

REFLECTIONS P4

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The graduation project: Adaptable urban fabric, waterfront areas with high climatic, urbanization and use variability; is part of the graduation studio Urban Fabrics, department of Urbanism, faculty of Architecture, Urbanism and the Built Environment, TU Delft. Overall, this project explores the changes of waterfront areas in the city of Bergen: causes, adaptation, solutions, and optimization. The goal is to link urban transformations with the urban fabric in an optimized manner.

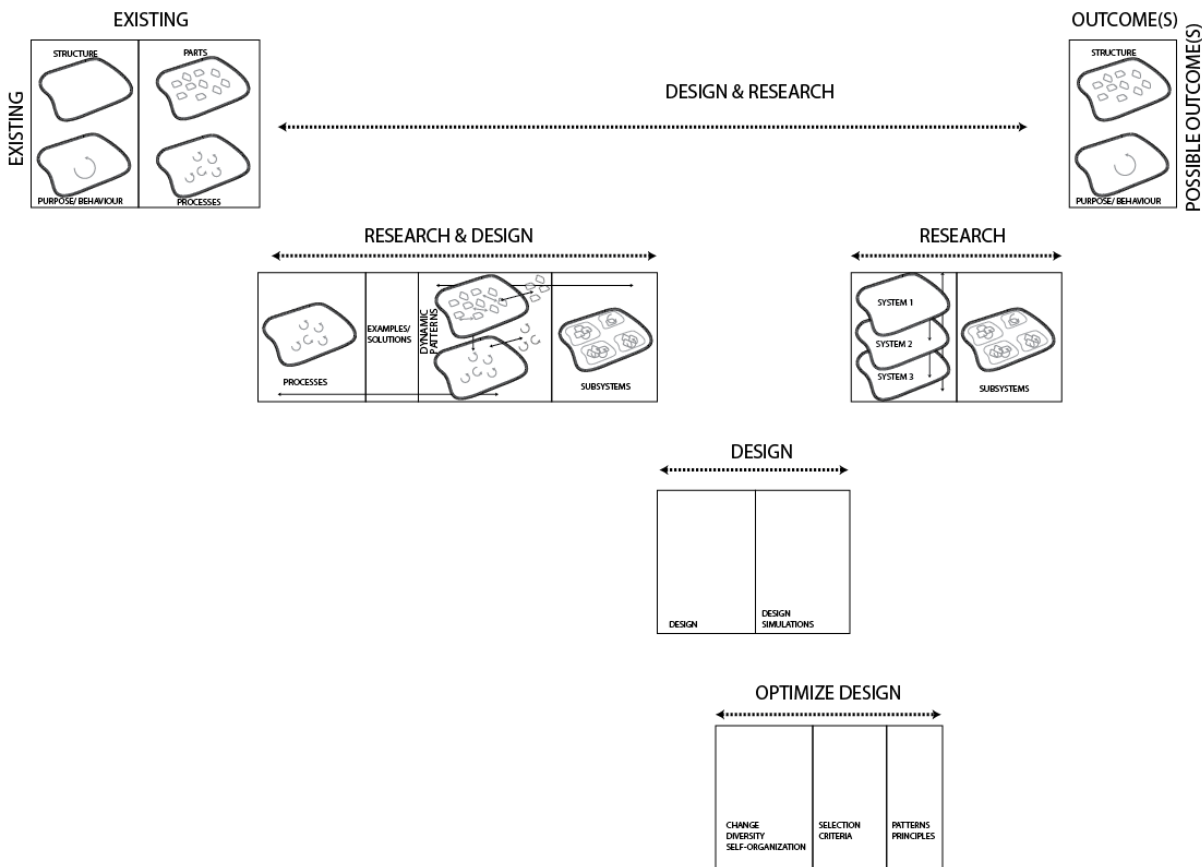
Research questions

The research question that defines the research and design project is: **How can adaptable urban fabrics propose optimized urban solutions for the changes taking place in waterfront areas in the city of Bergen?** Through this question, the project analyses the link between possible changes taking place in the waterfront areas and the physical urban structure. For this to be possible, these sub-research questions need to be answered:

1. What are the changes and their effects in the waterfront area in the city of Bergen? (The possible changes which have an impact on the waterfront areas are divided into three parts: weather, urbanization and use. Weather changes deals with: the impact of sea water fluctuations, urban runoff fluctuations, temperature changes, changes in wind direction and speed, fluctuations in sun light, the urbanization changes are influenced by the quantity of the demand for buildings/infrastructure/urban spaces and can be classified in urbanization and de urbanization (shrinkage) and the way in which it can be achieved: densification, intensification)
2. What are the adaptable urban solutions generated by the interaction between processes and the urban fabric? (Through the use of examples, a patterned language is generated for dealing with the possible changes)
3. What are the optimal urban solutions in terms of possible changes? (the adaptable urban solutions are tested in order to see the fitness and compatibility to the existing site)

Approach

In order to answer the question there needs to be established a series of links between processes of urbanization, climate change, change in use (transformations/changes) and the urban morphology (physical elements). In order to do that, several methods/techniques are employed. The data about the site is gathered through mapping, research of processes, layer analysis. This leads to the formulation of requirements and process and urban elements understanding. (**Mapping, layering**). Through research and design a pattern collection is organized to illustrate the connection between transformations and urban form (**pattern formation, recognition, and implementation**). The patterns are tested in the location and transformations are simulated in order to choose most viable solutions (**simulation**).



Product, Process and Planning

The end result is a master plan of possible urban solution(s) for waterfront changes. The master plan is utilized as a tool to visualize the physical connections between the parts of the urban structure. Through simulation of the changes taking place the master plan time and due to various causes, these the parts of the urban structure as well as the relationship between them change. In order to understand this, the project researches links between these changes and the optimal solutions they might yield.

To arrive at these spatial solutions the process of the design and research is illustrated in fig 1. Firstly, the area is analyzed to understand the components of the urban fabric and the processes and how these are interlinked at an overall level as well as inside the area, and outside the area. The outcome is to provide the suitable solutions for a certain area. Thus the site is divided further in subareas based on the processes that influence them the most. Considering the transformations and the urban structure, a pattern language of solutions is elaborated. These solutions are utilized in a strategy for the area, which generates a master plan. This is tested in order to analyze the best possible solutions.

Conclusions – research question, approach analysis

The project answers the research question by providing the pattern language of adaptation, and then through simulation an optimized version of these patterns. By integrating them in the urban fabric of the waterfront of Bergen, the simulation can uncover spatial qualities of the design and

then reaffirm the validity of these patterns. The approach used, finds a link between behavior and physical form, which helps in providing valid solutions.

Reproducibility

The research provided in terms of processes, adaptable pattern language can be reproduced in waterfront areas dealing with the same processes. In new sites, these solutions need to be tested/simulated in order to provide best solutions in terms of morpho-typology.

Aspects of thesis:

The relationship between research and design

As illustrated in fig. 1 the research provides a background for the subject, in terms of analyzing the site, the context, the urban components and processes, as well as the theoretical framework. This provides the data for the design and research phase. For the existing site, in terms of weather processes. Based on examples of other waterfront interventions (Hamburg, Copenhagen, and Amsterdam), dealing with the same processes as Bergen, a pattern language of solutions results, which is adapted to the current site. Through design (3D modelling and simulations) the pattern language is narrowed to the adaptable solutions.

The project has an iterative timeline in which both research and design have been utilized to narrow the goal of the project, and to gradually expand towards the final output.

The relationship between the theme of the graduation lab and the subject/case study chosen by the student within this framework (location/object)

The subject of the thesis Adaptable urban fabric is linked to the graduation lab of *urban fabrics* through its study of the processes, the urban structure and the link between the two. The processes can be either related to climate, urbanization, changes in use. As a case study, Bergen (Norway) was used due to its high climate variability, the need to restructure the waterfront areas, and the demand for densification of the urban fabric.

The knowledge gained from studying the processes and the structures that manifest urban fabrics, allows us to anticipate or stimulate changes by (evidence informed) design. In general, we study and promote two design strategies: the application of design patterns and the use of scenarios. By using design patterns extracted regularities in the urban fabric can be made operational for design purposes. By using scenarios possible and desirable futures can be explored, supporting the design of adaptive and prospective environments.

The relationship between the methodical line of approach of the graduation lab and the method chosen by the student in this framework

The methods used in the project are: the use of a pattern language to generate solutions and the use of simulations in order to narrow down the solutions and choose optimal ones for the site

The relationship between the project and the wider social context

The development of waterfront areas, as an extension of the city towards the sea/river, have come to the forefront, due to the expansions of cities and the need of attractive city elements.

Due to extreme weather patterns, this negotiation between city and water needs to be adaptable. The water edges have always been characterized by dynamism, whether it is water tourism, trade, industry or urban green spaces. The project explores how various changes can influence the transformation in an area, and how these can lead to quality urban spaces