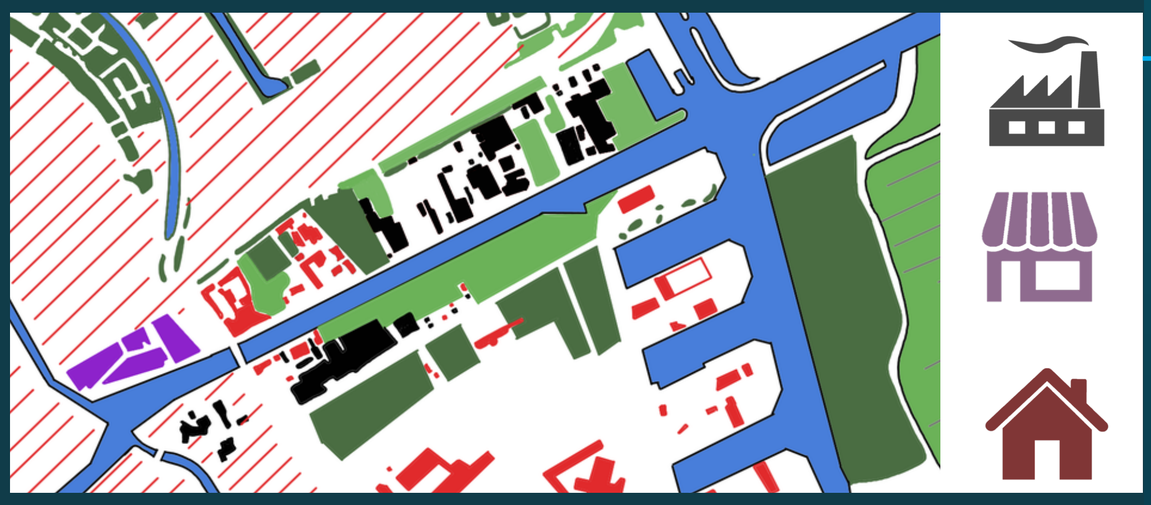


1930

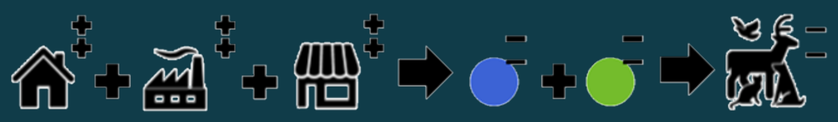


1930. Windmills made place for factories.
First ‘woningwet’ was introduced.

1970



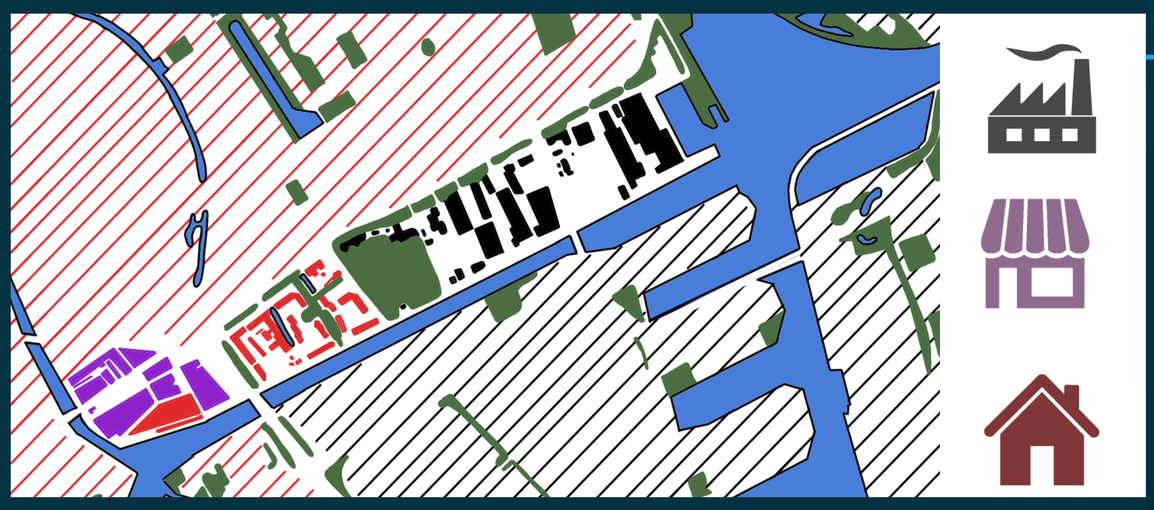
1970. Damsterdiep was damped and urbanisation was increasing.



