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Building Information Mega-puzzle

Master thesis at Chalmers Architecture

CHALMERS
UNIVERSITY OF TECHNOLOGY

17.02.2014
MPARC

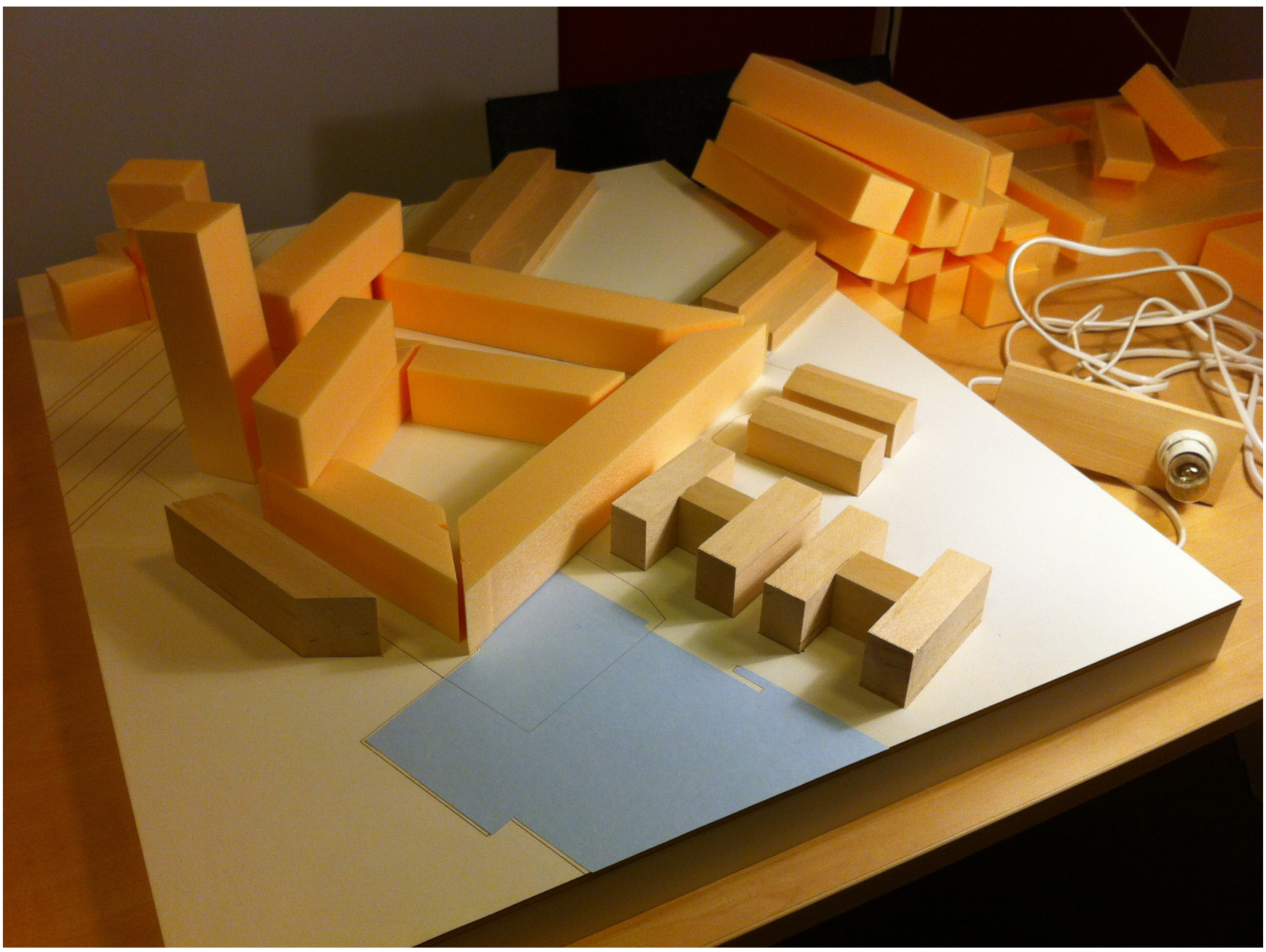
PROJECT DESCRIPTION:

The project is about creating a design process. It's exploring the use of computational tools to enhance the decision making in early project stages. The process includes both quantitative and qualitative approach in its evaluation. It's based on my findings of an existing method. It consists of an instruction with a set of rules and an example of how they can be applied.

The process of Building Information Modelling – It is a technology-based approach to design and construction, based on digital information. This information contains key physical and functional characteristics.
"BIM HAS SO FAR FOCUSED ON INTEGRATING PERFORMANCE AND MAINTENANCE FEATURES, SUCH AS PRODUCTION, BUDGET AND QUALITY. HOWEVER, UNLESS NEW TOOLS SUGGEST ALTERNATIVE VERSIONS TO DESIGN, IT IS AT BEST A SOFTWARE FOR PARTIAL APPLICATION,v AND AT WORST AN UNDESIRABLE SOURCE OF CONFUSION. RATHER, WHAT WE NEED IS A RENEWED VISION OF THE DESIGN PROCESS, ONE THAT COULD MAKE BETTER USE OF NEW TECHNOLOGY" - RYUJI FUJIMURA, architect and author of "A SEARCH ALGORITHM FOR GENERATING ARCHITECTURAL FORM" and "SUPER LINEAR DESIGN PROCESS THEORY" from JA70 and A+U "Architectural Transformations via BIM"

Often there's a lack of individual assessment (characteristic of traditional design methods) when the process is based on a digital model environment explicitly. The author of this model calls for a process of repeated collaborations and gradual revisions called 'Super Linear Design Process Theory'. At every step a model is made, followed by an analytical phase, that records all changes before moving on (case study page 1). In this way, they try to avoid shortcutting into the design phase. This would mean proceeding with a predetermined image of how the concept would look like. The SLDPT allows the building to materialize through the design process.

However it focuses on systematic documenting of information and collaboration/coordination.
I will remodel the structure behind this theory, using computational tools. My goal is to reinforce the design process with both quantitative and qualitative approach. I will examine the new structure and its implications on the design process, and test it on a site.

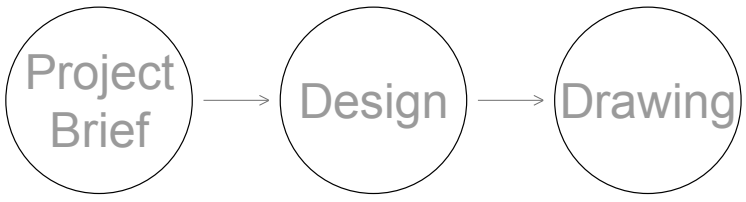


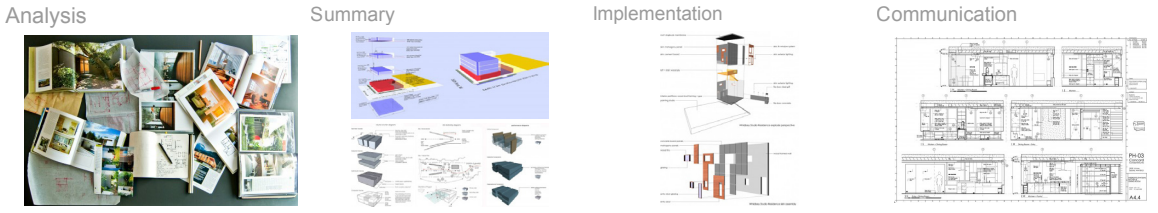
Design Processes

A quick search into the most commonly used approaches in design processes. All phases in the design can be commonly grouped into Brief, Design and Drawings. The brief is the program defined. The analysis part can be specified with studying existing conditions and form finding, followed by the summary – defining function and relationship between the building volumes, fitting the program and evaluation. The implementa tion and communication refer to how the building comes together – model making, drawings.

1. Series continuous linear steps with no redoing in back and forward movement.
2. This one involves no steps, everything is happening in the same time.
3. Investigative. This one is more exploratory. Each step is based on a selective investigation process of ideas and solutions. One idea leads to more ideas and eventually a solution is chosen.
4. Opposite to the exploratory. A linear process that involves redoing the initial idea, forming divisions of options at different steps.

The analysis and summary phases in this model is what my design process is focusing on (does not involve creating the initial building form, neither building design nor drawings). Let's take a closer look.





