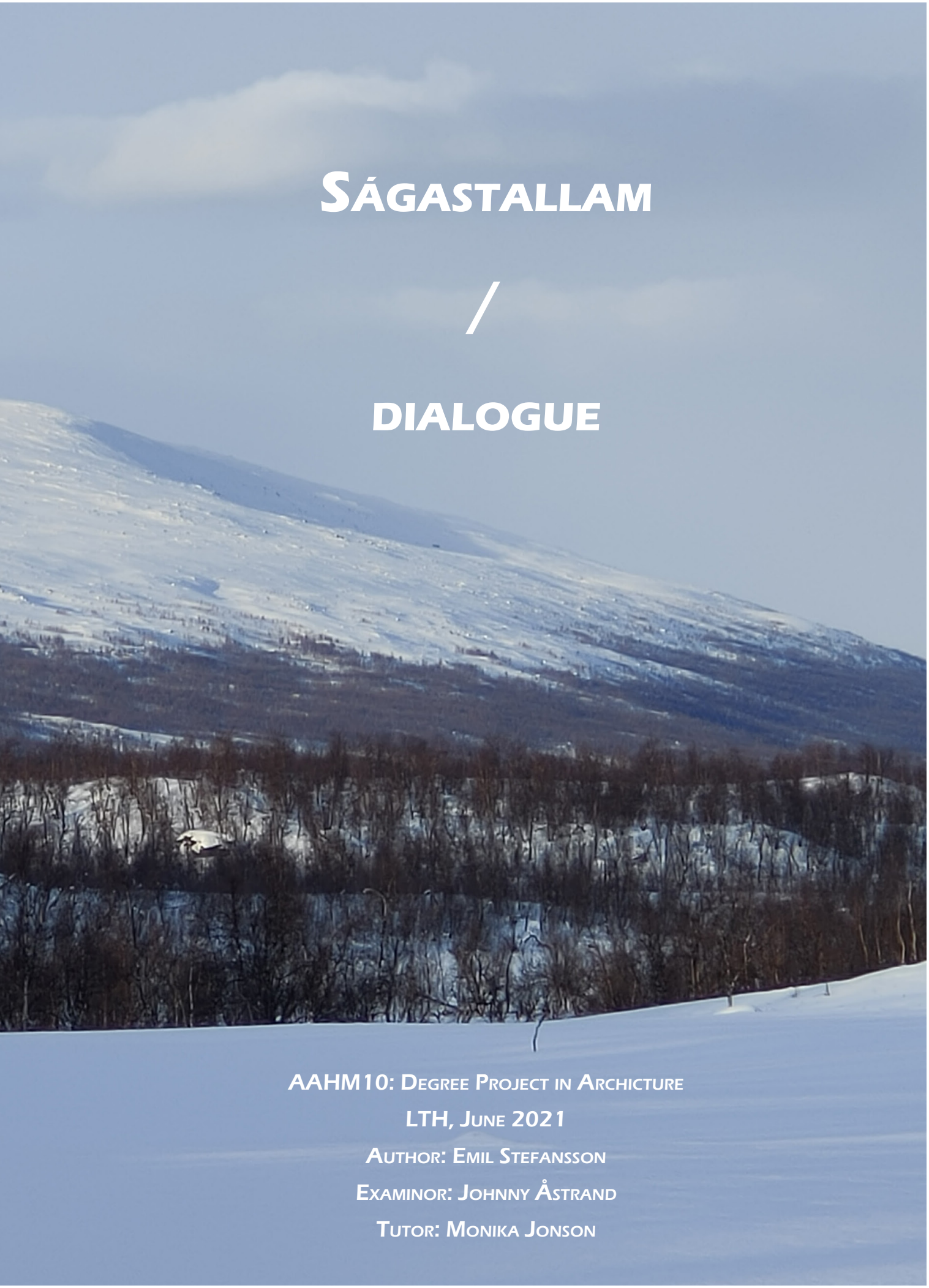

Ságastallam

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dialogue

AAHM10: Degree Project in Archicture

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Abstract

The hiker reaches out from the city, town, or village, intending to be alone. Away from sounds, away from paved roads and houses, away from streetlights and phones, away from people. But what is 'nature', and who has the right to it?

The untouched landscape shaped by nothing but the earth itself is today hard to find. Human activity is close to everywhere. Even in Sarek National Park, an area of deep narrow valleys, wild rivers, mountains, and glaciers, clashes between stakeholders occur. The tourist wants to explore wild places and experience natural wildlife, and the Sami uses the park as an office. The conflict between the workplace and leisure is apparent. But can architecture achieve a symbiosis between the two sides in such a remote location?

The thesis takes its starting point in realistic scenarios, including transportation of material, budgets, laws and regulations, and feedback from real stakeholders. It also zooms in on the off-grid location of the site, its challenges, opportunities, how to construct and maintain a building out there, and how to deal with extreme weather, lack of running water, and no electricity, among other things.

By marking differences and similarities between Sami cabins for reindeer herding and unmanned tourist cabins in the semi-exploited mountain region of Sweden, there is a possibility to create social encounters between them in the form of a standard cabin in the area. The cabin aims to address both the tourist's and the reindeer herder's needs while having a solid connection to both Sami culture and mountain tourism on the smallest possible footprint.

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Part 2 - Design Process

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Introduction

Current Situation

Nature is for us to share, according to Allemansrätten, the freedom to roam. By sharing, it means that one can pick berries, hike, and set camp for a few days on any ground as long as one leaves it tidy and unharmed. The definition of "sharing" might be a good part of the current friction between tourists and reindeer herders in northern Sweden.

The correlation between tourism and reindeer herding differs from country to country and region to region. In Sweden, the most infected relationship between the two is along the King's trail's northern section between Singi and Abisko. Speaking to a representative for Laevas Sami village in northern Sweden, he presents a vivid description of the King's trail as a wall of people for the reindeer when moving between the seasonal lands. Further south, the same picture is not shared in either Jåhkågasska or Sirges Sami village, but tourism does indeed affect the herding negatively. Speaking to Mikael Kuhmunen, Sirges Sami village president, the main issue with tourism is the lack of understanding of what one has access to. There are multiple events of tourists breaking into locked reindeer guard cabins for shelter or stayovers.

This is a frequent habit in Sarek National Park, "the last wilderness in Europe", where there is minimal infrastructure. The existing infrastructure is almost solely for protecting nature and helping the ancient reindeer herding.

Most cabins assigned tourism are close to the park's border, while the safety shelter Skárjá is situated in the heart of it. The other cabins assigned the reindeer herding, usually located in the center of a valley or used for just a fraction of the year, a month or less. Far from the national road system, the effort to reach these cabins requires good knowledge of the area, proper planning, and a decent estimation of one's ability. To not bring a tent here could be a fatal mistake.

Other issues related to tourism are lack of knowledge and/or respect for dealing with reindeer encounters. What should one do when a herd is about to cross a river? When is the most sensitive period for the reindeer? The information does not simply reach the tourist.

Reindeer in Sarek National Park. Photo by Peter Rosén.

Aim

The general purpose of the thesis was to create an understanding of each stakeholder's (reindeer herders and tourists) needs, merge them, and propose a structure that best corresponds to these needs to develop a stronger relationship between them.

Another purpose of the thesis was to explore and learn how to design for, build in, and deal with such an extreme location, down to the smallest detail.

Research Question

How does one build in off-grid locations, including extreme weather-resistant construction, material transportation, and local laws and bureaucracy, in order to bring different actors together in a typical structure?

LEXICON

reindeer herder

A reindeer herder's livelihood is the reindeer, from meat, skins, and handcrafts from the antlers. To be a reindeer herder, one has to be a Sami village member by law.

reindeer herder's cabin

A cabin used by the reindeer herders for stayovers when there is no possibility to return home.

Sami village

A Sami village is a nomadic "village", a large geographical area covering the village's reindeer's annual migration from the winterlands to summerlands. To be a member of a Sami village, one must be Sami.

Swedish mountain region

"Fjällen" is not a region per se but a reference to the mountain range Skanderna that forms the border between Norway and Sweden.

goahti

The goahti is the traditional Sami hut, built on-site for every annual migration. It is larger and more permanent than the lavvu.

lavvu

The lavvu is similar to the goahti, but due to its more miniature statue more moveable and therefore less permanent

CLT

Cross-laminated timber is flat wooden elements glued perpendicular to each other, creating a new, solid and form-stable product in the process.

Method

In order to understand the full complexity of the project and the research questions, several part assignments need to be executed. These are:

Literature studies

The literature studies are necessary to understand the bigger picture of what is possible to construct in a remote area, what kind of rules and laws one must follow and how the Sami perspective can be implemented into the project. These studies also collected valuable data from authorities and organizations regarding the situation between the stakeholders and the site's properties.

Site visit

To get a feeling of what is required to access this region, an excursion was conducted once a site was chosen. The planning, the kilometers traveled, the equipment purchased, the effort, etc. Even though the expedition did not have the expected result, it still significantly impacted the project and the process.

Case studies

A case study was done to analyze the typical Sami hut and its design, material, theory, and general adaptation to its locality.

A second case study of a recently built mountain hut in Sweden was conducted to glimpse how construction is done in a harsh climate, far off-grid. The economic aspect is also essential to consider, of which this case could be an indicator.

Photos by Dagnija Aboltina.

PART 1

RESEARCH

THEORY

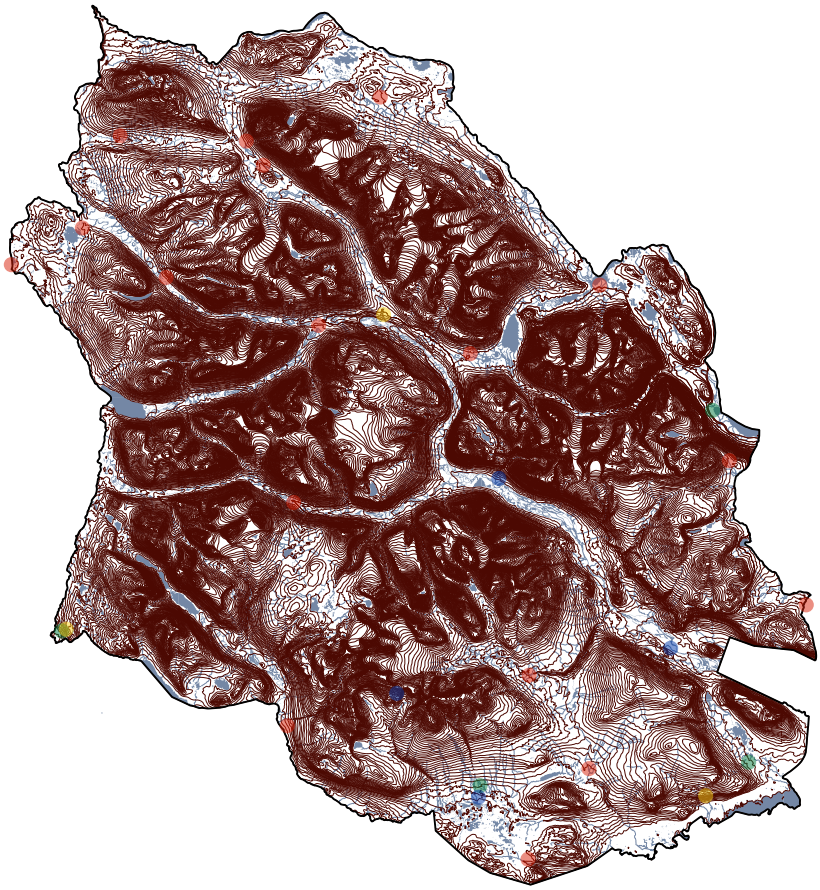
SAREK

The Swedish state established Sarek National Park in 1909 with eight others, making it the oldest national park in Sweden and Europe. Sarek is defined by its deep, long, narrow valleys, high, dramatic peaks, and wild, turbulent waters. It is an area considered untouched by us "ordinary" people. Still, it has been shaped for centuries and maybe millennia by the local Sami people, Europes last indigenous people, and their reindeer activity making Sarek a national park of cultural importance simultaneously. Since 1996, Sarek is a part of Laponia Unesco World Heritage Site together with national parks Padjelanta/ Badjelánnda, Stora Sjöfallet/Stuor Muorkke and Muddus/Muttos as well as nature reserves Sjávnja and Stubbá, and areas Sulidälbmá, Tjuoldavuobme, and Lájtávrre delta.