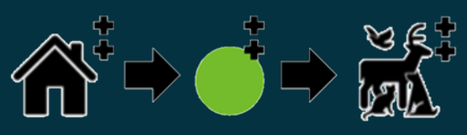
1990

1990. Damsterbuurt became more industrial while neighborhoods became more green.

2020



2020. More houses and green areas were built in Damsterbuurt.



Nicky Fokkema
Stefan Vuijst
Marco Zinger

Sources
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25-11-2021

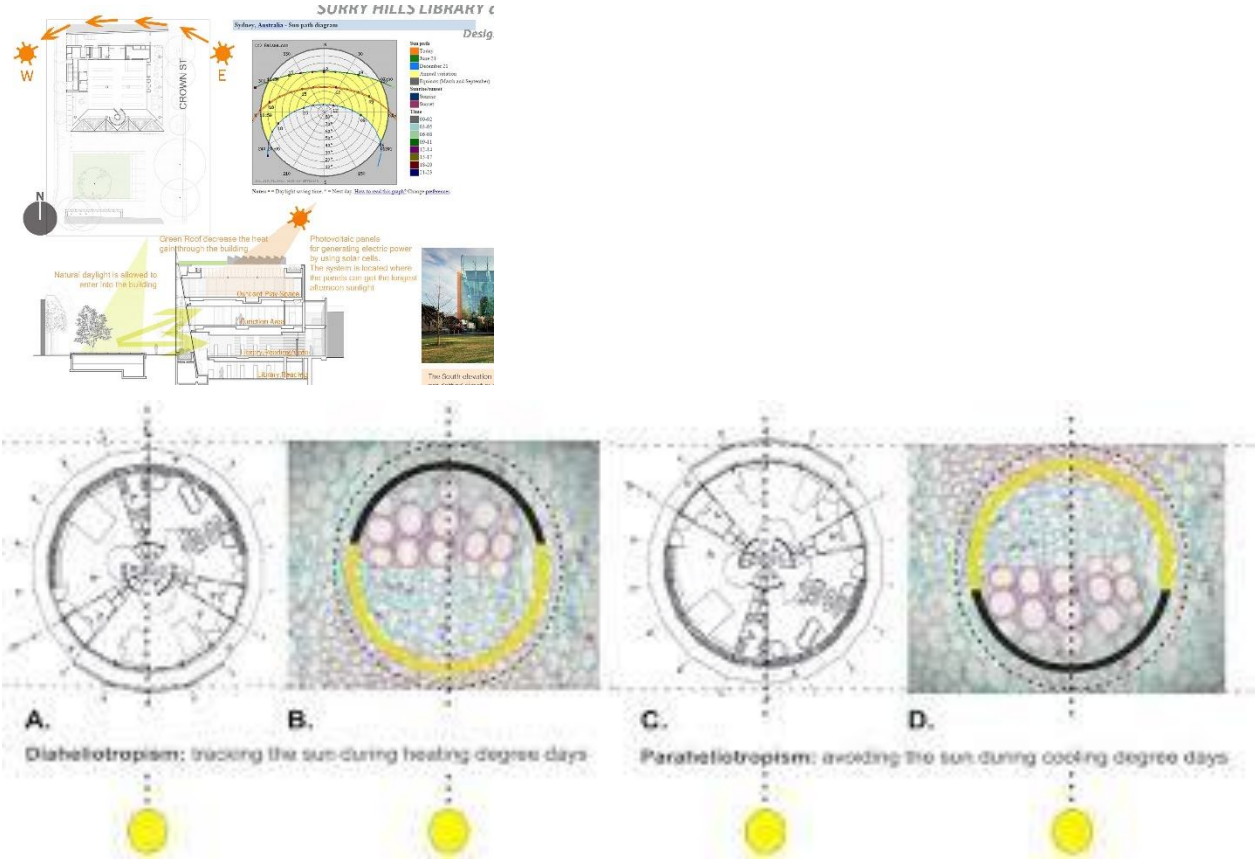
Research Rapport

Climate Adaptation

Vuijst ST, Stefan (406042)
GROUP 1

Summary

In this report, two buildings will be analysed. Those two buildings are built with the idea being climate adaptive. Summers are getting hotter and both buildings have their own way to create a comfortable indoor climate during those hot summers. The first building that is analysed is the Heliotrope in Germany. This building creates its comfortable indoor climate by being more efficient in generating sustainable electricity for artificial air-conditioning. The second building that is analysed is the Surry Hills Library in Australia. This building keeps the interior comfortable by the use of rotating louvers and a biofilter for sustainable ventilation. These buildings have some similarities and differences. One remarkable similarity is the materialisation. Both buildings are made out of wood. Another similarity is that both architects made use of the sun path in their design process. The main differences between the two buildings are the shapes and the context.