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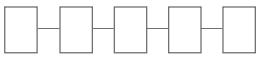
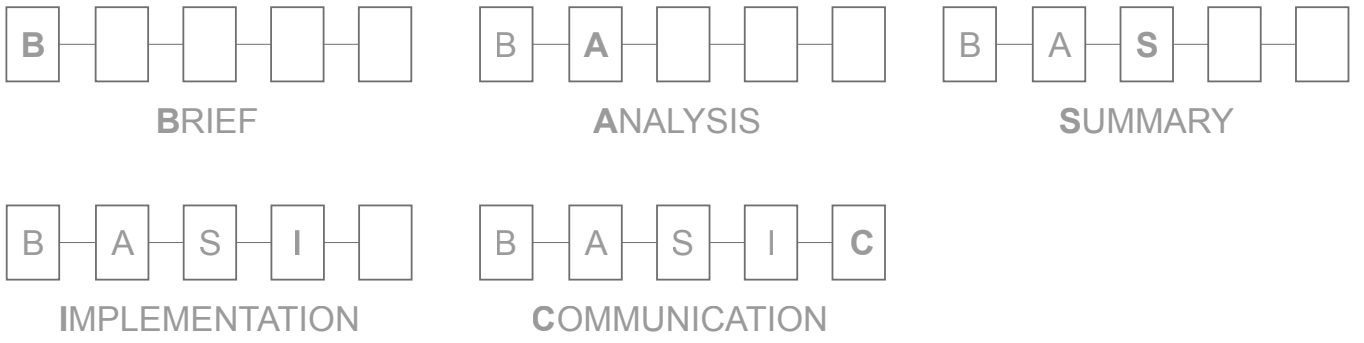


Linear



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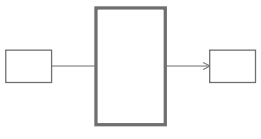
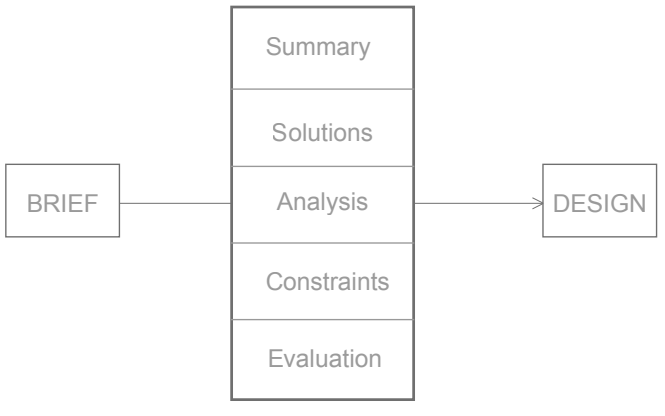


Centralized



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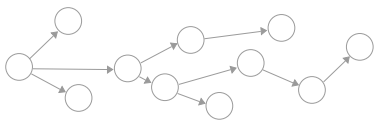
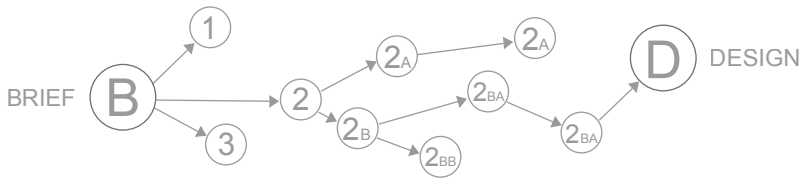


Investigative



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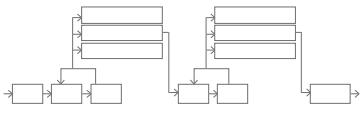
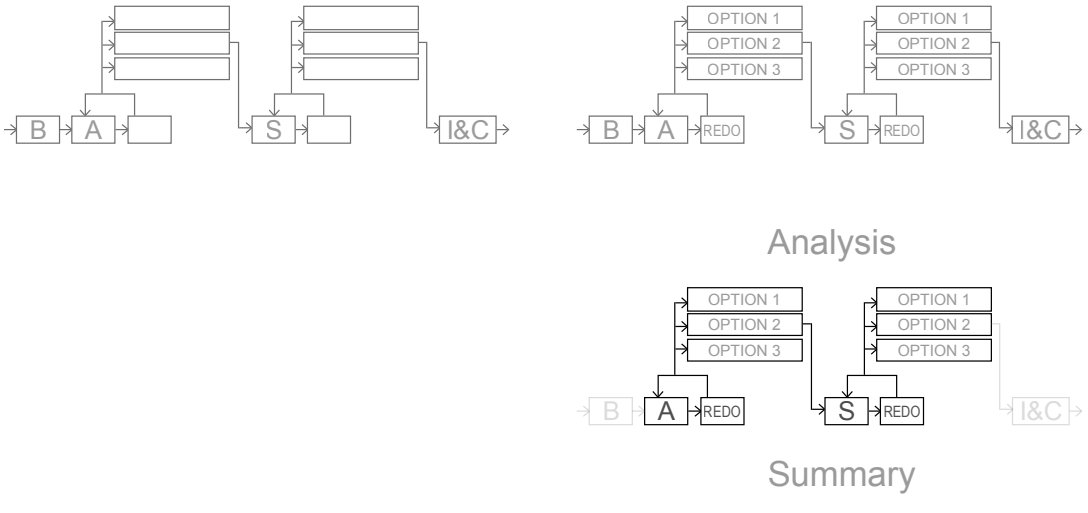


Divisions



INTRODUCTION

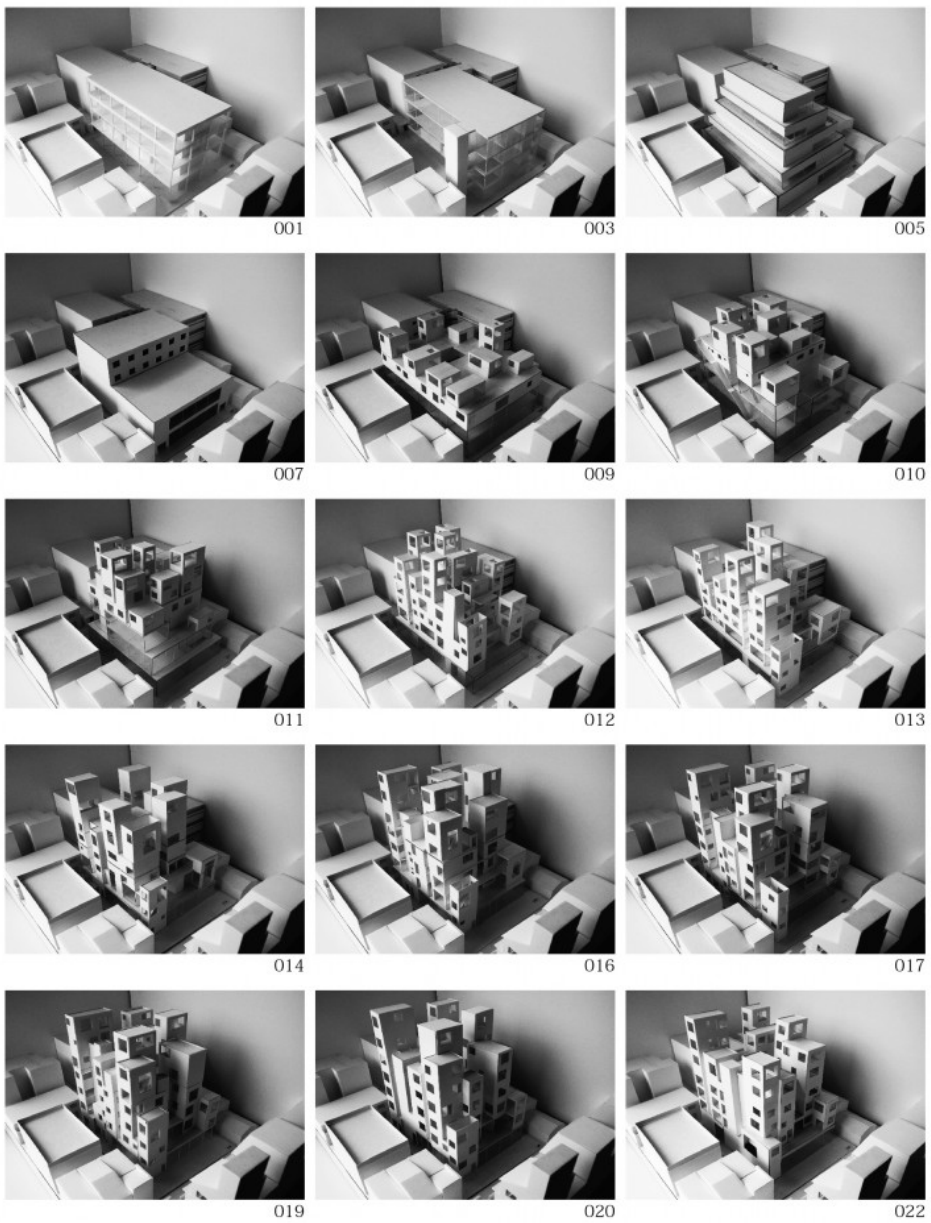
STATEMENT

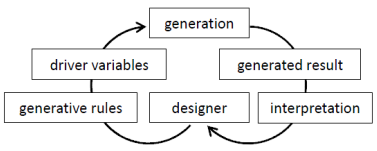
The process of Building Information Modelling –
It is a technology-based approach to design and construction, based on digital information. This information contains key physical and functional characteristics.

"BIM HAS SO FAR FOCUSED ON INTEGRATING PERFORMANCE AND MAINTENANCE FEATURES, SUCH AS PRODUCTION, BUDGET AND QUALITY. HOWEVER, UNLESS NEW TOOLS SUGGEST ALTERNATIVE VERSIONS TO DESIGN, IT IS AT BEST A SOFTWARE FOR PARTIAL APPLICATION, AND AT WORST AN UNDESIRABLE SOURCE OF CONFUSION. RATHER, WHAT WE NEED IS A RENEWED VISION OF THE DESIGN PROCESS, ONE THAT COULD MAKE BETTER USE OF NEW TECHNOLOGY" - RYUJI FUJIMURA, architect and author of "*A SEARCH ALGORITHM FOR GENERATING ARCHITECTURAL FORM*" and "*SUPER LINEAR DESIGN PROCESS THEORY*" from JA70 and A+U "Architectural Transformations Via BIM"

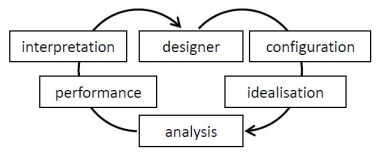
In parametric environments it is possible to associate geometric elements with a number of external factors, such as site conditions, structural feedback, program necessities.. This helps the design team to structure meaningful relationships between geometry and build up hierarchies of relationships. This allows to embed a higher level of design intelligence than before. This association allows us to make our design decisions explicit. Then the team can question and inform these decisions, hopefully leading to better and more feasible design. Moreover the model is dynamic and variable and it can easily be tested in different configurations, even though initial setup can take long. Furthermore this can now be done in a very early stage.