Since the researcher Axel Hamberg's activities in Sarek around the turn of the 20th century, resulting in the naming of several peaks, erecting five cabins in the name of science, and publishing numerous books and papers, Sarek became a magnet for adventures of the more extreme kind. With the level of equipment necessary to carry out such a quest and those time's infrastructure and knowledge, it was closer to an expedition than leisure. Yet today, traversing Sarek is not for beginners. It requires plenty of dedication to planning on reaching the National Park, and still, there are no open cabins in the national park for stayovers.

The establishment of the national park formed rules to limit further construction to maintain the park's "untouched" state. However, the Swedish law "Allemansrätten" (Freedom to roam) allows the public to access any public or private land for recreation and exercise, as long as no littering nor harm comes to nature. The estimated 5 000-7 000 people visiting the park every year will still affect nature negatively. Therefore, some recent structures within the national park have been erected to avoid harming wildlife, like footbridges, privies, and a few shelters.

The reindeer herders are exempt from this rule as they are considered a significant part of the status of a national park. They are therefore allowed to erect cabins to support their reindeer herding. These cabins are only used for a short period every spring and fall when the reindeer move between their seasonal lands. They are also very similar to the day cabins for tourism in both looks and program and are joint with the fact that they are left unused for most of the year, therefore subject to break-ins when tourists look for shelter and find them locked.



Sarek National Park. Reindeer herder's cabins in red, settlements in green, tourist shelters in yellow, Hamberg's cabins in blue.

Tourism

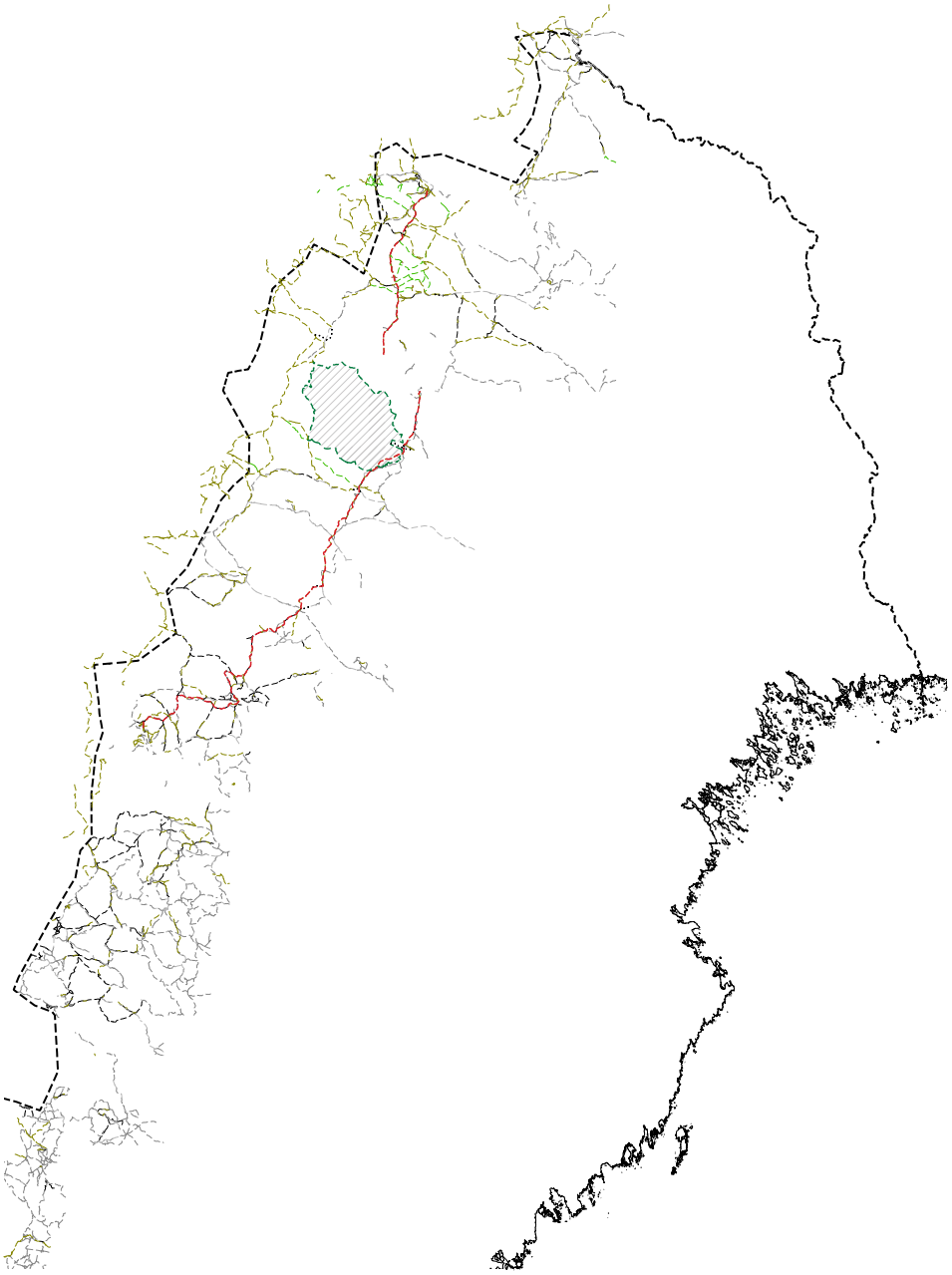
Mountain tourism in Sweden started at the end of the 19th century with the founding of the Swedish Tourist Association (STF). A few scientific expeditions had been carried out before this; the most notable was Carl Linnaeus's botanical expedition 1732. While pioneers Axel Hamberg and Gustaf Wilhelm Bucht exploring the mountains of today's Sarek National Park simultaneously as STF were preparing the mountains for tourists, the acknowledgment of what this region could offer, grew for every day. In 1920, STF had grown from 29 members in 1886 to more than 80 000. Today's number is 260 000 members.

Mountain tourism today is quite different in Sweden compared to other areas in Europe. There are no restaurants here and there, neither roads, cattle, and people. The Swedish wilderness is not exploited like, e.g., Switzerland. Even Norway has reached a level of mountain tourism that can be questioned if it is good for the environment.

The threat to our nature lies in knowledge and attitude.

Tourists' activity in the mountains is growing every year. Even if Sweden is relatively unexploited compared to the European Alps (there are no restaurants, roads, and farms here), the interest in experiencing the mountains is high, even internationally. Most notable was last summer's pandemic rush when our government strongly recommended people to stay in Sweden and explore the country instead. For many, the achievement of reaching the highest point of Sweden, Kebnekaise, was finally going to happen. The devastating result of overcrowding was evident as the masses left their cheap tents where they pitched them, resulting in an intensive clean-up action. Otherwise, the mountain region saw a decrease relative to previous years. Official estimations from Sarek show a similar number in 2020 as in 2019 and 2018.

Nationalpark	Län	Areal	Besökare 2015	Besökare 2016	Besökare 2017	Besökare 2018	Besökare 2019	Besökare 2020
Muttos	Norrbotten	49000	4 500	5 000	5 000	5 000	6 000	6 000
Badjelánnda	Norrbotten	198400	5 000	5 000	5 500	5 500	5 500	3 500
Sarek	Norrbotten	197000	6 500	5 500	6 500	7 500	7 500	7 500
Stuor Muorkke/St Sjöfallet	Norrbotten	127800	15 000	15 000	15 000	15 000	15 000	13 000
SUMMA			31 000	30 500	32 000	33 000	34 000	30 000



The mountain region's trail network. King's trail in red. Sarek for reference.

Sami & Sirges

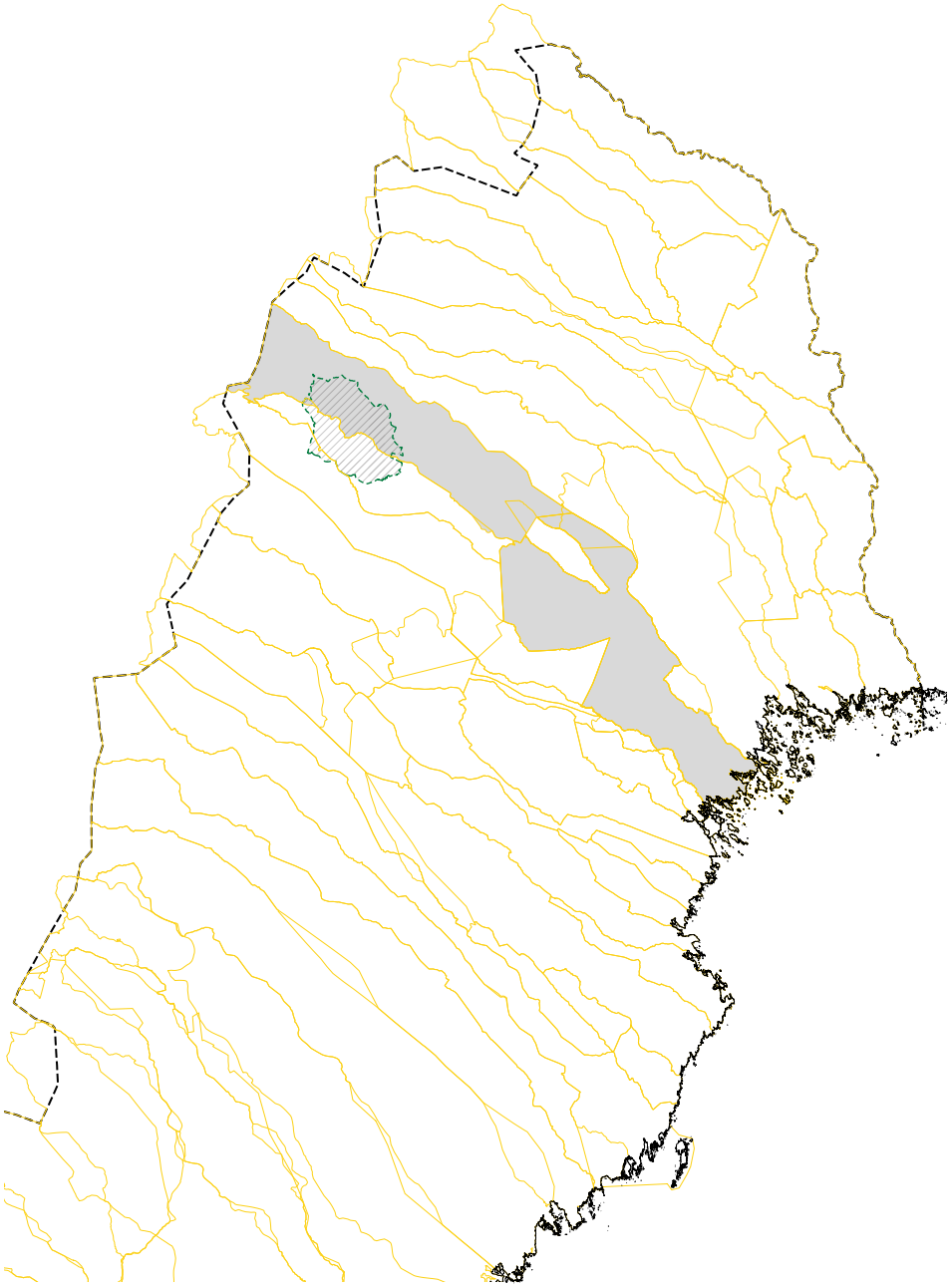
The Sami is a group of indigenous people of approximately 80 000 people spread over their land, called Sapmi, spanning Sweden, Norway, Finland, and the Kola peninsula in Russia. An estimated 20 000 people are Sami in Sweden, where only 2400 are reindeer herders. The Sami are identified as people who share the same culture and language that is significantly different from the rest of Scandinavia. However, there are significant differences between groups of Sami, probably due to their historical isolation and large covered territories. A Sirge Sami does not understand a Laeva Sami, with a geographical distance of 100 km between them.