Figuur 1 Sun Studies Heliotrope and Surry Hills Library (By MDes Lighting studio & ipcee)

Table of content

Preface

Temperature is rising, sea levels are rising, extreme weather is becoming more and more common. In other words, climate is changing. Different climate conditions require different types of buildings, buildings which are resistant against these extreme conditions.
In the Netherlands one of the climate changes we have to deal with every summer is the rising of the average temperature. This is why this report focusses especially on buildings that make use of the sun and particularly on how to make the inside climate as comfortable as possible. In addition of this, this report focusses also on the transformation of sunlight in an efficient and sustainable way into energy.

The buildings that are chosen to research for this report are:

- The Heliotrope in Freiburg (Germany)
- The Surry Hills Library in Sydney (Australia)

The interesting thing of the Heliotrope is the huge plane of solar panels on the roof. But not only the solar panels are interesting. The most remarkable thing about this building is that the entire building structure rotates by the rotation of the sun for the most optimal efficiency.

The Surry Hills Library is located in Sydney in Australia. The summers in Australia are in generally hotter than the summers in Germany. To protect the Library against the extreme summer heat. The building has automatically rotating louvers on three sides of the building. This keeps the inside of the building comfortable the entire year.

The main aspects that are focused on in the report are:

- The forms/space of the building
- The materialisation
- The function of the buildings
- The environmental and social context

At the end of the report there will be a conclusion and an list of the similarities and differences between the two buildings.

1. Defining the main questions

As you can read in the preface, climate change has an effect on different aspects. Some of these effects are: the raising of the sea level, reduction in biodiversity, the raising of the global temperature, melting of the ice on the arctics and more extreme weather conditions.

One of the consequences we have to deal with every summer in the Netherlands is the more extreme weather conditions. Heat waves alternate with lots of rain, in some cases there falls so much rain there are floods.
That the climate is changing is for sure. That we have to adapt to these extreme weather conditions is for sure as well. But how do we design buildings in a way that the indoor climate could be comfortable as well in the summer as in the winter? This question will be researched in this report.

In short:

'*How can we design buildings with a comfortable indoor climate to be resistant against the heat of future summer days*?'

To give a well-argued answer on this main question, the main question is split up in some sub-questions. These sub-questions are related to the 5 research elements (domains) as mentioned in the preface. These domains are: space/form, materials, function, environmental context and social context. Regarding to these domains, the sub-questions can be defined:

1. Which forms are used in the shape of the building and how do they contribute to the climate adaption?
2. Which materials are used in the building (exterior and interior), are those materials sustainable and in which way do these materials contribute to the climate adaptation?
3. What is the function of the building, is this building private or public and does this anything have to do with the reason this building is climate adaptive?
4. How does the environmental context look like, what kind of functions available in the neighborhoods and does this have anything to do with the climate adaptation?
5. How do people in the neighborhoods of the buildings live, do they have a good income, in what kind of houses do they live and in what way does the building contribute to how they live?

When there is given answer to all of those questions, the content can be analysed. What do these two buildings have in common? What can we learn of these designs? And moreover how can we use aspects of those two buildings to make one new design for a climate adaptive house in the nearby future?