Often there's a lack of individual assessment (characteristic of traditional design methods) when the process is based on a digital model environment explicitly. The author calls for a process of repeated collaborations and gradual revisions called **"Super Linear Design Process Theory".** It advocates the emerging of a process of repeated collaborations and gradual revisions: *"At every step a model is made, followed by an analytical phase that records all modifications before moving on. Ultimately, this produces an iterative body of work that resembles the apparently sporadic cycle of fish movement, and thus beautifully materializes over time."* In this way, he tries to avoid shortcutting into the design process. This would mean proceeding with a predetermined image of how the concept would look like.
The strength of this theory is that the morphology of a building evolves from responding to new layers of information and every modification is precisely reflected in each design variation. The project acquires its character through specificity.
However this method uses features of BIM technology like sharing and systematic archiving of information.





Generative design. Control of the design process by the designer

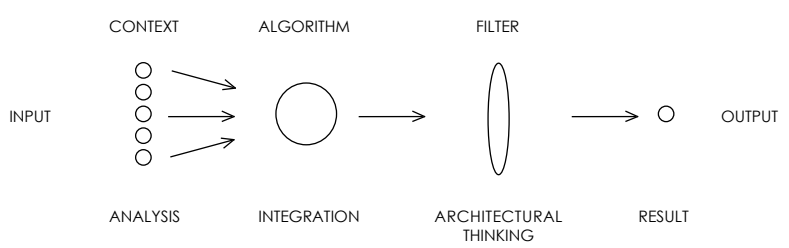


Analysis tools. Interpretation of analysis by the designer

Building K by Ryuji Fujimura.
The building complex consists of residences and a retail in downtown Tokyo. The mega-structure that contains facilities and structure regained a common external space usually covered with air conditioning and plumbing equipment as a place for life.
The process of starting with a simple form, then interpreting the exterior environment, program and other information and gradually evolving into a complex form. It's like the growth process of an organism. Each stage of development - adding a simple determinant. As the adaptations accumulate, the determinants become loosely connected and a new form is introduced.

Two important aspects:

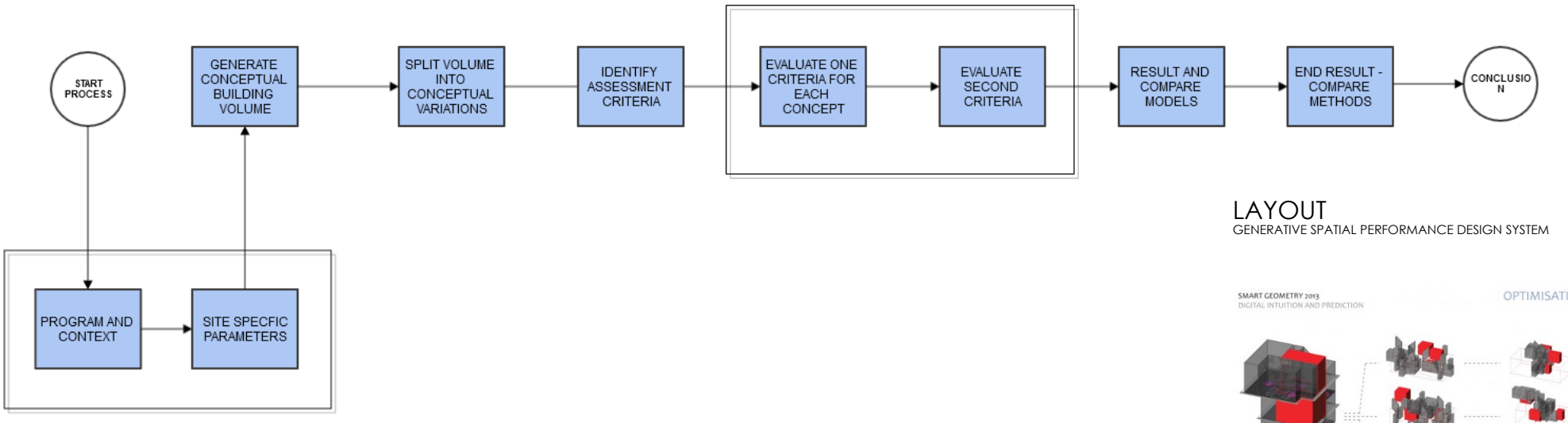
- **History of the design process** that is well documented
- **Transparent character** involving many professionals, evaluating each model on every stage



Work method used in the Building K project.

DESCRIPTION

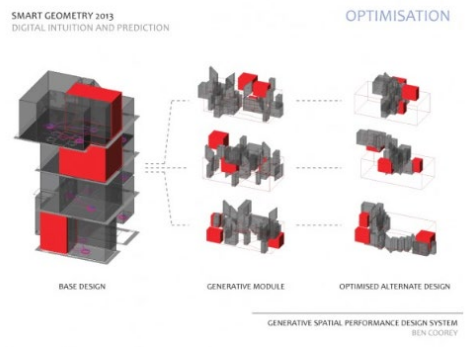
I'd will remodel the structure behind this theory, using different application of BIM. My goal is to reinforce the design process with both quantitative and qualitative assessment. I'd like to examine the new structure and its implications on the design process, and test it on a site.



VISION:

Making faster and more efficient decisions in the early design stage
by combining generative design with the quality of individually assessed design

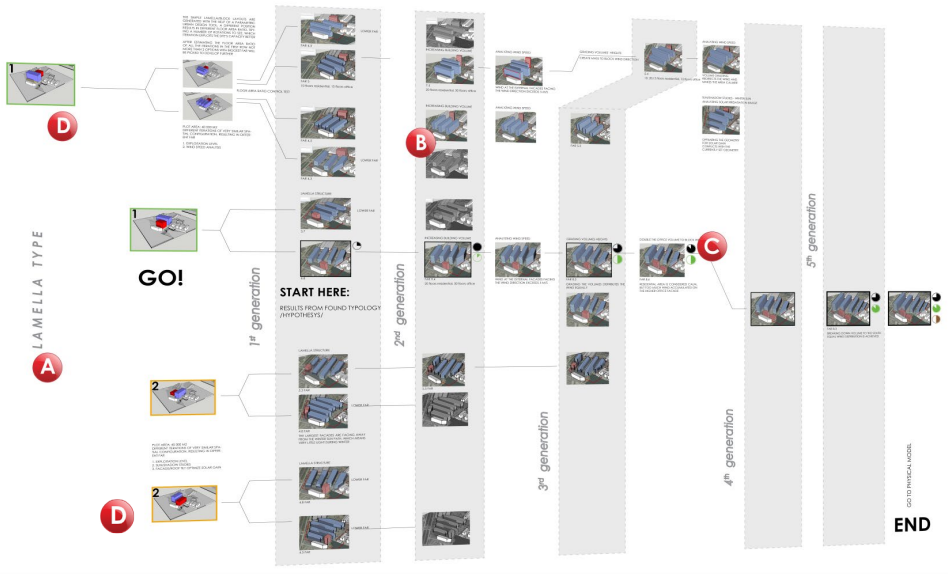
LAYOUT
GENERATIVE SPATIAL PERFORMANCE DESIGN SYSTEM



Given a sketch design with an initial spatial configuration, the intent of this system is to have the capability to search a corpus of design precedents for comparable designs, and utilise the precedent knowledge to generate informed variations for conceptual spatial design exploration. The spaces in the new generated designs have the same relationships as in the original high rise version.
This mainly relates to spatial configuration, but I can link the layout to my process.

BUILDING INFORMATION MEGA-PUZZLE

FOR CONCEPTUAL DESIGN



RULES OF PLAY

HOW TO PLAY

WHAT IS THE OBJECTIVE?

The object of the game is to reach the most-efficient design solution, while completing all steps and fulfilling criteria.

VICTORY:

The sequence of iterations that passes all comparison filters is considered successful.