Since Sapmi is not an official sovereign country, it has an undefined land border. However, a loose definition is to see what land they have the right to use. Sapmi is divided into "villages," which is not a village per se but a corporation that spans a geographical area defined by the village's reindeers' annual migration from the winter lands to the summer lands. A Sami village consists of multiple reindeer companies that, in turn, consists of numerous groups of reindeer herders. The herders are almost always related to each other; it is something you inherit through generations.

Hunting and fishing were the main livelihoods until about 1000 years ago when the Sami tamed the reindeer. Before that, the reindeer was still important, but for food and not cattle. Now the reindeer provides for milk, skin, meat, tools, and sometimes transport. The entire Sami culture lies on the reindeer, which is seen as a symbiosis relationship. The reindeer's migrations define the seasons, which in turn is determined by the weather. Therefore, climate change has affected the Sami way of life extensively, resulting in confused reindeer and uncertain food supply.

Most reindeer herders still live a nomadic life, but not to the same extent as it used to be. The spring and autumn settlements have lost their purpose due to faster means of transport. Vehicles such as quad bikes, snowmobiles, and helicopters are used instead of going by foot, ski, or reindeer. Especially the snowmobiles would not have to be used if there were no other users. They leave tracks that the reindeer follows, which is usually the not intended route. Therefore, the Sami have to invest in a snowmobile to guide the reindeer in the maze of snowmobile tracks found in the mountain region.

Snowmobiles are otherwise the most versatile machine a reindeer herder has. It allows for better control of the reindeer, fast transportation of tools, building material, and people. Drones are also a commonly used tool for the herders to overview the reindeer.



The Sami villages are occasionally overlapping.
Sarek in green, Sirges in grey.

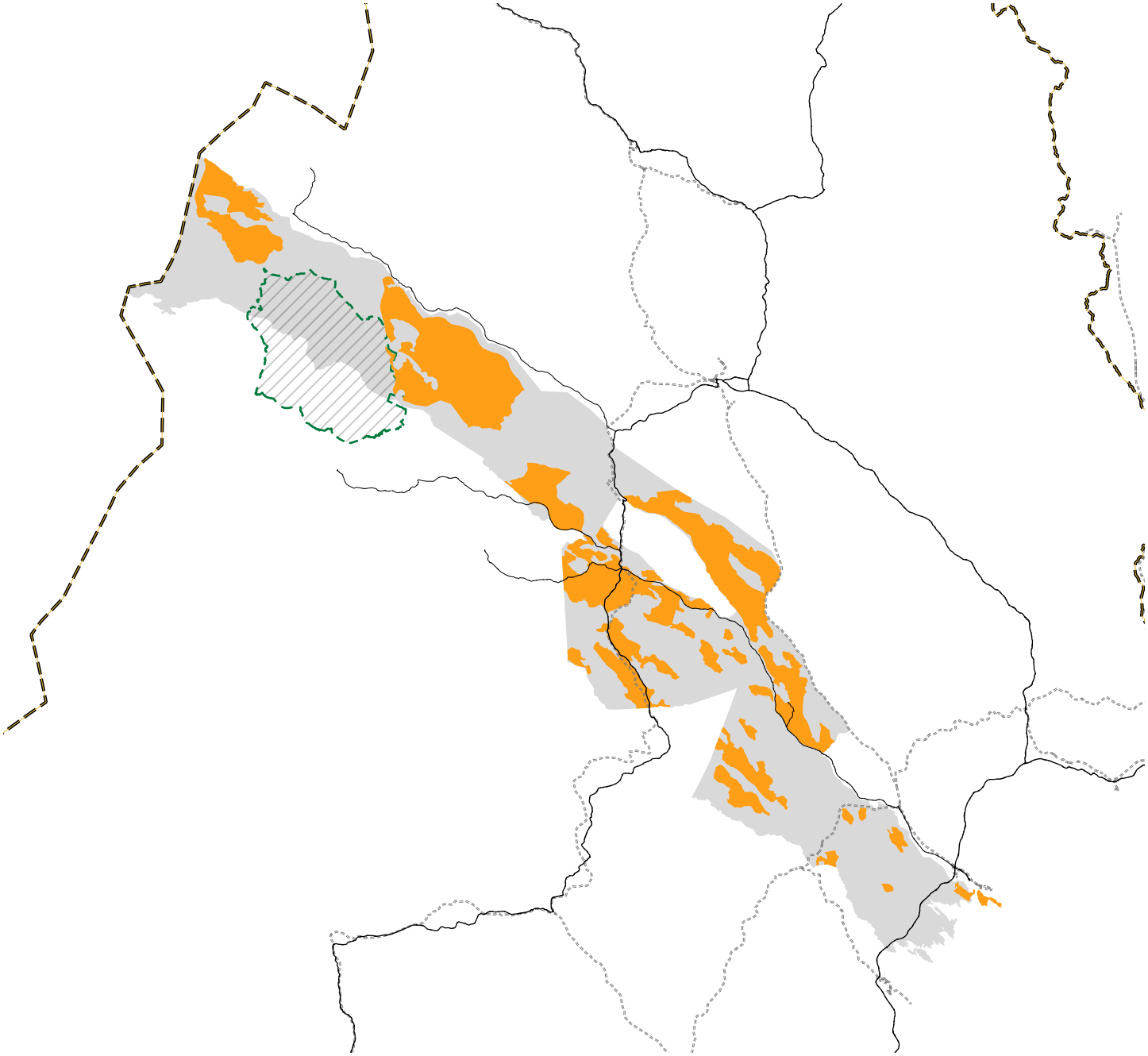
The thesis focus on the Swedish Sami in general and Sirges Sami village in particular. Sirges is Sweden's largest Sami village with 95 reindeer companies and over 300 members with a maximum reindeer toll of 15 500 animals after slaughter. They dwell in historically essential lands with Jokkmokk as the central community, where the Sami trade has taken place for more than 400 years.

The northern half of Sarek lies in Sirges. It is the most tourist-dense area of the park due to its relative accessibility. Sirges Sami village has decided to not use vehicles in the national park, expressing that no harm should come to the delicate nature they have the honor to dwell in.

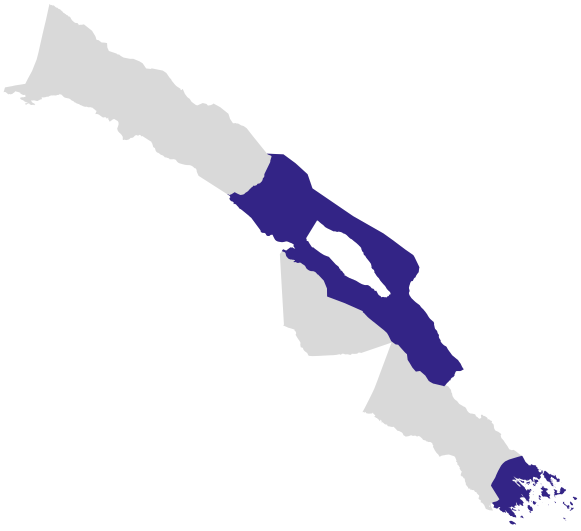
Sirges Sami village can be divided into several areas of different interest. The most crucial division displays the core areas. Those are areas where critical events of the reindeer herding take place, like seasonal grazing, births of the calves in May, and the slaughter in September. The largest core area is Ultevis, where the major spring and autumn pasture lies and where the most prominent calf marking facility, Kuorpak, is located.

The Sami refers to eight seasons, spring-winter, spring, spring-summer, summer, autumn-summer, etc. Other ways of dividing the Sami village are, therefore, by seasonal lands. Most of them are overlapping due to their weather-dependent character. If there is early winter, the migration down to the winterlands is earlier and vice versa. As a result of climate change, the weather has become harder to predict for both Sami and reindeer, resulting in reindeer scattered across the entire village, from the mountains to the coast.

Other mapped areas include grazing lands, routes, dwell lands and birth lands.



Sirges Sami village and Sarek. Core areas in orange.



Winter and Spring-winter.

Spring.

Spring-summer.

Summer.

Autumn-summer.

Autumn and autumn-winter.

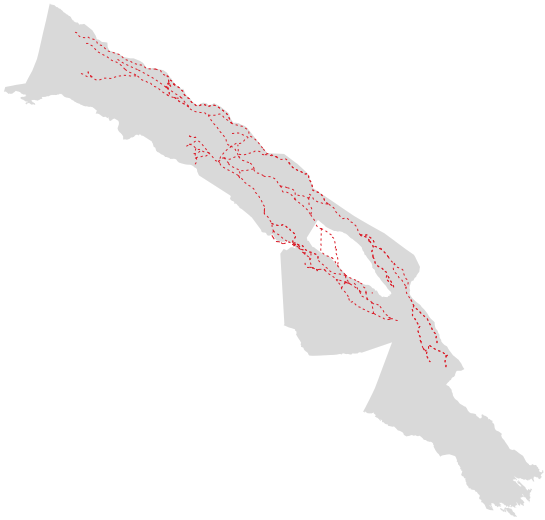
Dwell lands.

Calving lands.

Rut lands.

Gathering areas.

Rest grazing.



Migration routes.

The Reindeer

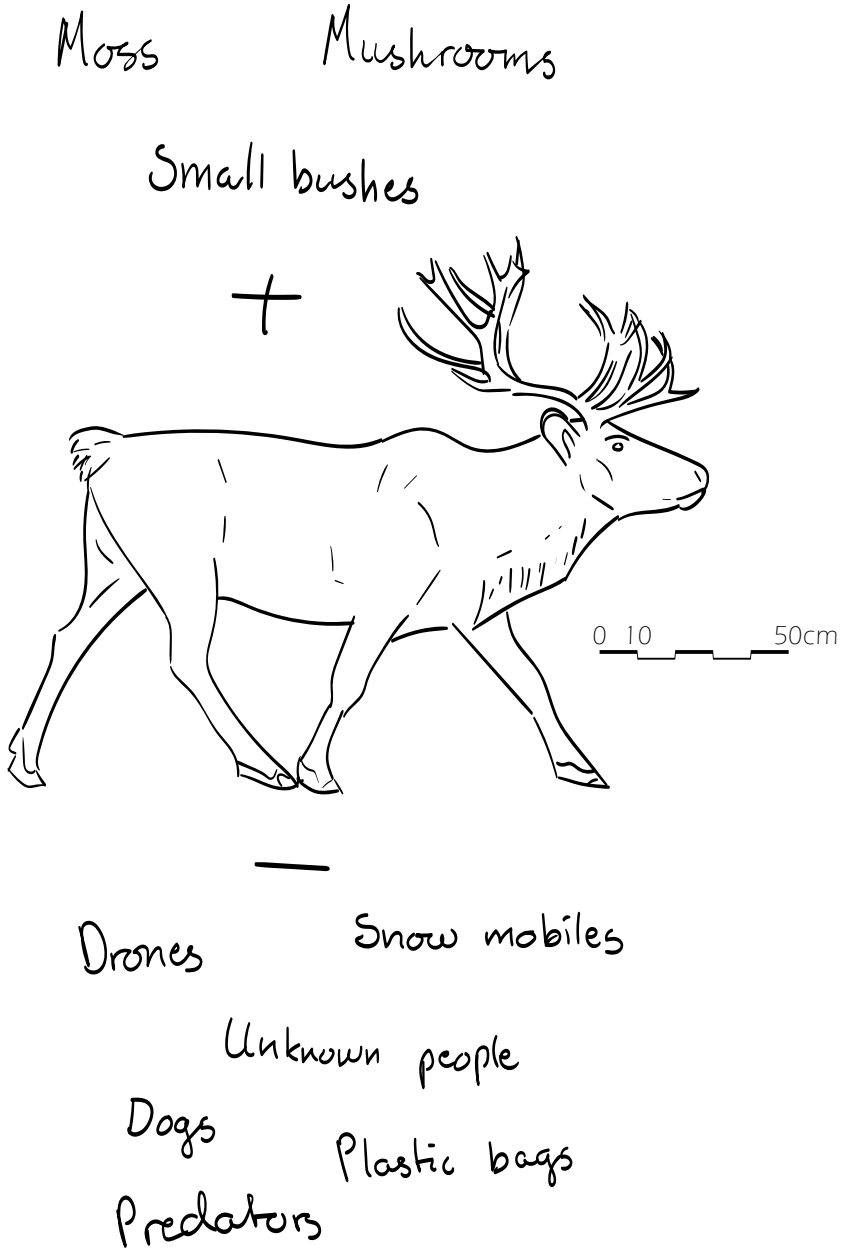
The reindeer is a fascinating mammal, being a part of the livelihood for the Sami for at least 1 000 years, but hunting of the wild reindeer happened even before that. The reindeer gave the Sami milk, transport, clothes, food, and meat. Today, it is mainly meat and skins that are the income.