2. Setup Research Methodology

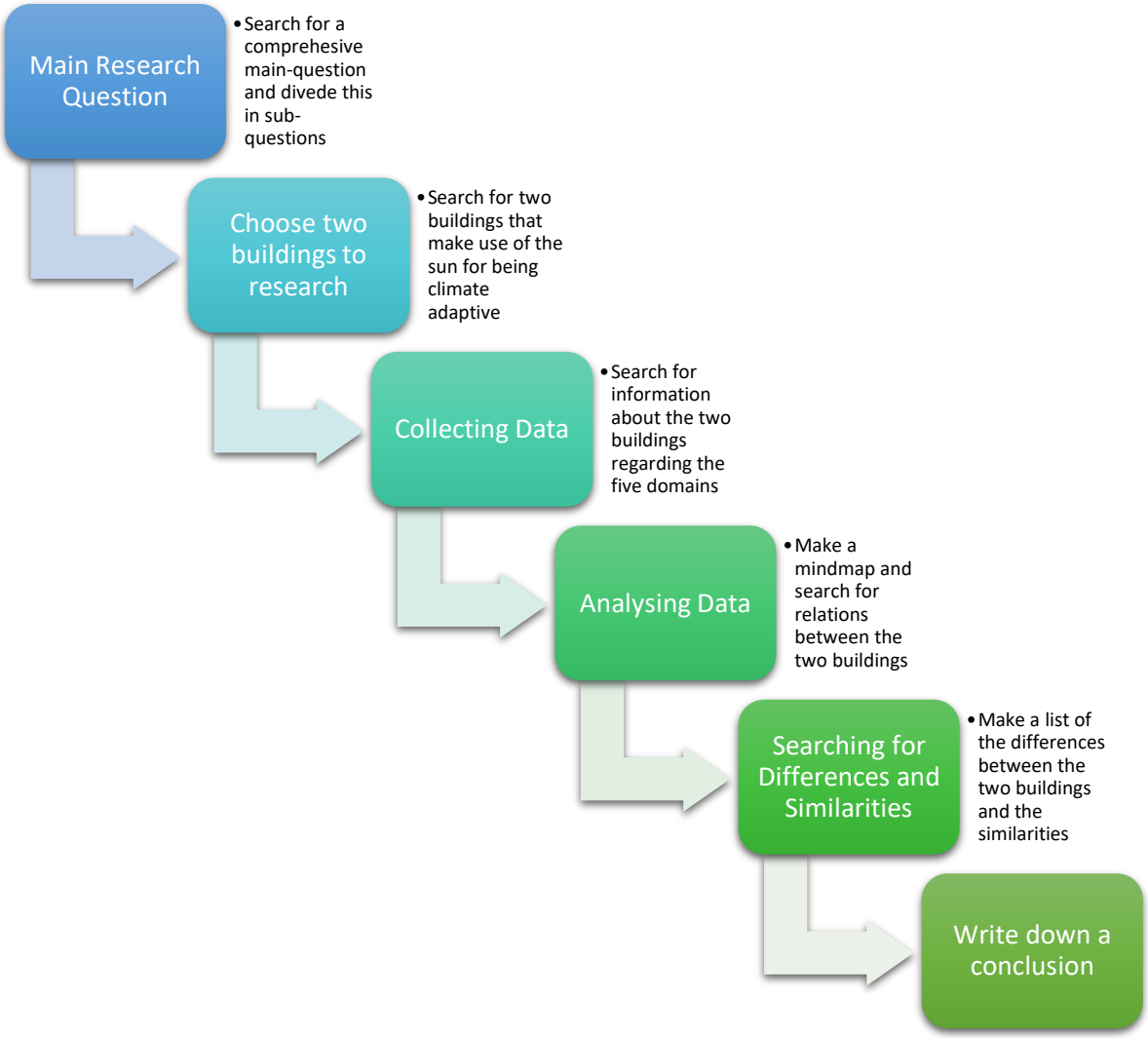
The first step for doing this research was to choose two buildings to analyse. These two buildings had to be climate adaptive and had to make use of the sun in its way of being climate adaptive.

When two buildings were chosen, the buildings had to be analysed. For these analysing there was setup an A1 sheet with a table on it with five columns wide and eleven lines high. This table was added with content like for example drawings and diagrams regarding to the 5 domains.

After the finishing the A1 domains-sheet, the collected information was analysed and differences and similarities were connected into a mindmap.

When there was a good overview of the differences and the similarities between those buildings. These differences and similarities were summarized and added to a list which is mentioned in the end of this report.

The final step of the research is the mention of a conclusion. This conclusion is also in the end of this report and gives a good overview on the research findings.



3. Collecting Data

In the next paragraph the results of a quantitative research are mentioned. The research is mostly a case study regarding to two buildings. For this case study there is made use of some deskresearch supplemented by some drawings and some diagrams. The results are assembled in an A1 domains-sheets which is included in the annexes of this report.

3.1. Choosing of the buildings

As mentioned before in this report, the two buildings that had to be analysed had to make use of the sun to be climate adaptive. This is why is chosen for the next buildings:

- The Heliotrope in Freiburg (Germany)
- The Surry Hills Library in Sydney (Australia)

Both buildings make use of the sunlight but both in a different way. That's what makes those building such interesting to analyse.
In general, the Heliotrope building is a large building with a big plane with solar panels on top of the roof. The interesting thing about the Heliotrope is that the building is situated on a large cylinder. This cylinder can rotate the entire construction of the building. This is quite useful because the building can rotate exactly in line with the sun what makes the solar panels the most efficient.
The Surry Hills Library in Sydney has also some very interesting elements regarding to climate adaptation. The main focus in this report is on the louvers that rotate in line with the sun. There are also some other elements that make the building climate adaptive (such as the green ventilation system by the tree's in the inside of the building) but these elements do not answer the main question mentioned in this report.

Figure 1 The Heliotrope in Freiburg (By ResearchGate.com)

Figure 2 The Surry Hills Library in Sydney (By Wikimedia.com)

3.2. Collecting information

After the two buildings had been chosen, there is collected some information about these buildings. This information had many interfaces with the five domains. In the next sub-paragraphs the two buildings are explained regarding to the five domains. The information is supplemented by some images, drawings and diagrams. The collection of the information is merged on an A1 domains-sheet which can be found in the annexes of this report.