COMPONENTS:

SITE

A **TYPOLOGY**

B **GENERATED BUILDING VOLUMES**
Presented as images

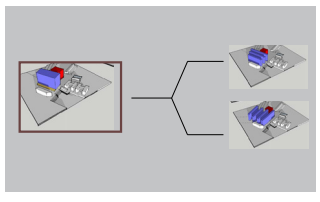
C **CRITERIA FOR SUCCESS**
Listed further down

D **SCENARIOS**
The scenarios are consequece to the chosen parameters + a set of rules

GAME MODE

» *analytical mode*

1. *Choose a site*
2. *Define site parameters*
3. *Run SETUP: specify components, establish relationships between them and link to the site*
4. *Start playing and perform action steps for each scenario*



» *intuitive mode (physical model)*
With the intuitive mode you can study design operations, that are not explored in the example (analytical mode)

ACTIONS IN SCENARIO:

1. *Create scenarios based on parameters (each scenario consists of **process branches** - horizontal sequence of decision making in the process layout and **steps** - showing the progress of geometry change or evaluation step by step within the branches)*
2. *Generate geometry, based on found typology or previous games*
3. *Inject site specific parameters and use the demands and criteria*
4. *Make a design choice on the grey field 'step'*
5. *Evaluate, display the results and explain. Results with lower value after first step are greyed out.*
6. *Make a new design choice as a follow-up to 5.*
7. *See if criteria for that scenario are fulfilled or go to 6.*
8. *Evaluate with another criteria (cross check)*
9. *Compare successful process branches and complete analytical mode*
10. *Proceed to physical mode or go back to Setup to reconfigure*

COMPONENTS' PROPERTIES:

SITE

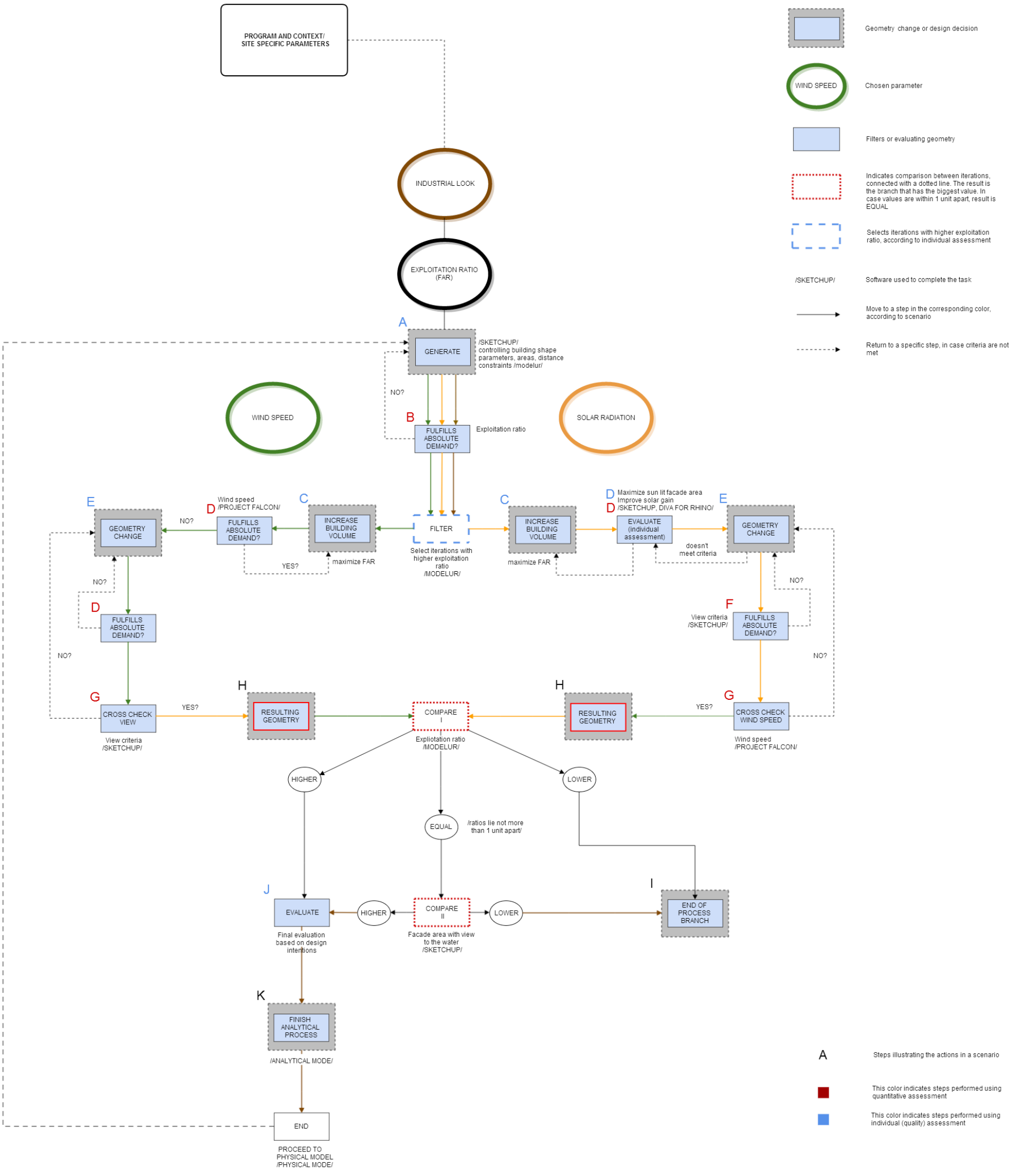
TYPOLOGY
- lamella
- block
- point

CRITERIA
- absolute demand - *must be fulfilled*
- evaluation criteria - *choice of individual assessment*
- design intention - *check if the aesthetic idea is fulfilled*

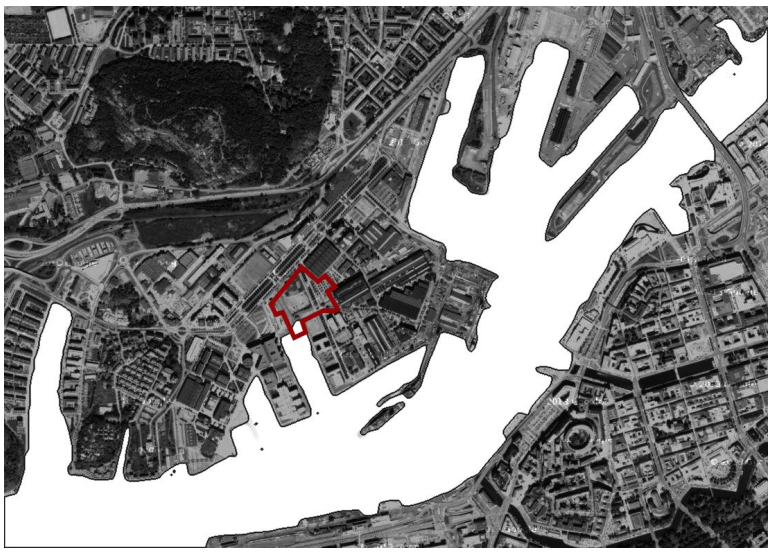
SCENARIOS
- environmental
- social
- economical
- design aesthetics

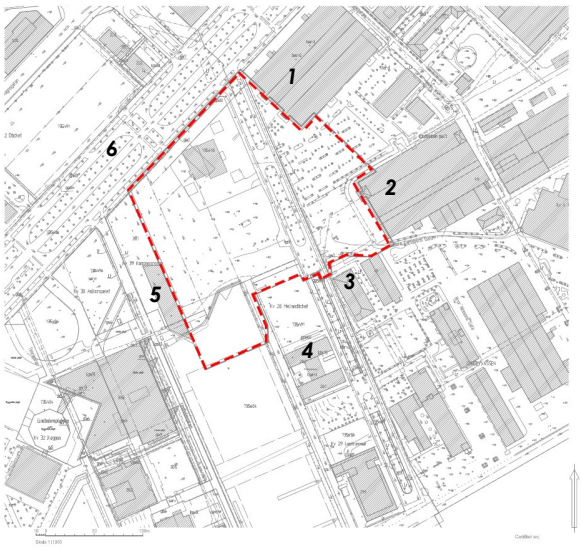
MECHANICS OF PLAY

/game map/

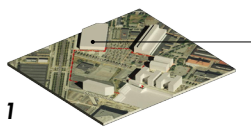


URBAN CONTEXT

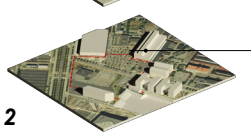




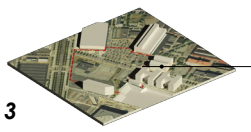
A proposal for developing the area in specific came up in the early 2012. The site lies on both sides of Götaverksgatan, between Lindholm's harbour and Lindholmsallen.
In the "cultural heritage value buildings, Götaverken is expected to have particular value. The area is a dense and relatively well-preserved industrial environment that can provide a perception of the former shipyard operations in the area. The environment includes various workshop buildings and facilities from 1908-60
('LINDHOLMEN FÖRR OCH NU' - KRISTINA MELLSTRÖM)



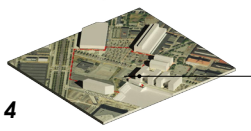
Old machine shop, M2: an, built in 1906 and extended in 1947. The house was added in two phases. Today, the eastern part workshop and the western part is rebuilt to office. The facade is in maroon brick. In the west facade is visible from several direction, combining two different styles, and some of the long side delimits planning area.



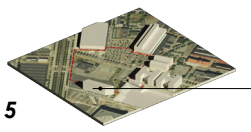
The oldest building on the site, M1. Built in three parts, very distinctive workshop building. Extended in 1940. The highest building part is preparing to be converted to office use.



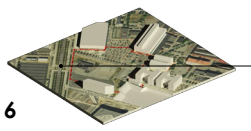
East of the planning area are two engineering workshops from 1940 converted into offices and other business premises. The house closest Lindholmsallén also accommodates parking. The houses are clearly visible due their large volumes and characteristic expression.



Newly built offices at the south side of the plot, next to the Lindhomen pier. The one near the site is still in construction.



The hotel is 9 floors high, theres an opportunity to extend it further towards Lindholmsallen. It is a reason for big overshadowing up to half the size of the plot during winter sun.



Lindholmen can be reached either by bus going in Linholmsallén or by ferry at Gota River. Lindholmsallén is the main street. Traffic, public transport and main routes for walking and cycling. It's a source of pollution and noise. Opens a view towards a forest hill.
The proximity to Lundbyleden and Port Line for rail deliveries to the outer port areas can mean noise and this needs to be investigated. Noise from traffic Lindholmsallén and Götaverksgatan have been registered.