The reindeer's height varies from a bicycle to a small horse, and it can be distinguished that both males and females grow antlers. They are pretty robust animals with short legs and thick bodies, weighing between 60 and 170 kg. They live primarily in groups but can drift alone during summers when the food supply is good.

While they eat mostly lichen and moss, they also have an appetite for mushrooms and small bush trees. The winters can be harsh, especially for the females as they are pregnant during that period. Food is sparse and might be hard to find or reach due to the snow cover.

They dislike loud, unknown noises, especially snowmobiles, cars, and barking dogs. Strange people could also be seen as a threat if they do sudden movements or rapprochements, while drones, one of the handy tools of the Sami, scare the reindeer immensely.

The sensitive period between March and May, when the females are pregnant, and about to give birth, the use of noise-generating technology is strongly recommended to wait. If the females get scared, they might reject the fetus to save themselves, a survival mechanism. When the calves are born in May, most tourist cabins in Sami areas are temporarily closed until the end of June so the calves can establish themselves and be marked by their owner.



The reindeer's likes and dislikes.

The site

By the foot of the characteristic mountain Nijak lies a small cabin "Laddbodan", put there by Sirges Sami village during the journeys to and from the summerlands.

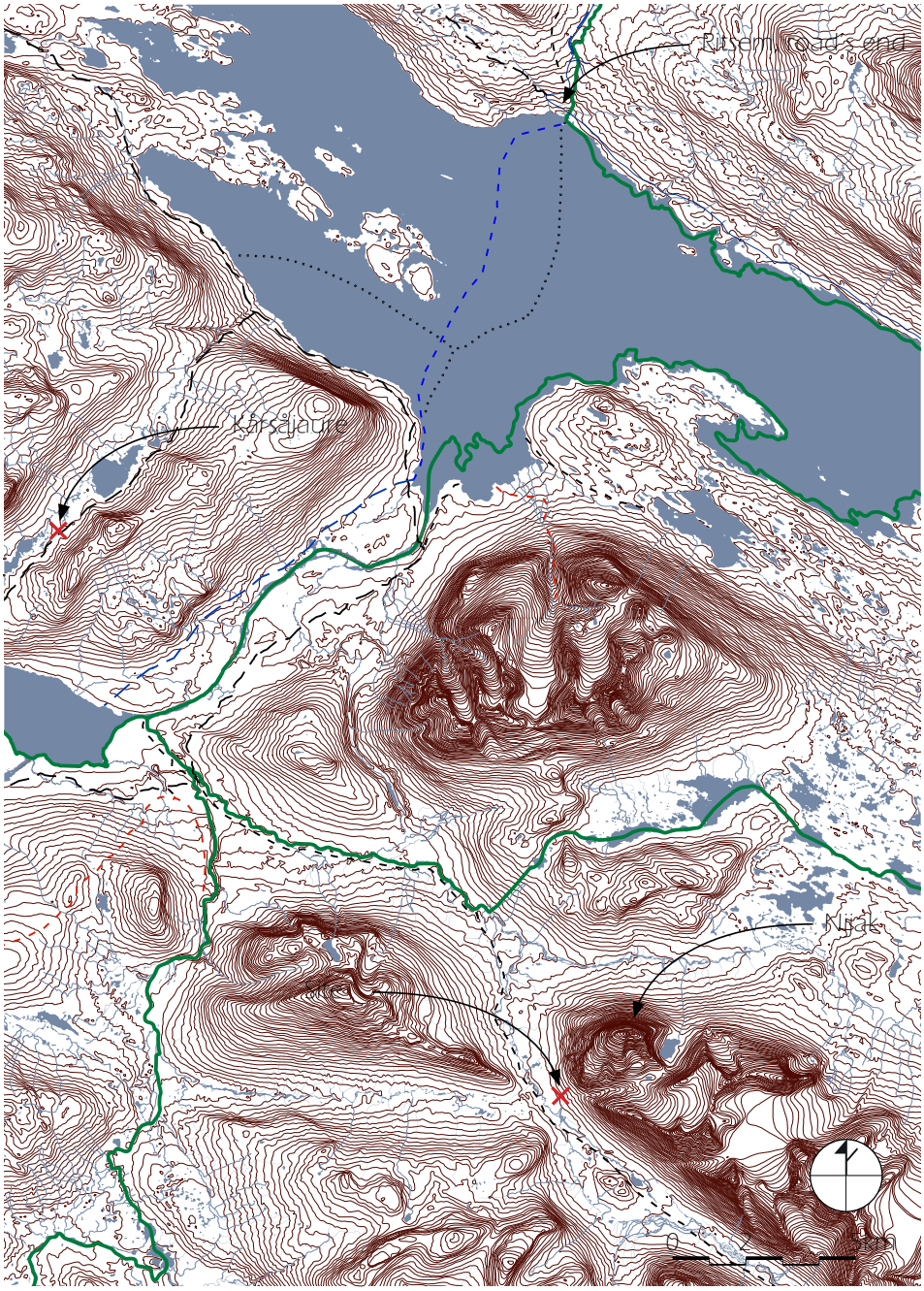
It has been hand-picked by Sirges president Mikael Khumunen as a good spot for a cabin with my intended use. Photo by Carl-Johan Utsi.

After weeks of phone calls and short interviews with representatives of Sweden, STF, and the Sami people, including a disappointing conversation with a Laevas Sami village representative, I reached Sirges president Mikael Kuhmunen. After a 45 minute call, he pointed out two good candidates for my idea of a typical cabin for reindeer herders and tourists. One was in Kårsåjaure/Gårssåjávrre and the other by the foot of the majestic mountain Nijak.

The site in Kårsåjaure has an existing cabin along a marked trail, managed by Norrbotten county, placed there for tourists' safety and a good spot for a break. In case of emergency, there is a possibility to stay for the night. It lies between Kutjaurestugan and Vájsáluokta, where Vájsáluokta is a large Sami summer settlement. Adjacent to the settlement, there is a reindeer facility for marking the calves and gathering the reindeer for the migration back to the winter lands. Kårsåjaure is also situated outside Laponia and any national park and is, therefore, free from significant building restrictions.

The other site is situated 5-600 meters uphill west from the path in northern Sarek in the valley Ruotesvagge. It acts as a four-way crossing for the reindeer migration. A small shed is placed there as a temporary solution for a stayover possibility when moving the reindeer. Further south is a larger cabin previously owned and managed by Sirges. Still, due to frequent break-ins by tourists, mainly during wintertime, they have abandoned it and practically letting it fall apart. This site is also situated within Laponia and Sarek national park. It is, therefore, subject to the prohibition of built structures that do not benefit nature solely and/or reindeer herding.

The choice fell on the second site due to its challenging location, the strategic position for reindeer herding, and the greater need for a proper shelter among both herders and tourists.

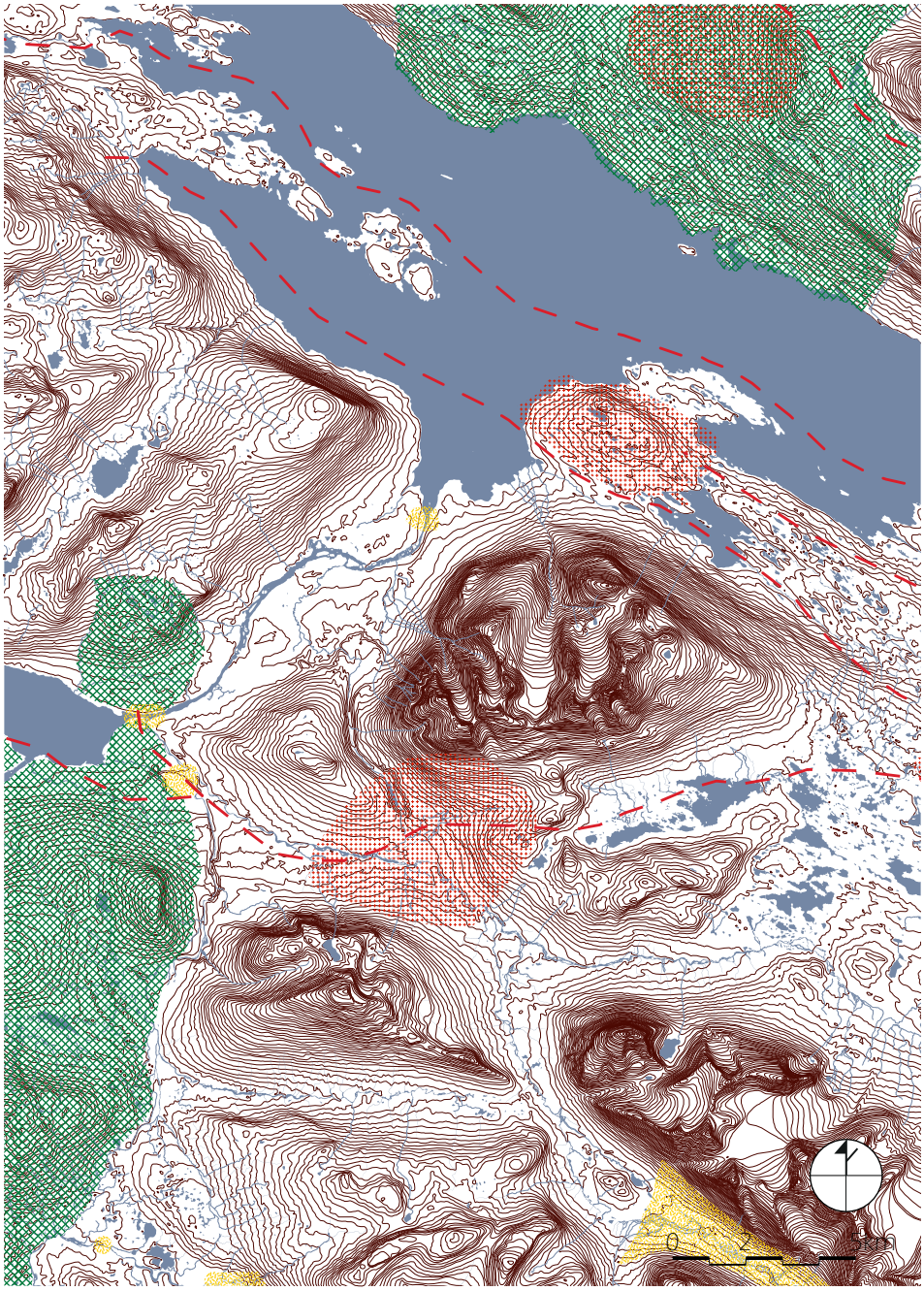


Trails and paths. National park borders in green. Marked trails in long black dash, paths in short black dash, difficult path in red, winter trail in long blue dash, ice-crossing in short blue dash, and boat routes in black dots.

“I want as few tourists as possible. At the same time, it will not be possible to avoid a certain demand, and then you have to choose to steer the tourists away from the reindeer industry.”

“I could imagine a site between Ahkka och Sarek, where we have a temporary shed as we speak.”

- Mikael Khumunen, Sirges Sami village president



Moving the reindeer. Routes in red dash, rest pasture in red hatch, dwell lands in green hatch, difficult stretch in yellow.