3.2.1. Space/form

When you take a look at the Heliotrope, the first main shape you'll notice is the cylinder. Both, the rotating element and the building itself, do have a cylindrical shape. The main reason of the cylindrical shape is the airflow that is going along the building. By a cylindrical shape, the building has the least wind load. When you make a vertical section of the building, most of the shapes that appear are rectangles. But when you take a look at the construction you'll notice that there are some diagonals that makes there are some triangular shapes as well in the building.

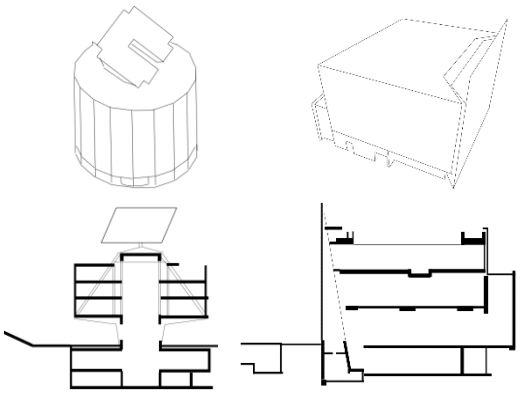


Figure 3 Forms/Shapes of the building

The Surry Hills Library has in contrast to the Heliotrope a rectangular shape. The building almost looks like a box with some subtractions but the plane on the right side of the building gives some more shape to the building. When you take a look to the inside of the building you see there is a triangular shape next to the plane. In this triangle there are some trees situated and the airflow alongside these trees make that the building is ventilated sustainably.

3.2.2. Function

The Heliotrope was built in 1994 as an experiment. The building should be a private residence for the Architect (Rolf Disch). The entire building had to be climate adaptive. That's why the laundry is done by rainwater, the sun heats the water when they wanted to take a shower and the building is not connected to the gas network. The building has three floors. The main floor is the first floor.

Figure 4 The interior of the Heliotrope (By:oregonlive.com)

The Surry Hills Library was built in 2009 on behalf of the Surry Hills community. They needed a public building where people could read, study and meet and where children could play. The building had to be climate adaptive and the way that this was achieved had to be illustrated in a resource centre in the building so people could be inspired. The building has 3 floors and a basement. Most of the functions are located on the ground floor, the first floor and the second floor. The offices are located on the third floor and the resource centre is for the biggest part located beneath ground level.

Figure 5 The interior of the Surry Hills Library (By architectureAU.com)

3.2.3. Materialisation

Although you can not see it from the outside, the Heliotrope has a wooden construction. The reason wood is used has to do with the idea of the architect of making a climate adaptive building. That's why for example the façade panels are made out of aluminium.
Besides the wood and the aluminium, the building has a lot of glazed windows.

The Surry Hills Library is for the greater part built out of wood. Both, from the outside and from the inside of the building wood is visible.
The louvers of the building are made out of wood as well. These wooden louvers are connected to a metal construction that rotates the louvers according to the position of the sun. Some other materials that are used in the building are tiles, stucco and glass.

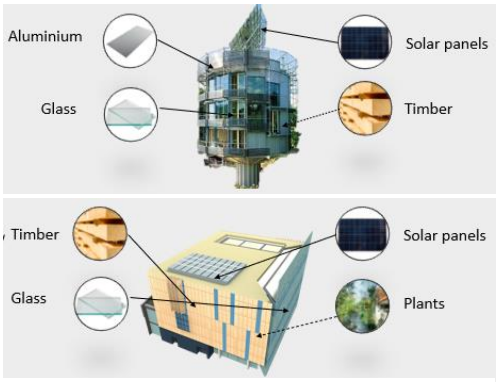


Figure 6 Global materialisation of the building

3.2.4. Environmental context

The two analysed buildings are located in different countries. The Heliotrope is located in Freiburg, a town in western Germany, near to the French boarder. The building is located in the Vauban suburb. This suburb isn't quite divers. The biggest part of the area contains detached and semi-detached houses. The suburb is located on the border of the town what means that there's a lot of green located near the houses.

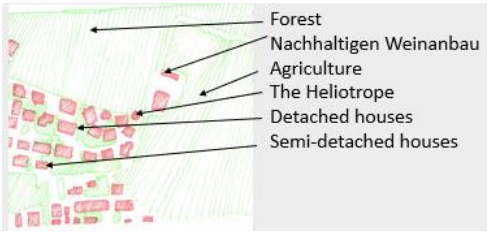


Figure 7 Area Heliotrope

The Surry Hills Library on the other hand is located in a completely different environmental context. The Surry Hills Library is located in Sydney. Sydney is the biggest and oldest city of Australia but not the capitol. The building is located in the Surry Hill suburb. Surry Hill can be characterized as a quite divers environmental context, there are houses (mostly terraced houses), shops, parks, café's etcetera. The area is much less green than the area of the Heliotrope.