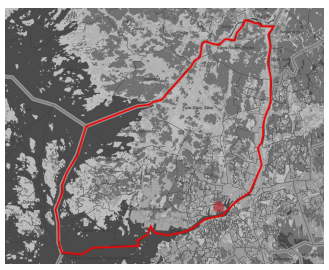
SURROUNDING AREA

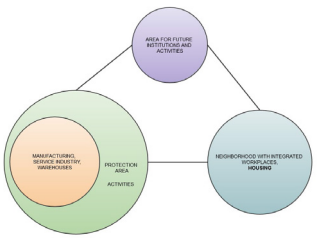
HISINGEN

There have been two conceptual soil environmental studies related to parts of the planning area. The samples taken show aggregate with a relatively large degree of waste, demolition debris, scrap and whe re elevated concentrations of metals found and petroleum hydrocarbons.

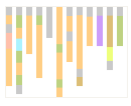
DISTURBING INDUSTRY - in the outer Hissingen areas.
Scrap, debris and emissions

NOT DISTURBING INDUSTRIES - services, engineering, workshop industries, warehouses

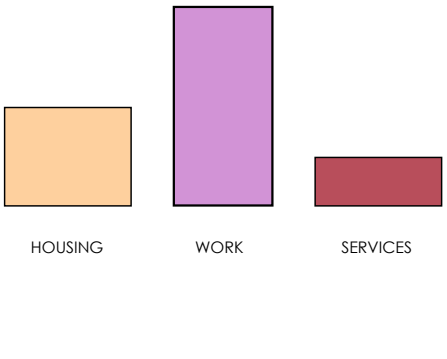




PLANNED ZONES ON HISINGEN. THE BLUE ZONE INCLUDES HOUSING.
SOURCE 'LINDHOLMEN FÖRR OCH NU' - KRISTINA MELLSTRÖM



Housing affordability is more than just a personal trouble experienced by individual households who cannot easily find a place to live. It's rare to fulfill all preference and criteria from the inhabitants. However, lack of affordable or convenient housing is considered by many urban planners to have negative effects on a community's overall health. Therefore affordability, convenient location and well being are euqally important in the design process or planning of a residence.



LINDHOLMEN

THIS MAP SHOWS THE LOCATION OF FORMER (OR STILL FUNCTIONING) INDUSTRIAL BUILDINGS AND SHIPYARD FACILITIES DATING BACK TO THE BEGINNING OF THE 20TH CENTURY AND OTHER SITES OF VALUE

1 A main office at Götaverken turns its yellow facade towards the activities at the river. Dates back to 1949. Facades were renovated in 1999. Built in three parts, constituting a single lamella type volume.

2 Gotia: originally built as a flophouse for the shipyard's employees. Built in 1920, having a very expensive exterior for that time. Today office and restaurant.

3 Tin workshop. The broad facade towards the river has been a symbol for Cityvarvet.

4 Pipe set-up workshop from the 30's, extended to south/east in 1944, renovated in 1998, houses a company for technical documentation.

5 Wooden workshop from 1930. Renovated in the beginning of 1990 and now used to house small companies.

6 Docks: repairing of vessels of different tonnage. This is one of the last shipyard activities left between the bridges.

7 Silo and a dock shed: this place was earlier a carpentry factory.

8 The big building is a workshop hall from 1946. There are also some preserved small office buildings from the 50's. All now modern education and administration facilities.

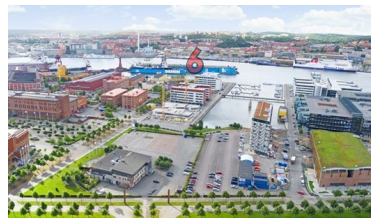
9 Slottsberget. Many old houses of historical value. Ferry connection to the south side of the river.

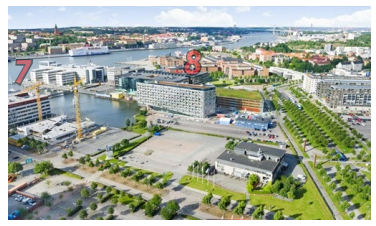
10 Ramberget mountain is a place for outdoor recreation and lookouts over Gothenburg. The residential area of Brämaregården, lies at the foot of Ramberget.

OLD HOUSING IN THE CENTRAL PART OF GOTHENBURG

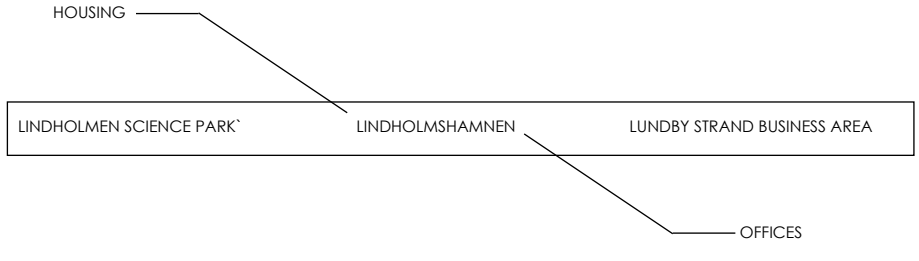
COMMUTING TO WORKPLACE

INDUSTRIALIZED AREA



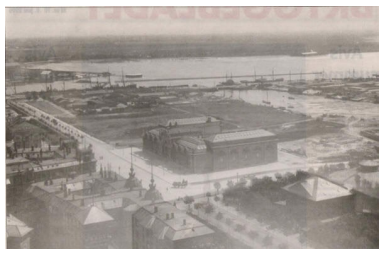


BRINGING HOUSING AND OFFICE TO THE AREA CAN BALANCE THE COMMUTER FLOWS TO AND FROM LINDHOLMEN AND IT CAN ALSO INCREASE PEDESTRIAN FLOWS AND POPULATE THE AREA DURING ALL HOURS OF THE DAY - AS A RESULT OF THE MIXED ENVIRONMENT ON ONE SITE



CASE STUDY

HAVNEHOLMEN ON KALVEBODBRYGGE IN COPENHAGEN



A BIG PART OF THE SOUTH HARBOUR WAS FILLED WITH WATER IN THE PAST AND LATER IT WAS AN UNATTRACTIVE AREA TO SETTLE IN

FOR MANY YEARS THE AREA WAS USED TO UNLOAD COAL AND TIMBER TO BE TRANSPORTED TO COPENHAGEN

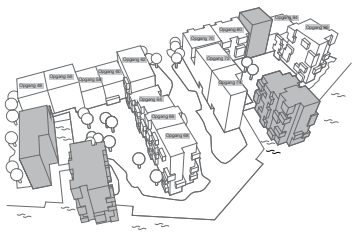
NOW SUCCESSFULLY TRANSFORMED AND DEVELOPED INTO A RESIDENTIAL COMPLEX WITH COMMERCIAL PART AND ACCESS TO FISKETORVET, RECREATIONAL SPACES AND A HARBOUR BATH

IN THE DESIGN OF THESE BUILDINGS, HAS BEEN VERY IMPORTANT TO CAPITALIZE ON THE ATTRACTIVE WATERFRONT LOCATION, WHILE ENSURING THAT THE HOMES HAVE THE BEST ORIENTATION TO THE SUN.

FOR EXAMPLE: A FOCUS HAS BEEN THAT ALL APARTMENTS ARE PLACED TOWARDS SOUTH-WEST AND THE PERIMETER OF THE FACADE, FACING THE WATER IS INCREASED.

SIMILAR TO THE IDEA WITH LINDHOLMEN, HERE WE HAVE THE CITY LIFE'S PULSE IN CLOSE PROXIMITY TO HOUSING.

THIS SITE HAS SIMILAR CONDITIONS TO THE ONE ON LINDHOLMEN - ACCESS TO *WATER, SUN, AIR* CAN BE VIEWED AS DRIVING DESIGN PARAMETERS.



THIS CASE STUDY SHOWS AN EXAMPLE OF A SIMILAR SITE TRANSOFRMATION, WHERE HOUSING CONNECTS TO RECREATIONAL AND COMMERCIAL AREA ON AN OLD INDUSTRIAL ABANDONED SITE, TAKING ADVANTAGE OF ORIENTATION AND VIEW TO THE HARBOUR

SOLUTION

WITH ALL INFORMATION ABOUT THE SITE I GAVE ACCOUNT FOR THE SITE'S POSITION, CONTEXT AND URBAN BACKGROUND. I ALSO DISCUSSED ABOUT THE EXISTING BUILDINGS' FUNCTIONS.

THE FOLLOWING DESCRIBES WHAT STRATEGY I HAVE CHOSEN FOR THE NEW DESIGN PROCESS AND WHAT FACTORS OF THE SITE (DESIGN PARAMETERS) IS MOST IMPORTANT TO TAKE ADVANTAGE OF.

affordability

convenience - **close proximity to work place/services**

well-being and environment

A need for office and residential building complex that enriches and completes the surroundings in its function and tradition.
A match between housing and offices in terms of the inhabitants, employees and their needs, lowering the commuter flows

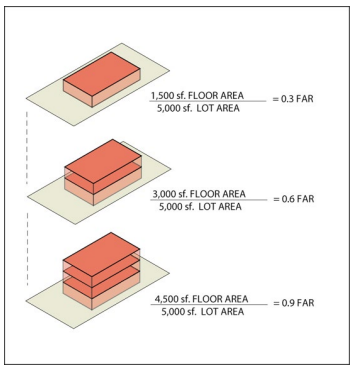
SITE PARAMETERS

WIND
There is not much hindering the wind from the harbour to Ramberget and the low construction in the shipyard area, makes the site easily exposed to strong gusts of wind from south and south-west.