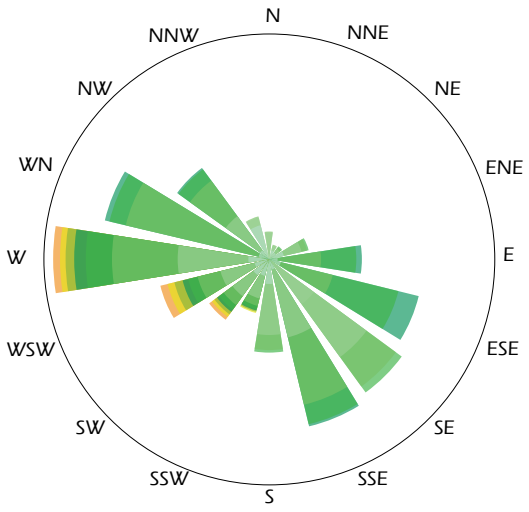
Nijak rises 1 921 meters above sea level. The difference to the shed, "laddbodan", is slightly above 1 000 meters. The mountain casts its shadow over the valley for the better part of the mornings, but the sun hits the shed past 10 o'clock during summers. Winters are far darker, with only twilight and darkness from mid-December to early January.

Sarek winds are generally blowing from the west, were also the most brutal winds blow from. Through Norway's sharp coastal peaks, Harsh Atlantic winds filter, run across Padjelanta and hit Sarek with full force. It is a windy place and wet as well. Up to

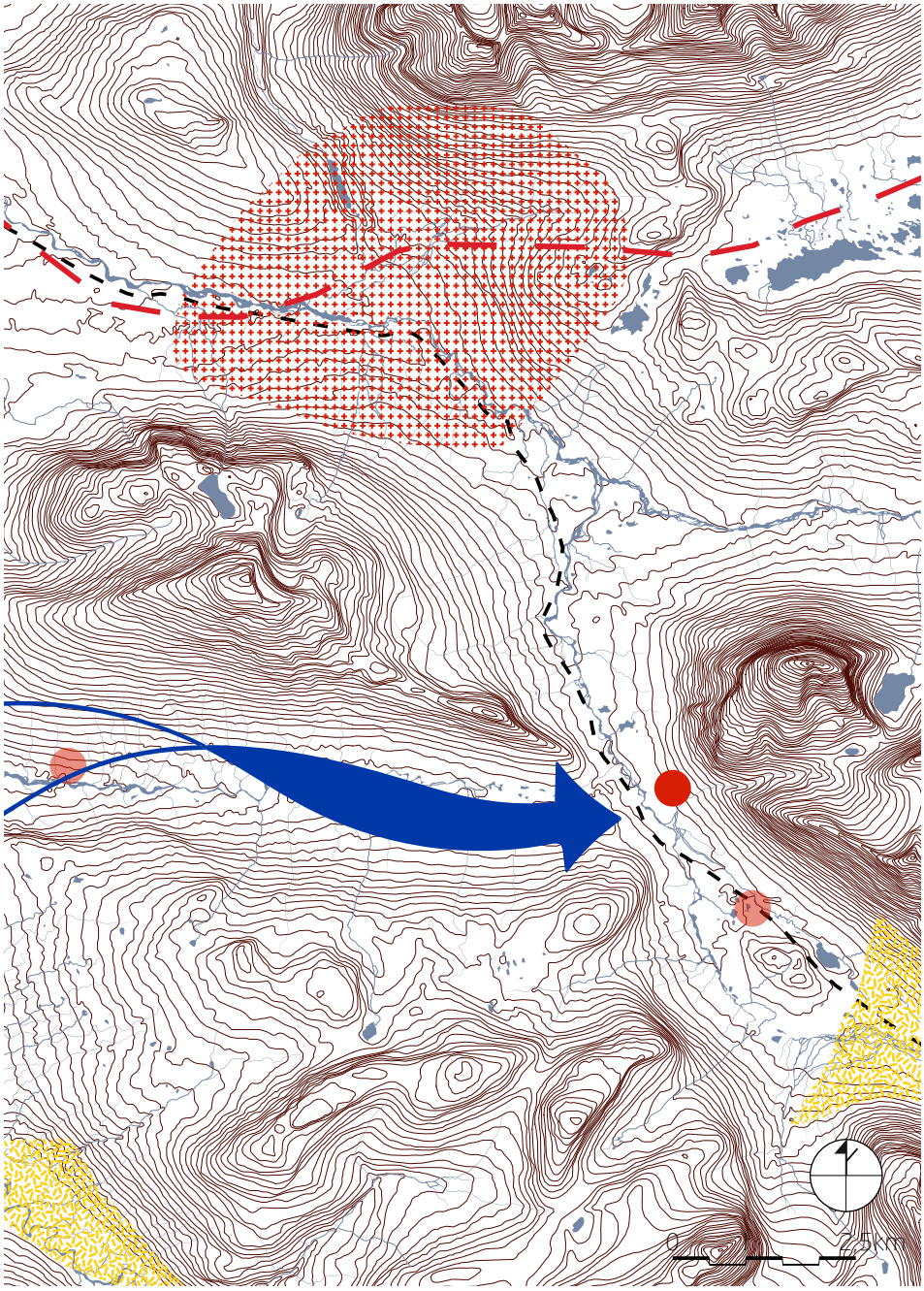
2 000 mm of rain and snow falls here every year, compared to the Swedish average of 500-800 mm per year.

The site lies rather exposed to this western wind from Sierggavággi, but according to Mikael, it is always windy in Sarek, where one build is less important. However, wind anchors are necessary to stabilize sideways wind forces.

The ground is moraine and has an approximate 3-4 meters before hitting rock bottom. That information proved to be valuable when choosing a foundation later in the process.



Wind rose. The strong winds comes from the west.

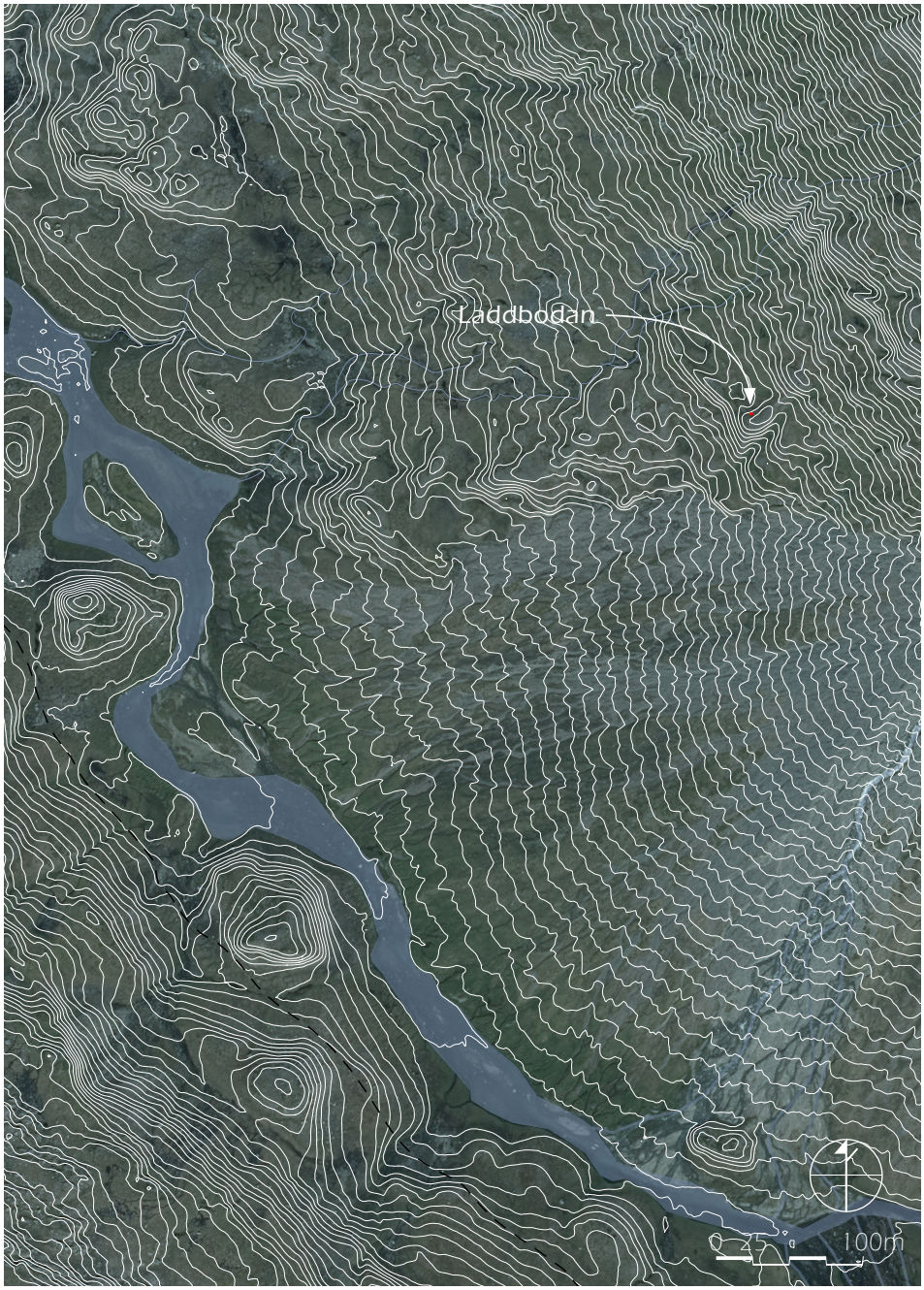


Conditions. Site in red, reindeer herder's cabins in less red, dominant wind in blue.

The present shed was very easily transported and assembled on site. It is attached to the ground with wind anchors and has been standing there since 2018. Sirges is using it for a few weeks every year for stayovers during the migration. It has a large solar panel and 12V outlet for charging communication systems and drones.

When making the migration, the standard size for a company is four-five people. Due to the shed's very moderate size, it is not a pleasant stay. Maximum two persons fit and then it is crowded. The other two-three people have to find another place to stay, mostly ending up going to Sierggavággi, more than 8 km from the shed.

The shed, "laddbodan". Approximate size 2,2x2 m. Photo by Mikael Kuhmunen.



Site approximate. Every curve is 1 m elevation.

Site approximate. Every curve is 50 cm elevation.

Site approximate. Every curve is 50 cm elevation.

"3.5.2 Lease of a reindeer herder's cabin

The right to erect a reindeer herder's cabin according to the 16th paragraph, 2nd subparagraph of the Reindeer Husbandry Act (RNL) is a right held by both the Sami village and the individual Sami village member. The person who has the legal right to dispose of the reindeer herder's cabin is likely to be the person who built it. The right is conditional in the sense that reindeer herders' cabins may only be built if they are needed for reindeer husbandry. The reindeer herder's cabin is thus clearly linked to the other rights under the reindeer husbandry law. As mentioned above, the Sami move their reindeer according to the seasons and have different year-round and winter grazing areas. Therefore, some of the reindeer herders' cabins are only needed during certain periods of the year and may be empty during the rest of the year. Therefore, there may be an interest for a Sami village or a member to rent out their reindeer guard hut when it is not in use. The introduction of the 16th paragraph of the RNL extended the possibility for the Sami to erect buildings, previously it was mainly huts and lodges that the Sami were allowed to erect. Reindeer herders' cabins were included in the 16th paragraph of the RNL because the standard of the Sami's working dwellings had been raised.

In introducing the 16th paragraph of the RNL, the legislator also clarified that the planning regulations and other building regulations are to be applied to buildings and facilities referred to in Section 16 of the RNL. In this respect, the right of the Sami to erect buildings is equated with that of the rest of the population, as the same rules apply to, for example, building permits, etc. However, a clear restriction for the Sami is the prohibition on letting in subparagraph 31 RNL, which means that a Sami village or Sami village member may not rent out their reindeer herder's cabin. A comparison can be made with what applies to leaseholds. According to 8:20 JB, the main rule in a lease agreement is that the lessee may rent out his buildings on the leasehold, provided that this can be done without considerable inconvenience to the landowner and that rentals have not been restricted in the agreement. There is thus freedom of disposition between the landowner and the tenant to agree on the right of the tenant to let the buildings or not.138 The freedom of disposition stems from the fact that the landowner should be able to control who uses the leasehold.139 For the Sami, this right is restricted by law in subparagraph 31 of the RNL, which means that the Sami do not have the same possibilities as those who lease land to agree with the landowner on the letting of their buildings."