Figure 8 Area Surry Hills Library

3.2.5. Social context

As mentioned in the last paragraph, the Heliotrope is located in Vauban, a suburb in Freiburg. This area can be characterized as a neighbourhood for people with a semi-high or a high income. This can be seen in for example the sizes of the houses. Most of the houses are detached or semi-detached.

The Surry Hill neighbourhood is a quite divers neighbourhood. People who live in the neighbourhood do divers in in for example age, income and in their cultural backgrounds.

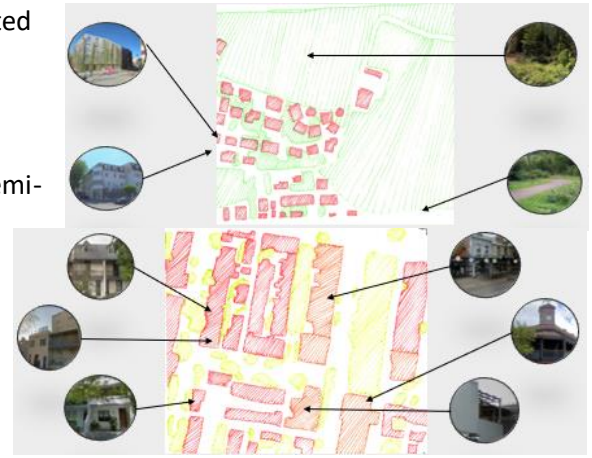


Figure 9 Pictures placed on the map of the neighborhood which give an impression of the area

3.3. Analysing Data

In the previous paragraphs, the buildings are analysed and the main aspects about the five domains have been mentioned. Now the main aspects of both buildings can be summarized and connections between the two buildings can be made. A good tool of looking for connections is making mindmaps. Underneath is a mindmap pictured about the Heliotrope and the Surry Hill Library.