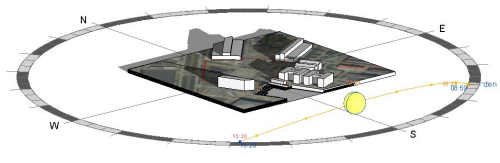
Table 1: Criteria for wind comfort and danger according to NEN8100 (Willemsen and Wisse 2007).

Wind comfort				
$P(U_{THR} > 5$ m/s) (in % hours per year)	Grade	Activity		
		Traversing	Strolling	Sitting
< 2.5	A	Good	Good	Good
2.5 - 5.0	B	Good	Good	Moderate
5.0 - 10	C	Good	Moderate	Poor
10 - 20	D	Moderate	Poor	Poor
> 20	E	Poor	Poor	Poor

Wind danger		
$P(U_{THR} > 15$ m/s) in % hours per year	Limited risk	0.05 - 0.3 % hours per year
	Dangerous	> 0.3% hours per year



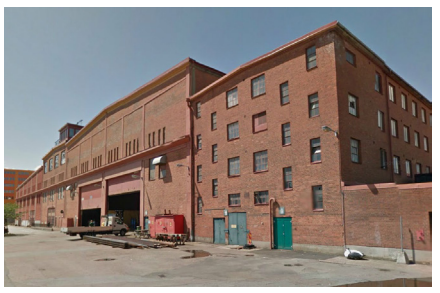
EXPLOITATION RATIO
Another idea that has been discussed is to challenge the site and make better use of the space. This can contribute to creating more space for living or making the site a landmark.



SOLAR RADIATION / VEW TO HARBOUR
Establishing a good orientation to the sun is important for housing. The hotel to the west and the newly built offices to the south are casting deep shadows during winter sun. Additionaly, the proximity to water is attractive for residents.

PRESERVING INDUSTRIAL LOOK

THE INDUSTRAIL LOOK IS VERY DISTINCTIVE AND REPRESENTATIVE FOR THE AREA. WHAT IF INDUSTRIAL LOOK CAN BE VIEWED AS A PARAMETER AND WHAT ARE THE SPECIFICATIONS OF THIS PARAMETER?
THIS WOULD CONTRIBUTE TO INFORM THE PROCESS IN A MORE INTUITIVE WAY FROM THE START AND AFFECT THE FURTHER DESIGN STAGES



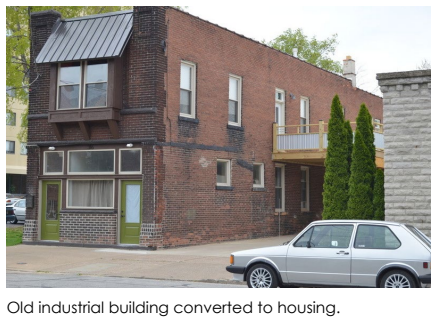
Industrial buildings from the Lindholmen area.

BASED ON A RESEARCH IN THE AREA, THIS IS WHAT IS COMMON FOR THE EXTERIOR SHAPE OF THESE BUILDINGS:

- INEGRAL VOLUMES, SIMILAR HEIGHT, NOT HIGHER THAN 25 m.
- UNIFORM, VERTICAL FACADES
- FLAT, MONO OR DOUBLE PITCHED ROOFS, SKYLIGHTS
- BIG FLOOR HEIGHTS, LARGE SPACES

I will additionally evaluate my design process, based on these design intentions. Including this qualitative evaluation in the process can refine the final choices, so it's possible to see which design options have potential to develop as industrial looking buildings.

In this new housing the industrial, saw-tooth shaped roof is used to bring daylight into the spaces.



Old industrial building converted to housing.

SETUP

In the following example, I choose all typology, criteria and *exploitation ratio, wind speed and solar radiation/ view* from the scenarios, considering them most relevant to the site.

SITE

TYPOLOGY
- lamella
- block
- point

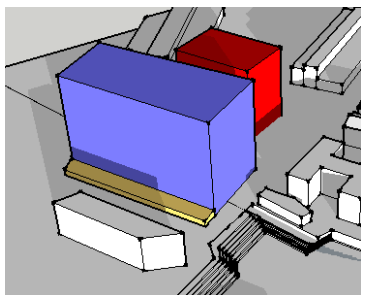
CRITERIA
- absolute demand - *must be fulfilled*
- evaluation criteria - *choice of individual assessment*
- design intention - *check if the aesthetic idea is fulfilled*

SCENARIOS
- environmental
  - *solar radiation/view to the harbour (eval. criteria + absolute demand)*
  - *wind speed (absolute demand)*
- social - *pedestrian flow (evaluation criteria)*
- economical - *exploitation ratio (absolute demand)*
- design aesthetics - *industrial look (design intention)*

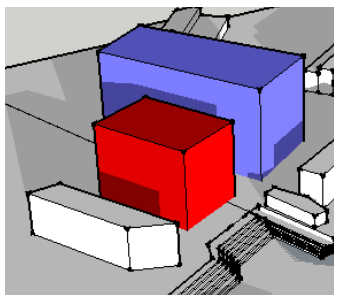
THE FOLLOWING IS SIMPLY SHOWING THE ARRANGEMENT OF THE BUILDING FORMS OVERALL IN RELATION TO EACH OTHER'S POSITION ON THE SITE, DISREGARDING THE TYPOLOGY. WHEN CONNECTING THE BUILDING FUNCTIONS TO THE TYPOLOGY THAT WILL BE USED, THE OFFICE WILL BE FIXED TO A POINT TYPE, AND THE HOUSING WILL HAVE BLOCK AND LAMELLA TYPE.

RED - OFFICE
BLUE - RESIDENTIAL

wind comfort

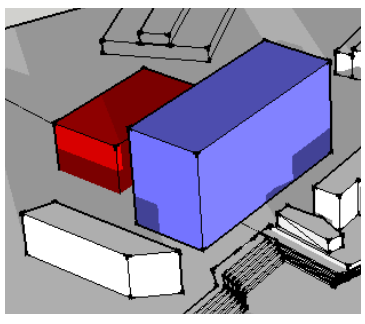


FOCUS: PLACING THE HOUSING ALMOST IN CONTACT WITH THE WATER/HARBOUR ENVIRONMENT AND A RIVERSIDE PATHWAY

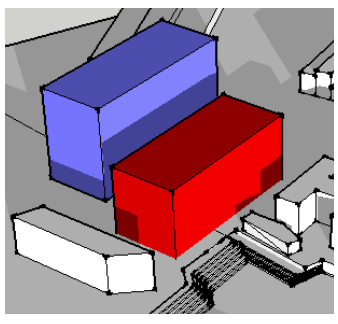


FOCUS: THE OFFICE IS NEAR THE RECREATIONAL AREA BY THE WATER. CREATING A VOID IN THE OVERALL BUILDING VOLUME FACADE FACING THE WIND

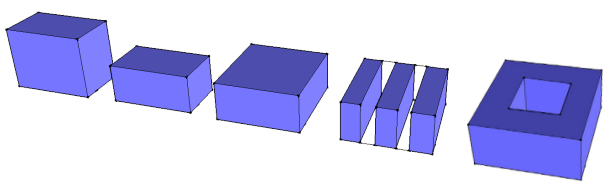
solar gain/view



FOCUS: PLACING THE HOUSING IN THE SUNNY AREA NEAR THE HARBOUR - OFFICE TO THE STREET

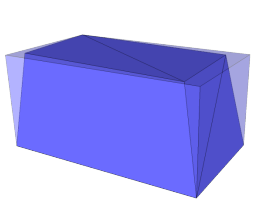


FOCUS: THE HOUSING IS FACING THE STREET BUT IT AVOIDS OVERSHADOWING FROM THE HOTEL

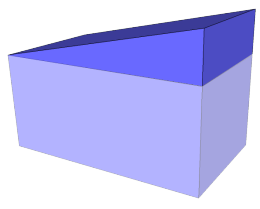


TO SIMPLIFY THE GEOMETRY AND THE PROCESS, ALL ITERATIONS START UP FROM STUDYING 3 SIMPLE BUILDING VOLUME TYPES: POINT, LAMELLA AND BLOCK

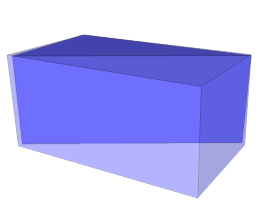
SHAPE MANIPULATIONS



facade slanting



roof slanting



wedging

SHAPE MANIPULATIONS ALLOWED. VOLUME HEIGHT FOLLOWS 5, 10, 15, 20 AND 25 FLOORS' HEIGHT AND WIDHT IS CONSTRAINED TO 25m.