In a paper written by Victor Appelqvist at Umeå University in 2020, he lists the reindeer herder's cabin laws. The law says that a Sami can erect a cabin if used for the reindeer herding temporarily. If used more often than for seasonal herding, it will be placed according to where the landowner (usually the state) finds it suitable. As long as the land of interest is covered by the Sami village's seasonal lands as defined by the state, the Sami does not have to own the land to be allowed to build on it, and that is written in Swedish law.

The spectacular aspect of the law about reindeer herding is not only that a Sami can erect cabins without reporting it, but also that he is not allowed to sublet the cabin to other people but other Sami of the same Sami village doing herding, fishing, or hunting, in the opposite of other land leasing laws. This results in many days of no occupant and faster decay due to sparse inspections of the condition.

However, there are cases where a Sami has built his own cabin within his Sami village's seasonal lands and yet got pulled to court for violating building laws. The cabins are far from the national road system and require days to reach. Still, the municipalities of these areas have argued for demolition, referring to the too high standard of the cabin or that it is built too close to a lake. In the most viral cases, the Sami's won.

Building a national park requires its own method. There are park-specific rules to apply, heavily based on the characteristics the national park had when it gained recognition. Sarek National park was, during its establishment, more or less untouched, and therefore the aim then and now is to keep it like that.

As earlier stated, the Sami has a much stronger case here regarding the built environment. Bridges and cabins are put in strategic areas to help the herding. Unless it is for crucial science or safety, any buildings detached from the reindeer herding will not be approved by the county administrative board. Neither would they allow a joint reindeer herder's- and tourist cabin if the access to it is the same. But according to Mikael Kuhmunen, there is a possibility of approval if firewood and solar power are reserved for the reindeer herding.

Excursion

Preparation

Preparing an adventure of a week-long kind is one of the most exciting procedures on a personal level. To research the place, look at the maps, go through different possible scenarios and what type of equipment will be needed, and so forth.

I had never been on a winter adventure before this. My closest snow encounter during a hike was in Corsica 2019, and I was lucky to be prepared with crampons. This time there would be only snow, so backcountry skis were a must. My mum did not want me to go solo, so she made my stepfather join me, for good and worse.

Before I start packing, I make up a preliminary route. This route tends to change while sharing the route ideas with someone, or once you are on the train of no return, you have to put your mind to it. In our case, the route changed many times due to circumstances I will mention later.

While packing, you will need to know what temperatures you are going to spend time in. Prepare for the worst and use layers for flexibility: a down jacket for lunch breaks or an extra woolen undergarment if one gets wet. Some specific items had to be purchased for the matter. Considering the area's stormy and fast-changing weather, the focus was safety, not avalanche equipment. A shovel, a good tent, and a transmitter were necessary in this environment in case of.

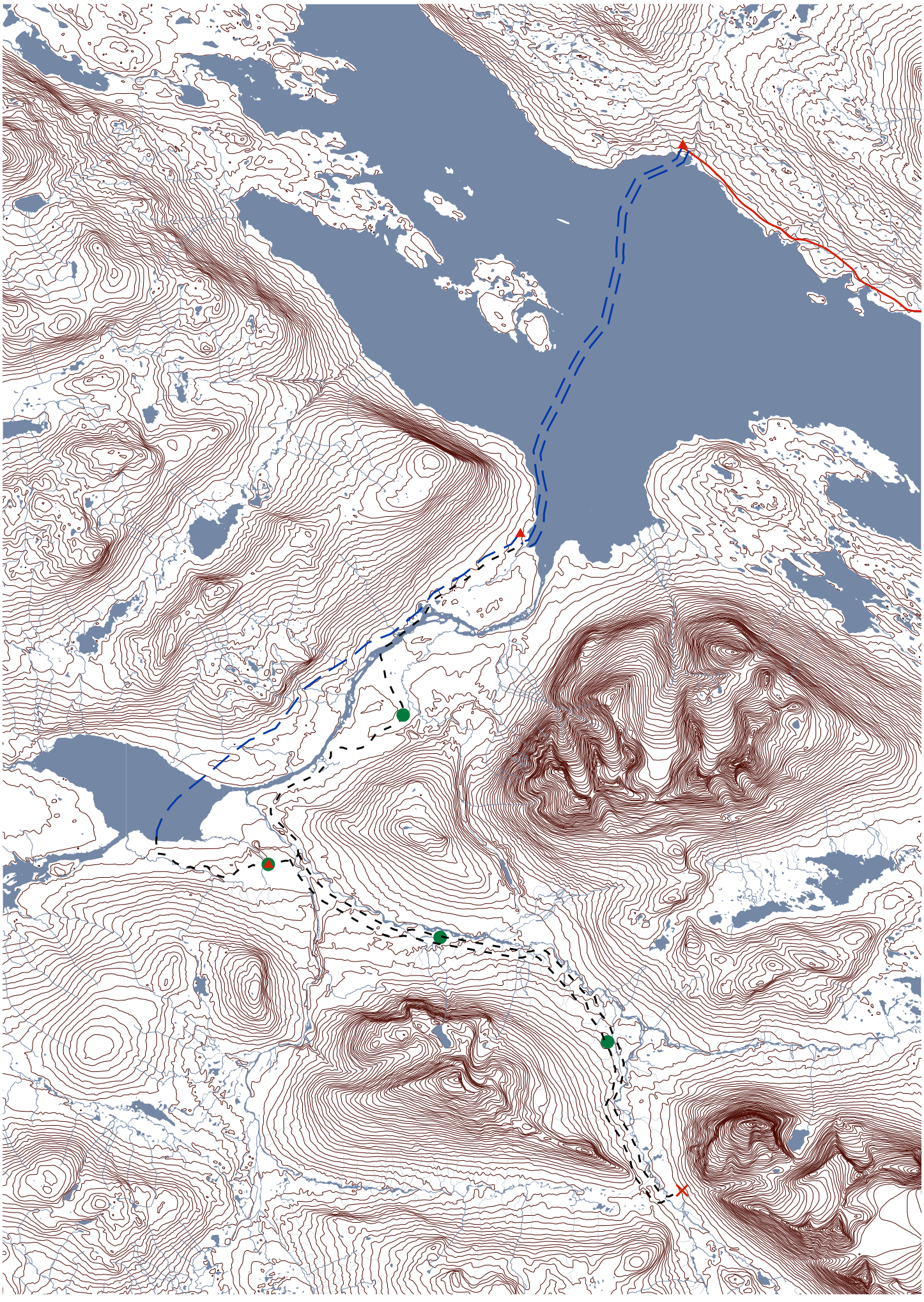
Since my Corsica adventure, I had put plenty of effort to slowly lower my dry weight. Dry weight is the equipment you carry on your back, not counting food and water. My guess is that my dry weight for this adventure was as low as 9-10kg, with food and water bringing it up to 13kg. My stepfather decided to buy plenty of equipment from scratch, not taking weight into consideration. He also chose to pull his kit with a pulk that brought his dry weight up to approximately 25-30 kg.

List of equipment brought on the excursion.

When we arrived in the RItsem mountain station, the plan was to catch a snowmobile and taxi across the frozen lake, along the winter trail to Kutjaure, and across that lake as well. Then the national park Padjelanta starts, and we would have to ski to the Kisuris cabins. The snowmobile taxi was expected to take approximately 60 minutes and cost us 600 kr per person. We were going to stay the night in the cabins in Kisuris.

The upcoming day would start with a climb towards the mouth of Sarek, where Kisuris and Nijak meet, a 20 km stretch in rough terrain. I expected us to have to sleep along the path, and we hoped there were any tracks from other adventurers. We then expected to reach the site the next day around lunch. A few photos, water sourcing, wind analysis, and general views and vistas.

The journey back was expected to require two more nights outside in the tent. We would ski on the summer trail to easily follow the markers and ski on a thinner layer of snow. When arriving at the Akka cabin, the snowmobile taxi would be called once again for a return to Ritsem, where phone reception could be established. The bus back to Gällivare would then bring us to the train station for our homecoming.



Expected route. Snowmobile ride in blue, cabins in red, stayover in green.

Adventure and backfires

Starting in Malmö, the train took me March 13 at 8:17 AM to Stockholm. After a quick family recap, my stepfather and I caught the night train towards Narvik at 6:03 PM. Here came the first backfire:

1. Forgot the woolen overalls and winter gloves.

After multiple calls, I managed to buy an extra pair of undergarments and ski gloves, delivered to the bus stop the following day by snowmobile.

A shaky night and bright white morning and we had arrived in Gällivare. A tiny bus waited outside the characteristic train station, receiving all the adventurers going towards Ritsem. In Saltoluokta, most went off, and I got my necessary clothes.

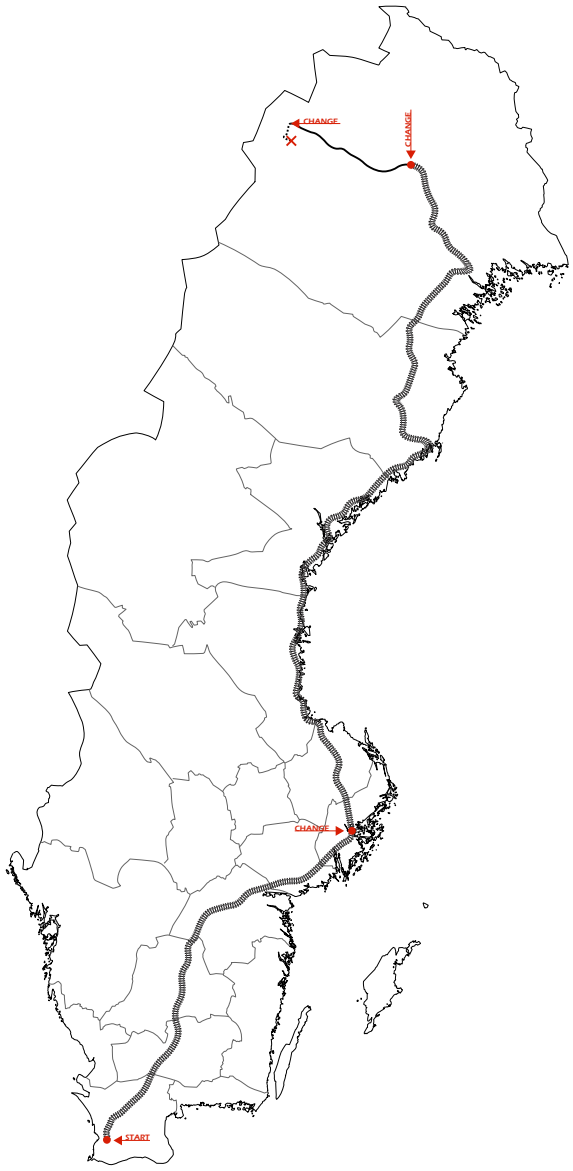
Arriving at Ritsem, we found out that the snowmobile transport across the lake had to be rescheduled. A friendly Sami from Unna Tjerusj Sami village gave us a ride instead, but not to where we had planned:

2. The Akka cabin instead of Kutjaure lake.

This change meant a day lost on an already tight schedule. It was sunny and calm, so the only reason to do at that moment was to strap the skis on our feet and follow the prepared tracks. We managed to reach Kutjaure when we pitched the tent for the night.

The second day started with foggy snow. Not intense, but there was a difficulty to see much ahead of you. We crossed the frozen lake and reached a ridge where the summer trail marked the way. The snow was sparse and not ideal for skis, but we could, after an hour, spot the Kisuris cabins. To our horror, it was separated by a narrow but deep valley that forced us to untie the skis, descend and ascend. A physical test of its own.

The sun made it surprisingly warm around lunch, which we enjoyed alone inside the cabin, but the view was still obstructed by lower clouds. We could hint at the mountain Kisuris (1677m MSL), but not entirely. My interest lay in seeing the monstrous hermit of a mountain Nijak hoovering above the site, but it was not in sight.



The journey from Malmö to Ritsem via Stockholm and Gällivare, a journey of close to 2 000 km.

Bus and trailer in Gällivare.

Ritsem, view towards south, Akkajaure, and Akka/Áhkkà.

Camp by a reindeer fence. Kutjaure behind the hill.

Following the winter trail to Kutjaure.

