

## ABSTRACT

This abstract will guide you through four phases in our quest to challenge architecture in the North. We will present the foundations of what the challenges in our project is. Then we will discuss our inspiration and what parameters we have set to guide us, followed by the process and how we got to the result. The abstract will be summarized with a discussion on how form follows climate and the outcome of our research.

## THE FOUNDATION OF THE PROJECT

Our Diploma seeks to design a housing project that adapts to the local climate in the North, and utilizes the climatic conditions to offer comfortable outdoor connections, practical living spaces and enhance the contact with nature throughout the seasons.

When building and living in the high North, you are offered unique experiences, qualities and challenges. The way architecture confronts these challenges has an impact on the daily life of the northern inhabitants. Our project is inspired by three architects that will be our guide throughout the whole project; Ralph Erskine, British/swedish architect who studied town planning in the arctic. Anne Brit Børve, Norwegian architect, known for Fuglenesdalen in Hammerfest where she studied the relations between housing and climate. Steinsvik Arkitektkontor, Norwegian architecture couple based i. Tromsø, that has worked with the arctic climate in most of their projects. They've also created a manual, or guide, on what to consider when building in the Arctic or for cold climates, called "*suitable for the purpose, biophysical environment planning*"

Our site is located above the arctic circle, in the largest town in Northern Norway, Tromsø. Tromsø is an island close to the coast, it's placed between Kvaløya, the outermost island and the mountains within, giving it the perfect conditions for large amounts of snow each winter with a record of 240 cm.

Tromsø is a city with almost 80.000 inhabitants and 15.500 students. The city had its peak in growth in 2016, but it still needs more space for both large and small families, singles and students. In our search for a site we wanted there to be an existing zoning plan and some regulations to keep it realistic. It led us to the north half of the island, between the airport and university hospital. The site is located in a hillside in "marka", and is still virgin ground, but plans have been made for infrastructure, zoning and utilization.

## DESIGN PARAMETERS

From Steinsvik's manual and an interview with Rosemarie Steinsvik, we have extracted the three most important variables to consider when building for an arctic climate.

The first point is the sun. At 69 degrees north the sun never rises higher than 44 degrees and it never sets during the summer months. In the winter time the sun is below the horizon for 45 days. This makes the sun a very important aspect to consider. The wind is the second point, and during wintertime the dominating wind direction is from the south west. The summer wind

turns 180 degrees and blows cold arctic air from north east. The third point is the snow. There is huge amounts of snow in the area. With a record of 240cm snowfall on flat ground, this will impact how you should build.

We went to visit Tromsø at the start of the semester. During this visit we had the opportunity to study the houses, qualities and what happens when form follows function at any cost. We found four aspects we will look into. The entrance is shading for wind, snow and protects against the climate. This gives comfort but often results in something looking like a storage box or at the end of a carport, hidden away from the street. The connection between the inside and the outside, where you feel closeness to the outside is often overlooked. This is shown in the last point where carports and big objects intended for comfort take up valuable space. The outdoor spaces vary a lot. Some create highly valuable space out of very little. Yet those in newly erected houses and of modern architecture are largely open surfaces with grass and little to no program, leaving the area open to draft and exposure. The social aspect of the housing we explored was connecting with neighbours in different ways. We find this to be a key feature in achieving a high density program.

## THE PROCESS

In order to design climate adaptive architecture, we found there to be a workflow following some key principles. We started out with simple volumes, these volumes are tested using the parameters we set and then run through CFD (computational fluid dynamics) to stress test the design. From here we start to establish a pattern that sets us in the right direction. By running these iterations multiple times we found the most basic principle we need to achieve climate responsive architecture. During this process we went from a straight volume, creating a wall, shielding the winter and summer wind. Then we bent the volume, trying to control the wind, and give it direction. The curved volume was then divided into less dominating volumes, creating a housing appearance that relates more to what we want as a result, and the nearby typology.

After the basic shape was set, we worked in sections to control the sun, shade and height differences. Establishing the best distance between the rows for optimal sun during summer months, making sure everyone would get the sun in the south facing facade.

The height would also play a vital role in the view from each apartment. As a rule, we established that everyone should get to see the sea from the 1st floor. This set the height to 3 and 4 stories.

From the first iterations we did with the CFD we know how the wind works on the site. The winter wind flowing through the site more or less straight on the enclosed volume creates a vortex on the south facing facade. This clears the area of snow and the wind will deposit it on the north side of the volume. The summerwind coming 180 degrees opposite will bend around the volumes, this gives calmer and sheltered spaces in the south, shading the cold arctic winds.

## THE PROJECT

The garden, a rather steep terrain filled with mountain birch, now has a housing community that encourages its residents to utilize the outdoor space. It aims to encourage more play, social interaction and use of the gardens by sharing pergolas, greenhouse, fire pits and playgrounds.

The volume, retracted and pushed, added and subtracted, creating voids, shading, shelter and nooks. All of these follow the parameters we defined in the analysis. Giving the qualities of shading the cold wind and trapping the heat from the sun. The south facing garden in the high North now has a much higher quality and we can stretch the seasons locally.

The entrances role in our project is to create better access for everyone, and encourage the social aspect of this project. By placing the entrance in the south we can exploit the sun and shelter, creating a less stressful way to enter the home. This entrance connects 5 units directly to the parking basement, storage and common space. This space works as a transition where you can put down your groceries while you help the kids with the winter gear, store a baby stroller, thaw frozen winter gear or dry wet summer clothes.

The indoor garden, a room located in the north in the common space. This garden stretches the seasons. It offers the inhabitants different functions. Here you can have social gatherings, parties and your morning coffee. Grow food and share skills with the kids and neighbours. And best of all, enjoy the midnight sun that doesn't set in the North, or the Aurora Borealis in the winter.

Connection with the outside.

We believe that a connection to the outside, either directly to the garden, or via an alternative outside space gives better qualities to life. In our proposal we have given everyone a space in the sun outside. The space is placed closed to the ground or on a balcony facing South. This is something fundamental to have when living in these harsh winter conditions. Each ground floor also has their own little garden in the north.

The apartments

The project offers apartments in different sizes and elevations. Every apartment connecting with the 1st floor are all in accordance with accessibility, as they easily can adapt. As the apartments differ in size, it will encourage different people to apply for these apartments and will have more varied residents.

This type of community housing, or shared housing is continuously growing typology. We believe that this type of house can offer some new and good qualities not tested this far north.