COMPONENTS: DETAILED INSTRUCTIONS

Criteria in detail:

ABSOLUTE DEMANDS
THIS CRITERIA TRIES TO FULFILL THE MOST IMPORTANT AND CRITICAL PART OF DEVELOPING THE SITE PARAMETERS THAT IS OFTEN THE MAIN GOAL OF AN ARCHITECTURAL PROGRAM. THIS CRITERIA MUST BE MET. LEAST QUALITATIVE ASSESSMENT OF THE GEOMETRY'S POTENTIAL

EVALUATION CRITERIA
CRITERA WHICH EVALUATES GENERATED GEOMETRY, BUT IS MAINLY INDIVIDUAL THINKING. STUDYING THE POSITION OF THE VOLUMES GIVES INFORMATION ABOUT PROBLEMATIC AREAS, THEN THE DESIGNER'S CHOICE DETERMINES WHAT THE ACTUAL DESIGN SOLUTION WILL BE, WHICH WILL BE RE-EVALUATED IF NECESSARY

DESIGN INTENTION
MOST QUALITATIVE ASSESSMENT AND ARCHITECTURAL CHOICE. IN THIS PART ALL PRODUCED ITERATIONS ARE ENTIRELY DEPENDANT ON THE DESIGNER'S CHOICES AND HOW THE PARAMETER(S) OF QUESTION ARE BEING INTERPRETED

RESULTS - SUCCESSFULLY DEVELOPED BRANCHES
THE PROCESS RUNS SIMULATEOUSLY IN 2 DIFFERENT SCENARIOS, WITH FOCUS ON DIFFERENT PARAMETERS. AFTER THE CRITERIA OF FOCUS HAS BEEN MET, THE PARAMETERS OF THE OTHER SCENARIO SHOULD ALSO BE EVALUATED (*cross check - refer to the flow chart on the previous page*). BRANCHES THAT PASS THAT EVALUATION ARE CONSIDERED SUCCESSFUL. THE REST END WITH A BLACK AND WHITE IMAGE

COMPARISON FILTERS
COMPARISON FILTER IS NEEDED WHEN TWO OR MORE SUCCESSFUL BRANCHES NEED TO BE COMPARED (no matter if its same or different scenarios) THE FIRST FILTERING DEPENDS ON THE **FAR**
FURTHER COMPARISON IS CARRIED OUT IF NEEDED, DEPENDING ON SOUTH FACADE SURFACE AREA (**SFA**), INCLUDING APARTMENTS THAT HAVE A DIRECT VIEW TO HE WATER AND REMAIN UNSHADOWED AT WINTER SOLSTICE 13:00 o'clock - least sun gain and deep shadows

Criteria and parameters:

ABSOLUTE DEMAND

1. OPTIMIZING THE EXPLOITATION RATIO (**FAR**) FROM MINIMUM 1.75 (THE MINIMUM DENSITY FACTOR FOR RESIDENTIAL AND OFFICE BUILDINGS COMBINED) AND MAX. 10

MAXIMIZING NUMBER OF APARTMENTS FACING THE WATER (SOUTH) MIN. DISTANCE BETWEEN BUILDINGS 10 m

2. WIND SPEED WITHIN THE SITE < 5 m/s

3. MINIMUM OF 400 APARTMENTS, WITH A DIRECT VIEW TOWARDS THE WATER /SOUTH DIRECTION/ THAT CONSTITUTES 6000m2. This criteria can be used for a cross check /evaluation of an additional parameter/

EVALUATION CRITERIA

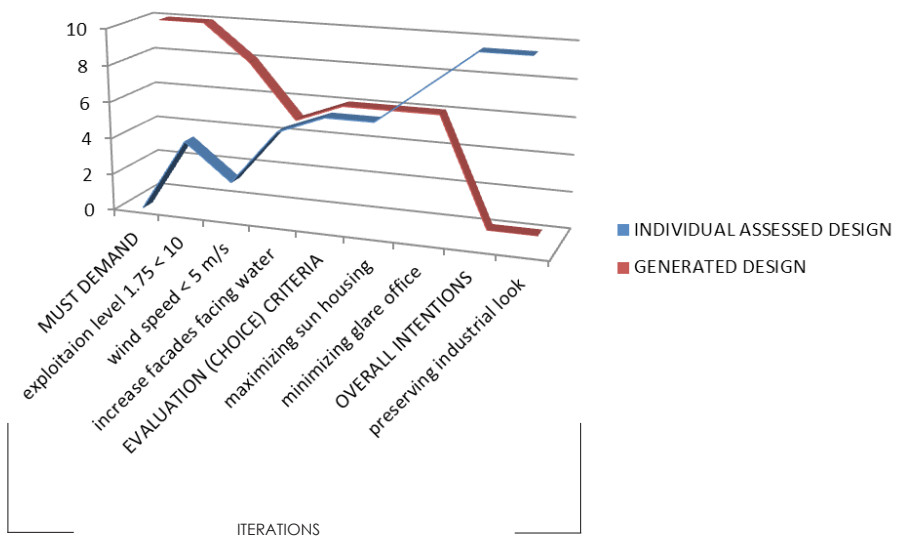
4. EVENLY DISTRIBUTED SOLAR GAIN ON THE FACADES, MAXIMIZING GAIN FOR THE RESIDENTIAL (WINTER SUN) REDUCED GAIN FOR THE OFFICES

OPTIMIZING THE ORIENTATION OF THE FACADE AND THE ROOF

DESIGN INTENTION:

5. PRESERVING INDUSTRIAL LOOK

- INEGRAL VOLUMES, SIMILAR HEIGHT, NOT HIGHER THAN 25 m.
- UNIFORM, VERTICAL FACADES, NO SHARP EDGES
- FLAT, MONO OR DOUBLE PITCHED ROOFS, SKYLIGHTS
- BIG FLOOR HEIGHTS, LARGE SPACES



NOTE: FIRST PARAMETER TO BE INVOLVED IN THE EXAMPLE IS THE EXPLOITATION RATIO (FAR). IT DETERMINES WHICH ITERATIONS QUALIFY TO GO ON TO THE NEXT STEP. FURTHER BOTH FAR AND THE DIFFERENT SCENARIO PARAMETERS ARE CONSIDERED

LEVEL OF MAXIMIZED EXPLOITATION RATIO /FAR/

LEVEL OF SATISFYING THE CRITERIA FOR WIND SPEED /STILLNESS/

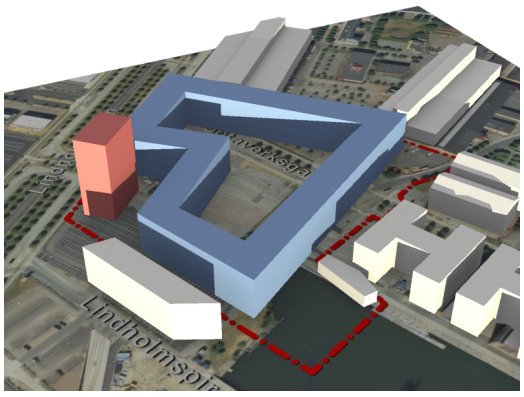
LEVEL OF MAXIMIZED SOLAR RADIATION

LEVEL OF FULFILLMENT OF THE INDUSTRIAL LOOK INTENTION

BLOCK TYPE

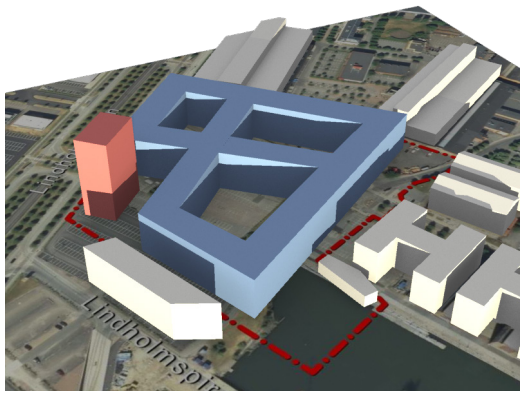
GO!
START HERE:
filter
compare I
compare II
END
GO TO PHYSICAL MODEL

EXPLOITATION RATIO



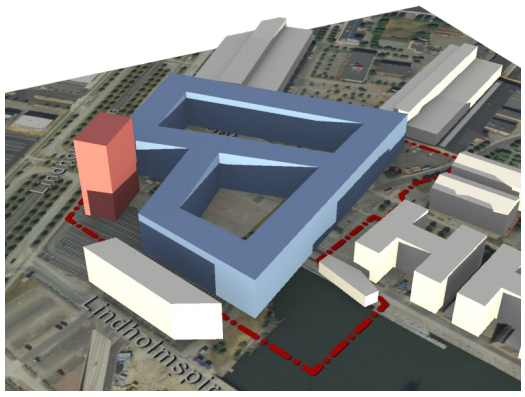
Smaller part of the housing is affected by the street noise, and bigger parts are exposed to sunlight, while office is kept away from direct sunlight
/parametric urban design tool Modelur for Sketchup/

EXPLOITATION RATIO



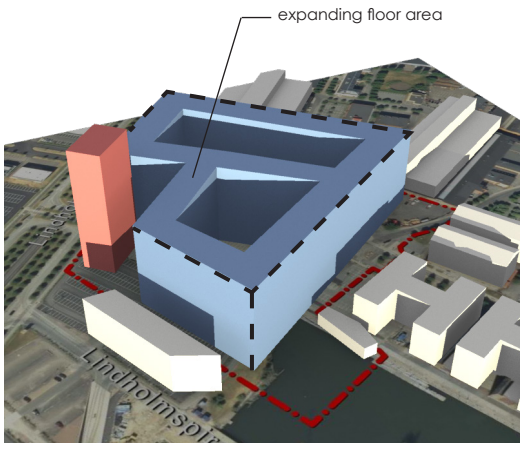
Increasing building volume
/parametric urban design tool Modelur for Sketchup/