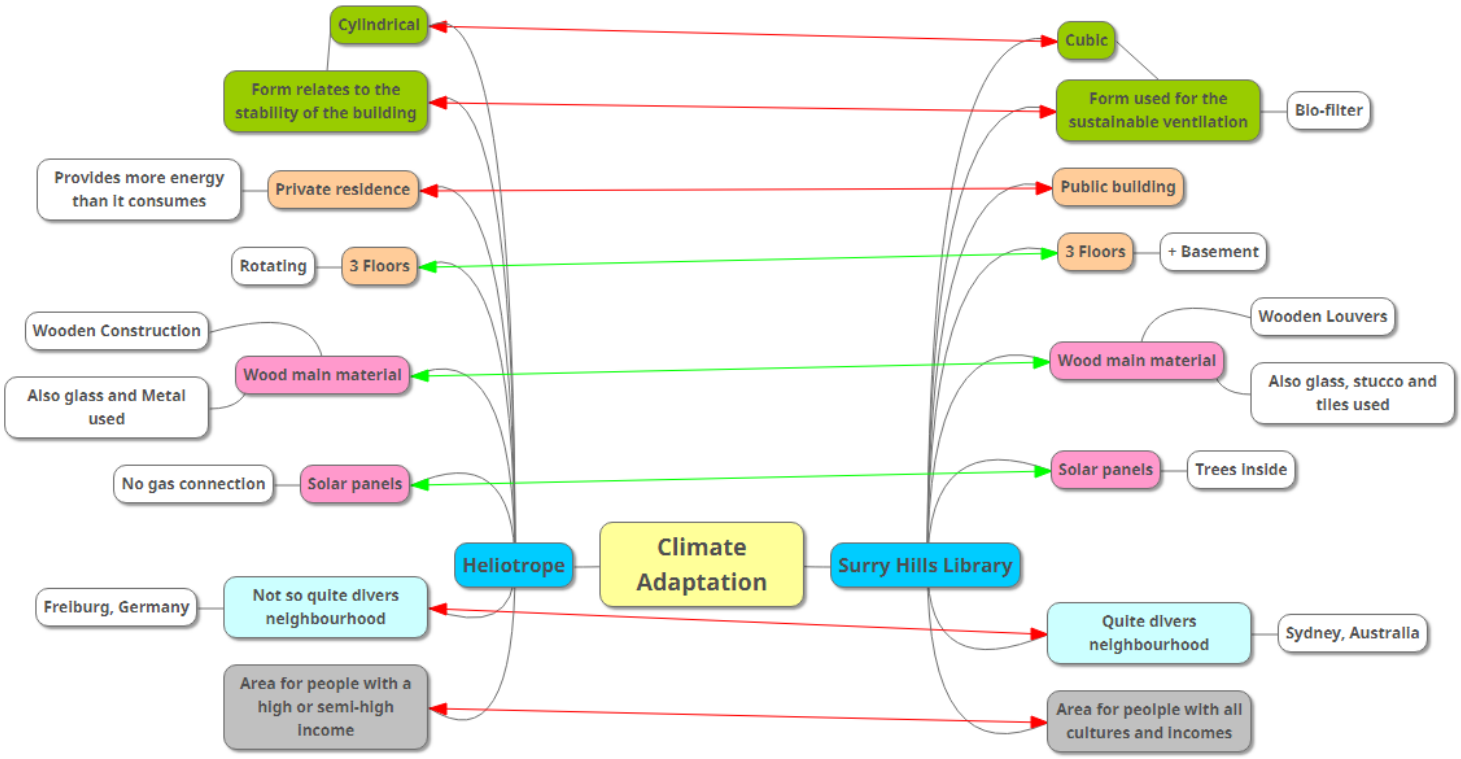


Figure 10 Mindmap Heliotrope and the Surry Hill Library

3.4. Differences or Similarities

In the mindmap of the last paragraph, some of the differences and similarities show up. The main differences and similarities between the Heliotrope and the Surry Hill Library are mentioned in the table underneath:

Differences	
1.	In the German Design the sun was used as a source of energy while in the Australian design the architect wanted to protect the indoor climate from the outside heat
2.	The Environmental and Social Context of the German design is different from the one in the Australian Design
3.	The German design is a private building while the Australian building is public
4.	Both buildings do have a totally different shape
5.	The German design uses electricity from the solar panels and artificial air for cooling down while the Australian design uses a bio-filter
Similarities	
1.	Both architects made use of the rotation of the sun in their designs
2.	Both buildings do have three floors
3.	Both buildings do have solar panels on the roof for green energy
4.	Both buildings are for the biggest part made out of wood

4. Conclusion

The global temperature is rising. Winters are getting colder and summers are getting hotter. Some summers days, the outside temperature is such high that people can't stay outside for to long. Inside buildings the temperature has to be suitable the entire summer long. This can be achieved in different ways but the one way is more sustainable than the other. The Heliotrope and the Surry Hills Library show two different ways of cooling down a building during hot summer days. The Heliotrope generates power with the solar panels on top of the roof and uses this electricity for air-conditioning installation. The building rotates in line with the sun and so the solar panels rotate in line with the sun too what make the solar panels work the most efficient. The Surry Hills Library cools down the building almost without the use of electricity. The building has solar panels on the roof but those are not used for cooling down the air. The major reason the building stays comfortable the entire year is because of the rotating louvers on the façade of the building. These louvers ensure that only indirect light can entre the building and the building doesn't heat up too much.

Both buildings are climate adaptive. This can be seen in for example the use of materials. Both buildings are mostly built out of wood. Wood is a biobased material which is a renewable resource. The form makes the Surry Hills Library a climate adaptive building as well. The building gets ventilated by the airflow inside the building which passes a biofilter and an air-labyrinth before it flows through the interior of the building. The function and the context do not have a lot to do with the climate adaptation of the building.