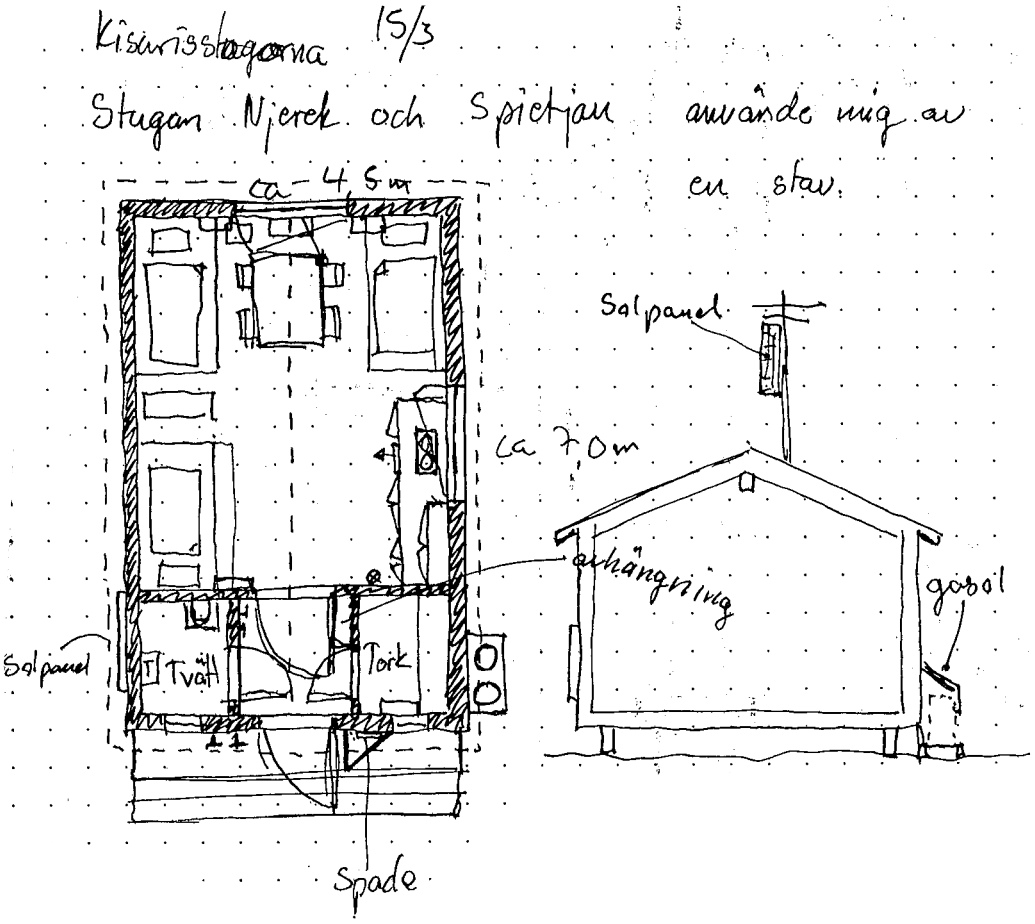
Dinner inside the tent.

The Akka cabins, last day off-grid.

Our Sami friend on his snowmobile, picking us up for the ride back to Ritsem.

Aggressive blisters came after one hour on skis, and worsened as we advanced.

The Kisuris cabin was of comparably good standards of what I remembered from other adventures. The entrance was enclosed with doors to the drying room, washing room, and the combined cook/eat/sleep/socialize space. Three bunk beds could host up to six people, and there was an emergency phone in the washroom. The cabin was powered by two solar panels and heated by an LPG system. The drying room had a gas radiator, and another radiator was situated under the window in the standard room, surprisingly complicated to lit. An LPG tank was attached to the exterior, to the right of the entrance.



Sketches of the cabin, scale 1:50

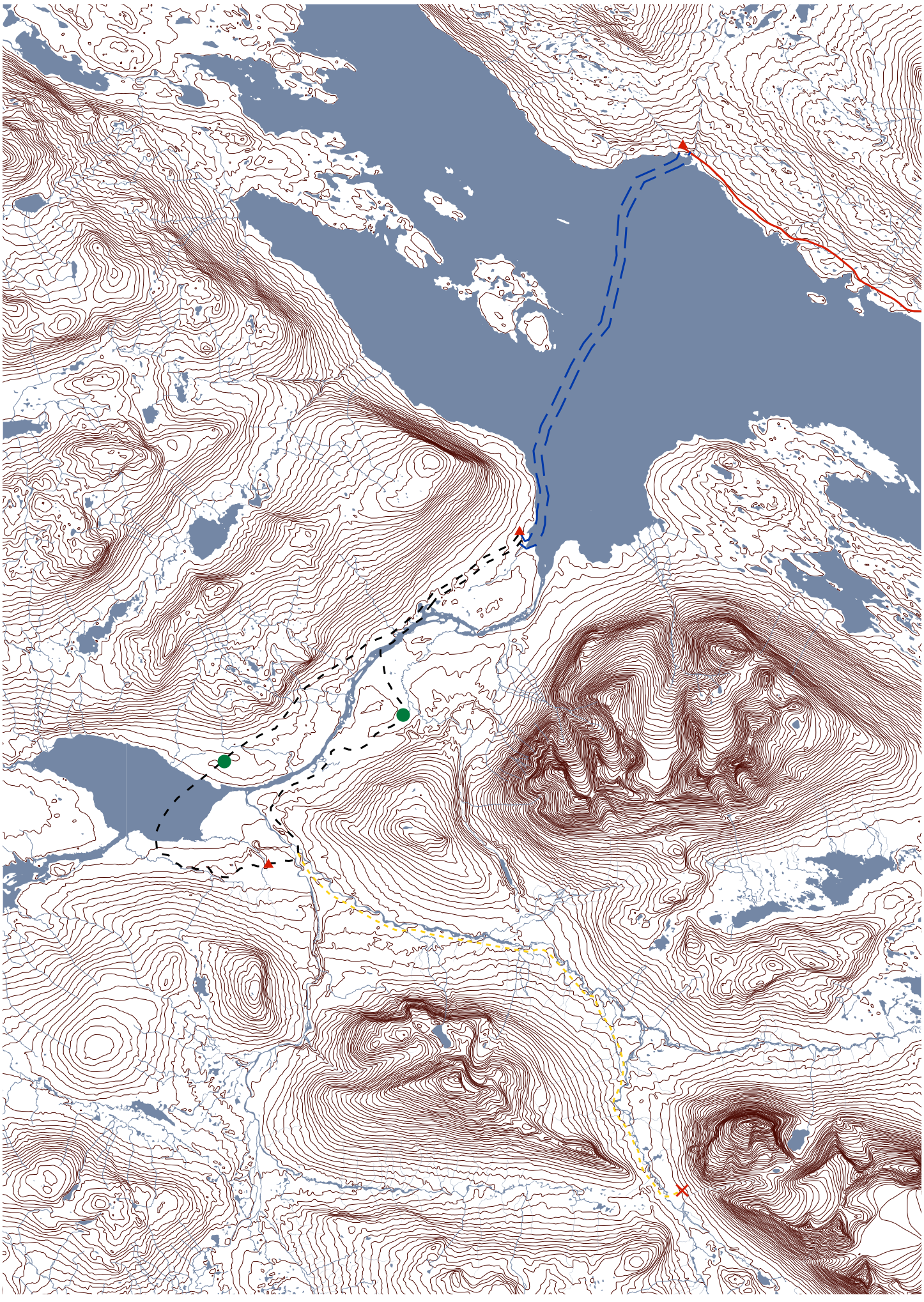
Exterior.

Interior.

After lunch, we continued in the comfortable weather solely in undergarments. Next up came another valley similar to the one just before the Kisuris cabins. Cursing and fighting through it, the challenge became overwhelming for my stepfather, pulling double of what I was carrying. After a long exhausting recap, a mutual agreement to return was determined, based on the delays, the weight carried, the unpredictable weather, the uncertain interpretation of the map, and our overestimation of our ability.

We continued along the summer trail but avoided the ridge it followed. As we set camp on a mire, the temperature dropped fast. When we woke up the following morning, we estimated the temperature to an impressive -15 degrees. The sky was clear, and as we started to move down the river, the temperature rose. This was the first day we saw the lonely massif of Áhkká (Lule Sami for "old woman"), tall and beautiful.

To make good use of the failed adventure, I contacted Sami president Mikael Kuhmunen and scheduled a visit for the upcoming day.



Experienced route. The expected route in yellow, snow mobile ride in blue, cabins in red, stayover in green.

AREAL VISITS

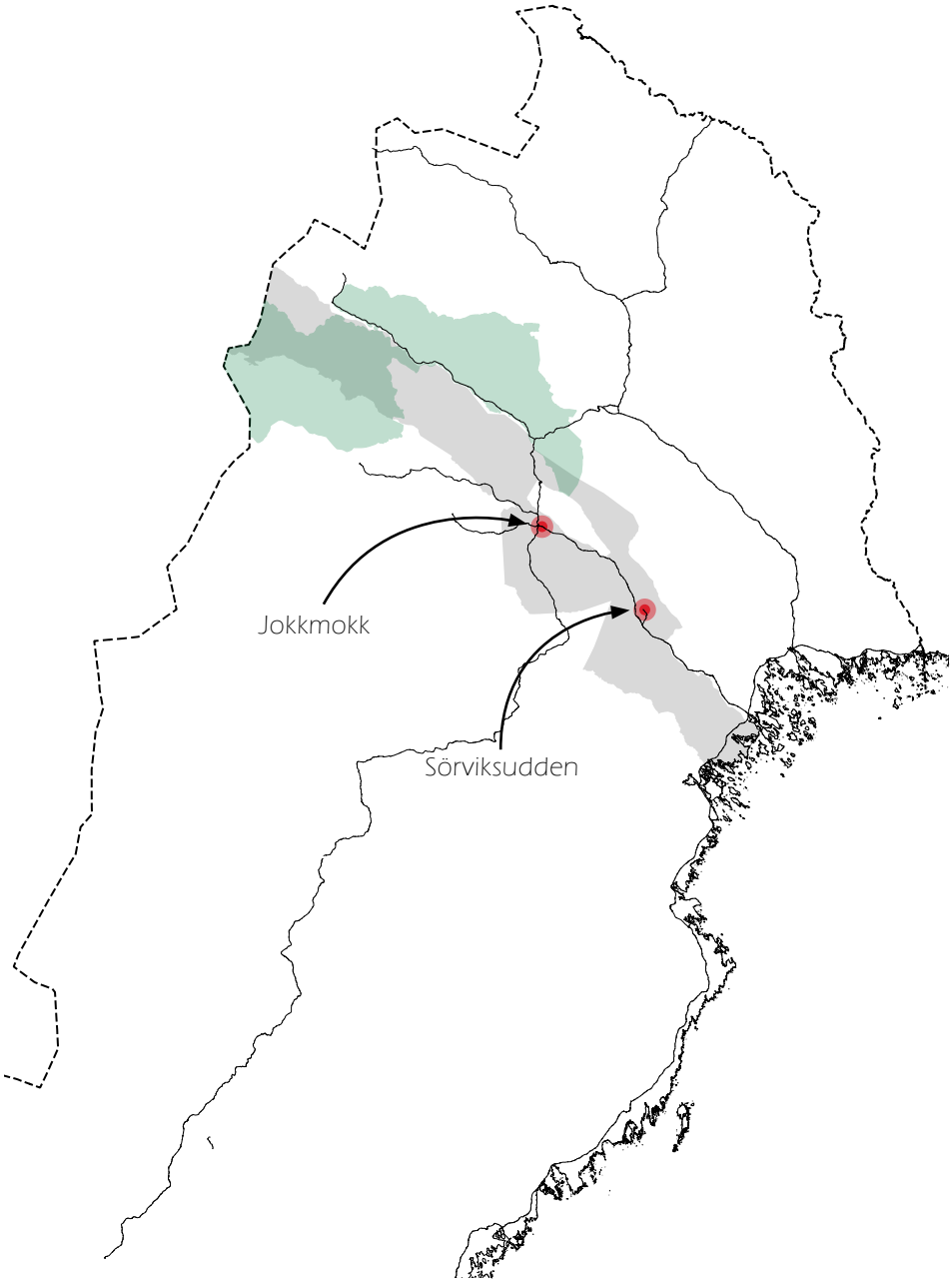
The following day we rented a car and left for Harads and Jokkmokk, a journey of 180km, a considered close distance up here. The day's task was to meet Mikael to learn more about reindeer herding, what they do, where they go, how the reindeer behaves, and how they use their cabins.