EXPLOITATION RATIO



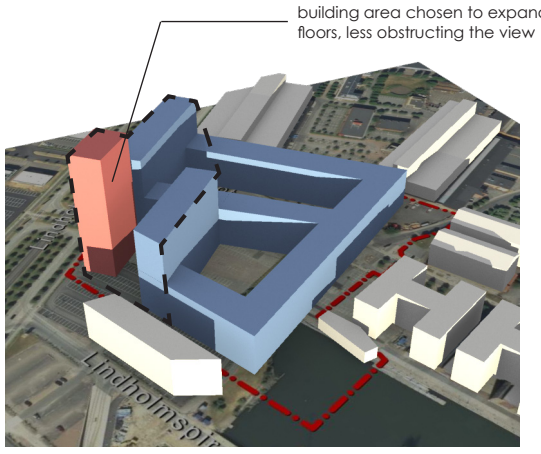
Connecting the south and north part of the building form
/parametric urban design tool Modelur for Sketchup/

EXPLOITATION RATIO



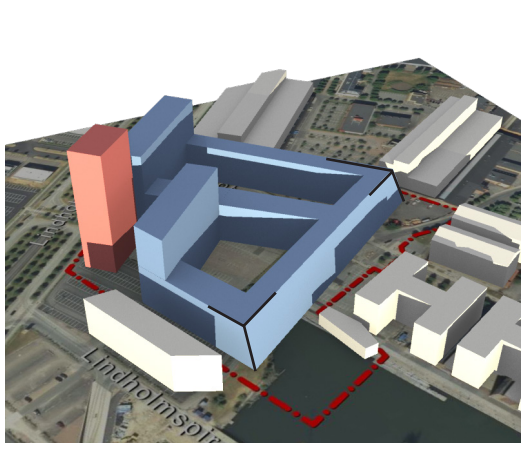
Increasing building volume
/parametric urban design tool Modelur for Sketchup/

SOLAR GAIN / VIEW



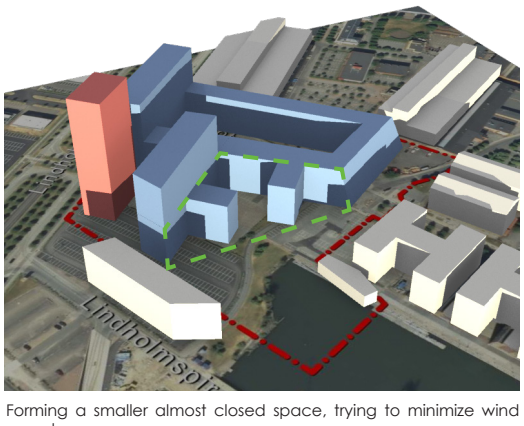
Geometry change - avoiding overshadowing
/Diva for Rhino, Modelur/

SOLAR GAIN / VIEW



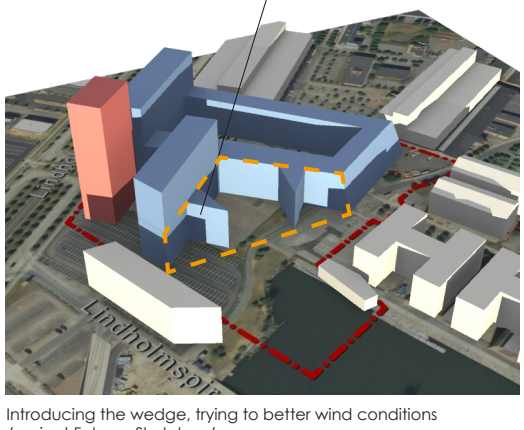
Modify facade geometry based on studies for winter sun in Gothenburg
/Galapagos optimization tool for Grasshopper, Diva for Rhino/

WIND COMFORT / VIEW



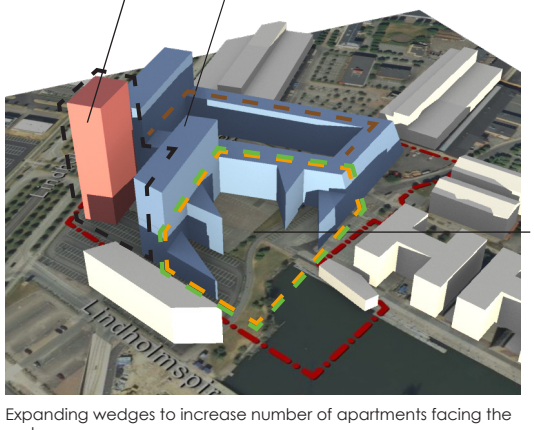
Forming a smaller almost closed space, trying to minimize wind speed
/project Falcon, Sketchup/

WIND COMFORT / VIEW



Introducing the wedge, trying to better wind conditions
/project Falcon, Sketchup/

WIND COMFORT / VIEW / INDUSTRIAL LOOK



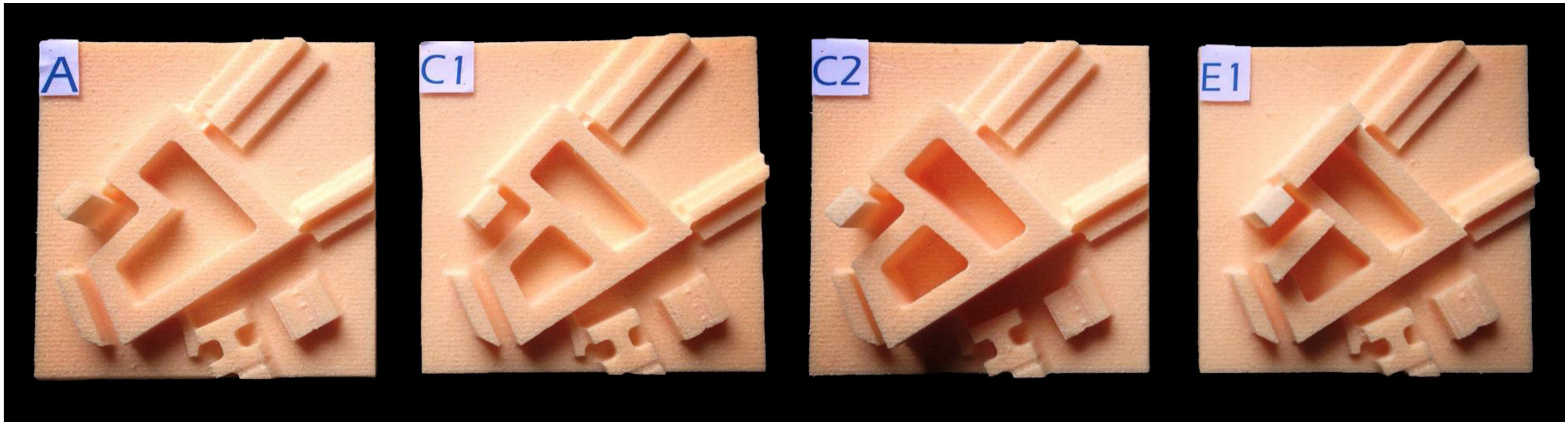
Expanding wedges to increase number of apartments facing the water
/project Falcon, Sketchup/

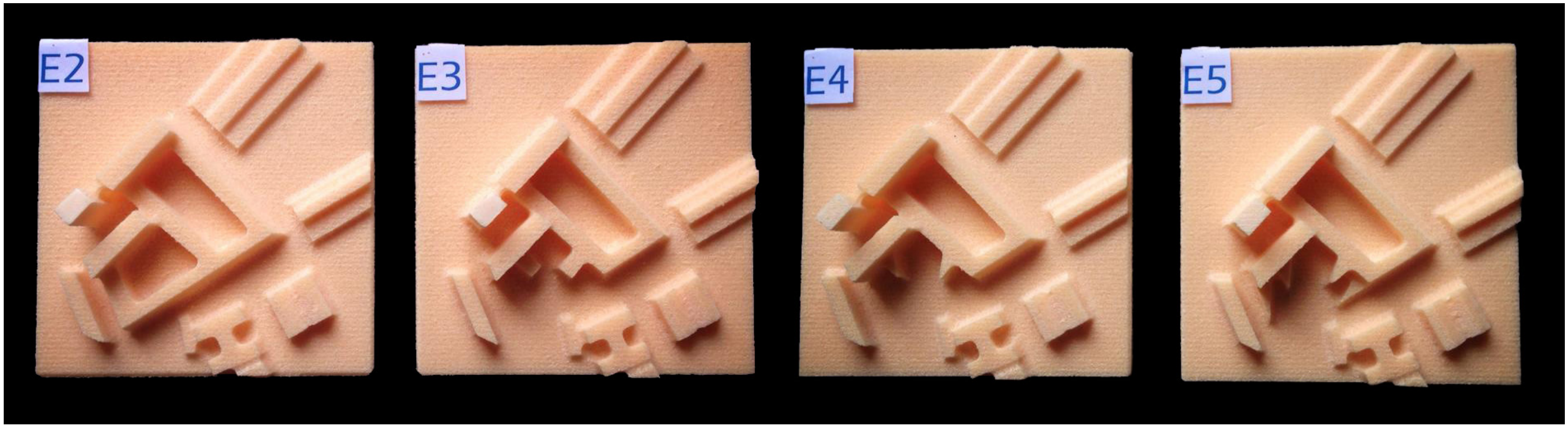
CONCLUSION:

The result in the example is NOT to be seen as an image of a building, but a matrix, a new design process embracing the very early design stage. It shows exemplification of how the use of digital analysis tools can be applied in those stages.v

What aspects of SLDPT are improved?

The formed process can be viewed as a theoretical design tool/guide – easy to use, accessible and routine based. The part with the physical model presents different media to explore the process in a more intuitive way (and also loops back to the original theory). There you can easier discuss and present your idea to anyone.


A
C1
C2
E1


E2
E3
E4
E5