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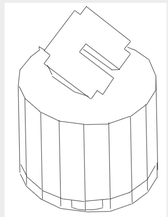
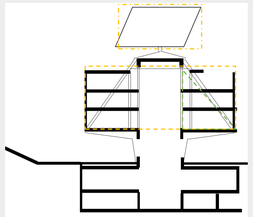
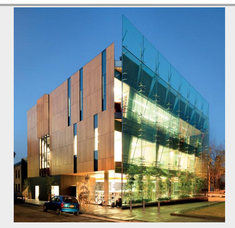
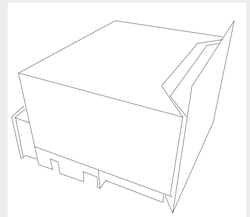
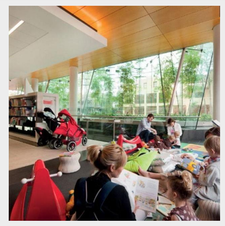
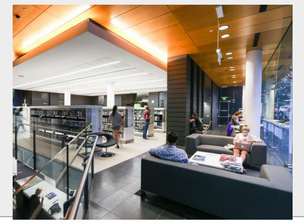
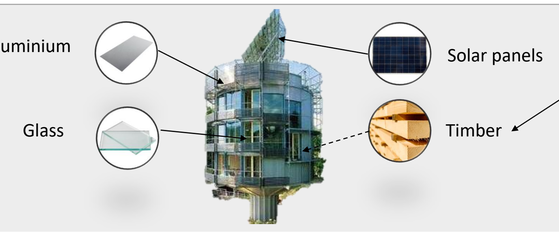
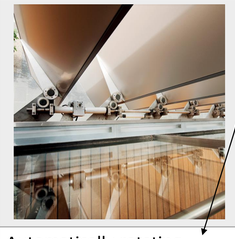
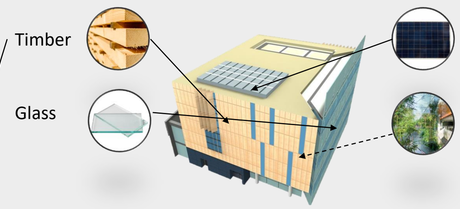
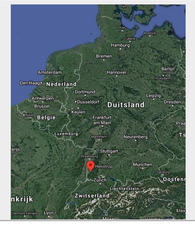
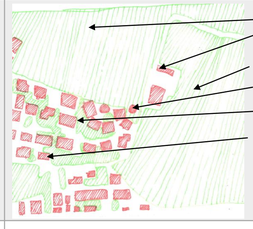
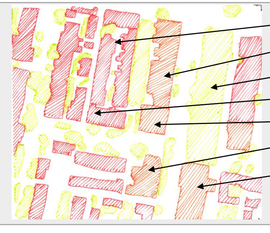
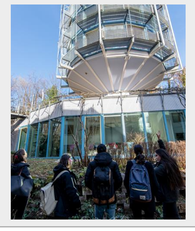
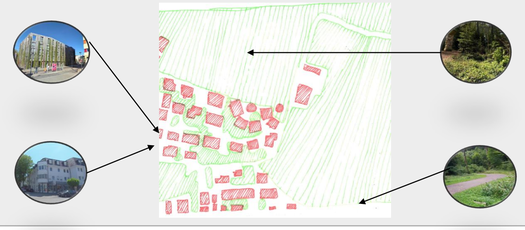
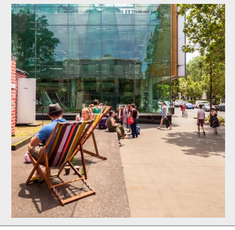
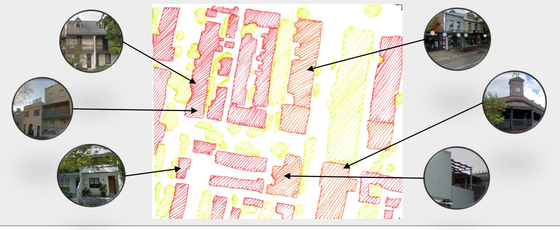
Annexes

Domain	Case 1: Design Heliotrope **Location: Freiburg Germany** **Architect: Rolf Disch**			Case 2: Design Surry Hills Library **Location: Sidney Australia** **Architect: FJMT**		
Space/form	 Perspective of the building		3D: - Cylinder 2D - Planes  Forms: - Square - Triangle - Rectangle	 Perspective of the building		3D: - Cube 2D - Planes  Forms: - Square - Triangle - Rectangle
Function	 Central first floor		Functions: 1. House 2. Sustainable inspiration 	 Room where people can read their books		Functions: 1. Library 2. Meeting Rooms 3. Resource Centre 4. Children's Spaces 5. Kitchen 6. Balcony 7. Store 8. Staff Rooms 
Material	 Rotating cilinder to phisically rotate the building to track the sun.	 Aluminium Glass Solar panels Timber The building captures more energy than it uses because the structure (made out of wood) rotates physically to track the sun. The solar panels on the roof transform the energy from the sun into electricity.		 Automatically rotating louvers to protect against extreme heat	 Timber Glass Solar panels Plants	The building has a unique air quality system which reduces the need for artificial cooling. Air is drawn in at the top of the atrium and it passes through special plants acting as 'passive'filters.
Environmental context	 The Heliotrope is located in the city of Freiburg	 Forest Nachhaltigen Weinanbau Agriculture The Heliotrope Detached houses Semi-detached houses	The architectural context isn't quite divers. The biggest part of the area contains of forest, agriculture and detached semi-detached houses. There aren't any shops in the neighborhoods.	 The Surry Hills Library is located in the city of Sidney	 Apartments Shops Park Houses Surry Hills Library Café Commercial/industrial premises	The architectural context is quite divers. There are some residential apartments, some terraces, houses, shops and commercial/ industrial premises which vary in scale.
Social context			The Heliotrope is located in the Vauban suburb of Freiburg. This area can be characterised as a neighbourhood for people with a semi-high, or a high income.			Surry Hills is an inner-city suburb of Sidney whose community is characterised by a diversity of age, income and cultural backgrounds.
Conclusion (Similarities)	The architects of both designs made use of the rotation of the sun. In the German design, the sun was used as a source of energy while in the Australian Design, the automatically rotating louvers protected the inside climate against the extreme Australian heat in summers. Some remarkable elements the two designs defer in are the shapes and the context. Especially the second one is quite remarkable. The German design is located in the middle of a green high-class neighbourhood while the Australian design is located in the middle of a suburb area. One important element the both designs have in common is the construction that in both designs is made out of wood.					

II. Analysing Mindmap