While in Jokkmokk, the Sami center was unfortunately closed, but the bordering restaurant was open. The famous Sami dish Suovas smoked reindeer with mashed potatoes and lingonberries. While there, I contacted the museum by phone and scheduled a visit the following day.

Driving down south-southeast, passing the Lule river multiple times, watching it produce electricity for most Swedes living in the far south. The regulated river has heavily affected the Sami people's landscape, which is evident while driving on road 97.

Reaching Harads, the scheduled meeting with Mikael Kuhmunen was carried out outside on his driveway to one of his reindeer herding company's facilities. Obviously stressed, Mikael spoke about the reindeer, their behavior, needs, and challenges. In the forest behind him was around 2000 reindeer roaming just a few weeks before the annual migration to Laponia and the summerlands. Mikael told us that they tend to move the reindeer by truck to avoid dangerous road crossings and lack of pasture along the route. But this year had been a "normal" winter with consistent cold temperature and a decent amount of snow, so the grazing would sustain the reindeer enough for them to make the migration by foot.

Consistently called up by either his colleague or his father, Mikael invited us to visit the nearby cabin that the colleague Lars Nutti was based on four days a week.



Places visited when plans changed.

Sörviksudden reindeer herder's cabin.

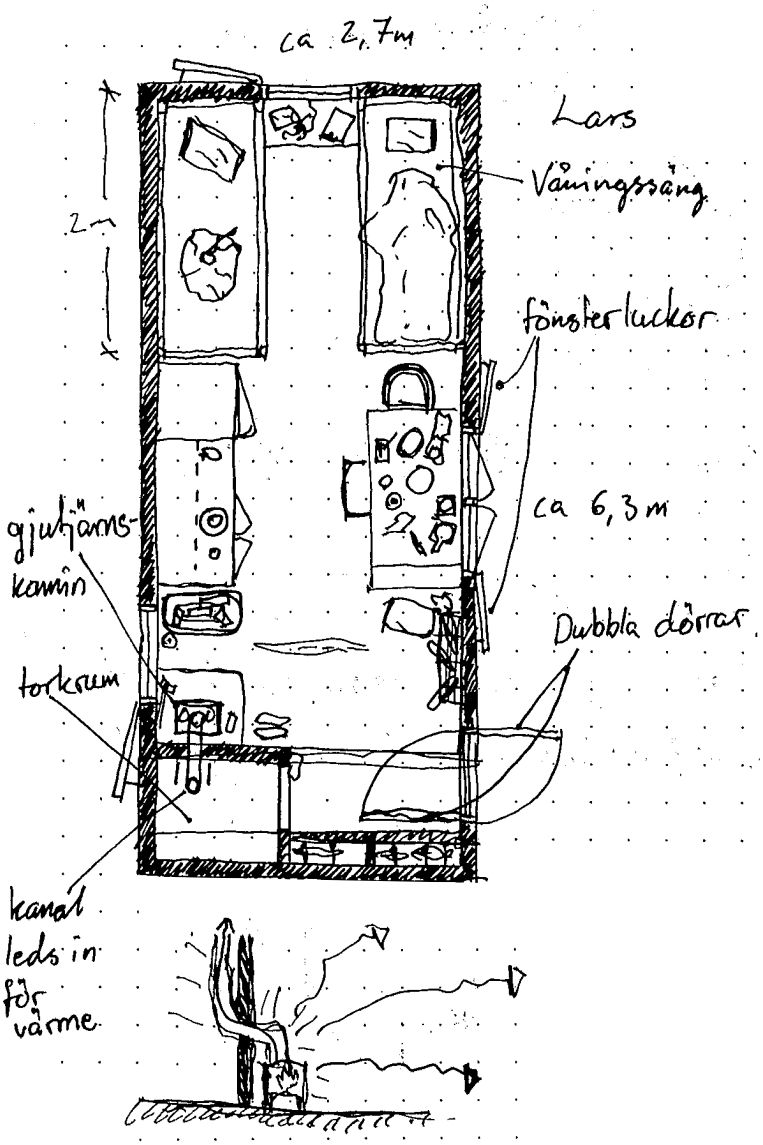
Lars Nutti offered dried reindeer and sandwiches.

The "cabin" had for sure seen its better days. It was practically a house on a trailer, but Lars Nutti was happy and enjoyed its simplicity. Hi explained that reindeer herding is a lifestyle, a rough lifestyle that you do not get rich from. But it involves freedom and involvement with nature.

After two cups of coffee and some hand-carved dried reindeer meat, we had a look around more in detail, and I carried out a brief analysis of the cabin:

The entrance is immediate and reaches every other space. A cabinet hides next to the door for hanging clothes. A small room for drying wet clothes is situated in the corner, heated by the wood stove via the stove's flue. The furnace is easily reached from the entrance, radiating towards the kitchen and bed area. The cabin has three windows on three walls and is powered by an external gasoline generator. It was furnished with bunk beds, a table, chairs, stools, kitchen modules, wardrobes. Lars said that usually, he and his son stayed there. They had bunk beds instead of single beds because it is good to have something to put your things on, and if another colleague has to stay over, there is space.

This cabin was significantly different from the Kisuris cabins. There was no porch, no assigned place for washing. The layout was generally different and more petite. However, space was much more efficiently planned. Windows towards three directions allowed for good lighting, and the tight design allowed for easy access to necessities straight from the entrance. The fact that the cabin was on wheels achieved something that goes well with the Sami culture of mobility and nomadic lifestyle.



Plan sketch and wood stove. Scale 1:50

Jötul wood stove with a hob.

Flue heating the drying room.

Interior.

A scheduled visit to the Sami Centre Ájtte proved to be valuable and educational. The exhibitions are quite permanent, as I remember many of them from a prior visit five years earlier.

The first thing to encounter is the full-scale lavvu. As earlier stated, the lavvu is more flexible than the goahti and can be moved from site to site, like a tent. This is impressive to see the structural elements of this, as no nails are used, and the wooden poles are cut entirely by an ax. When the nails became common, it got easier to build a savvy or a goahti to such an extent that the inconvenience to bring it wherever overpowered the inconvenience to cut another structure.

Ájtte focuses a lot on the Sami community as it was, including the social structure. There was never a Sami "king" or "earl", but the communities (siita) were based on several families living together through the seasons. Some siitas consisted of multiple permanent buildings of different characters for different uses. The goahtis, the home, ájttes, the tool shed, and njallas, the food storage, among others. The families cooperated in many daily duties, but they rarely shared food or accommodation.

The Sami also center has a beautiful collection of Sami formal dress, the gákti. They are all comparably similar, with a few variations, but the pattern is the most distinct feature to distinguish a dress from another. Every area has its designs, and every family has its interpretation of it. Colors are blue, red, green, and yellow, which are also featured in the Sapmi flag. Jewelry is mostly silver, which has a substantial symbolic value among the Sami.

Lavvu, traditiona nomadic tent

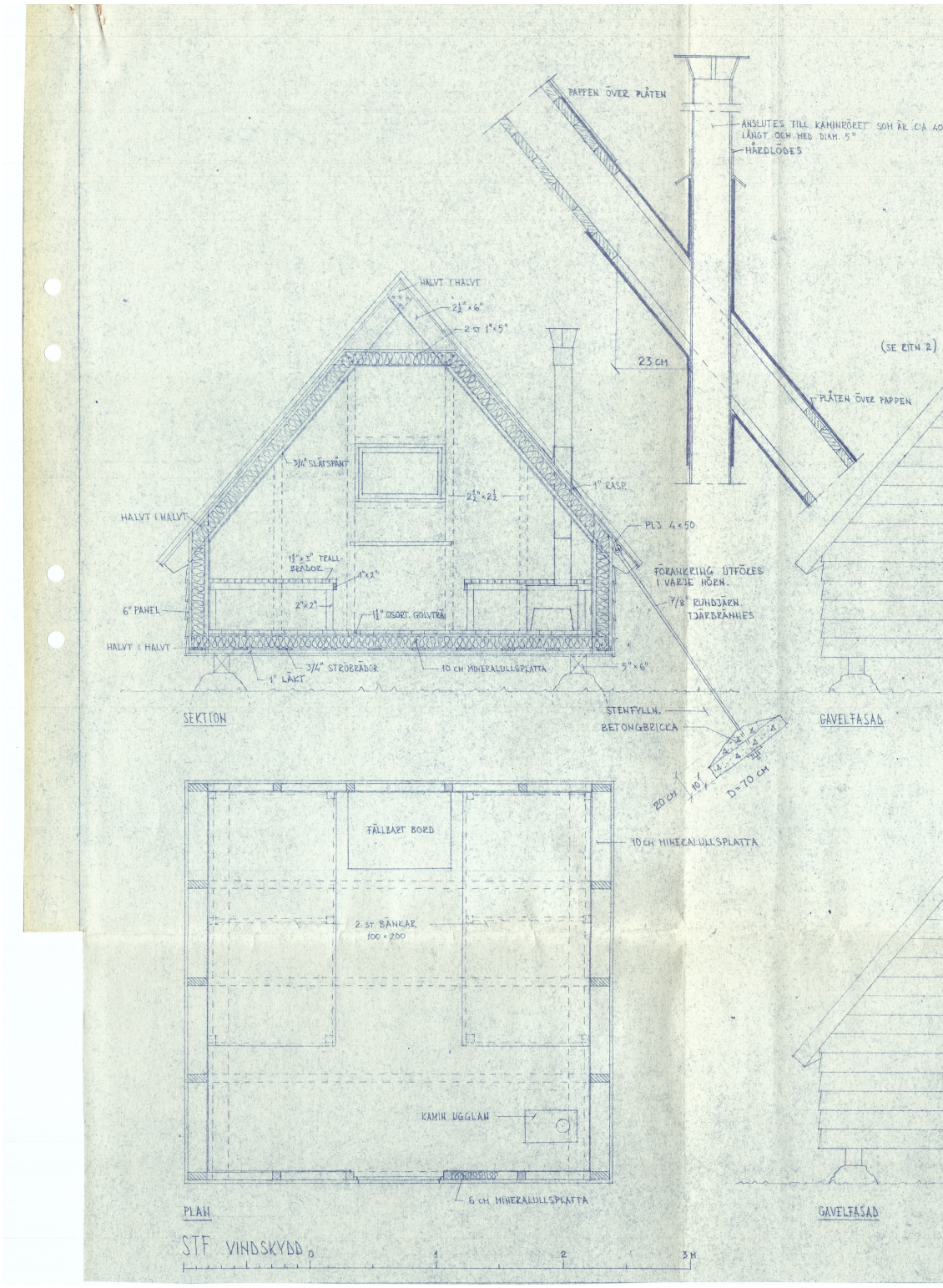
Detail of the lavvu.

Model of a permanent seasonal camp, siita.

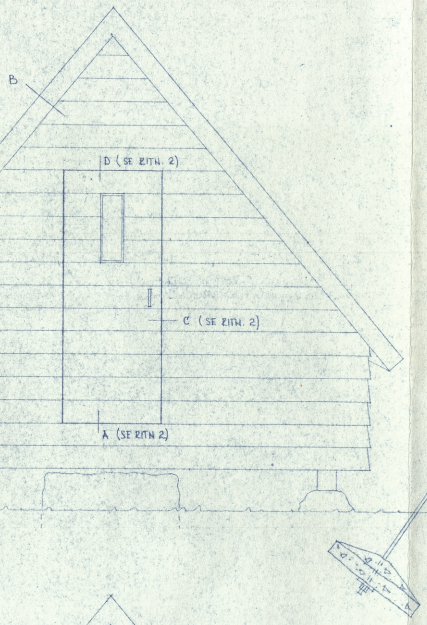
Traditional Sami costume for Jokkmokk area.

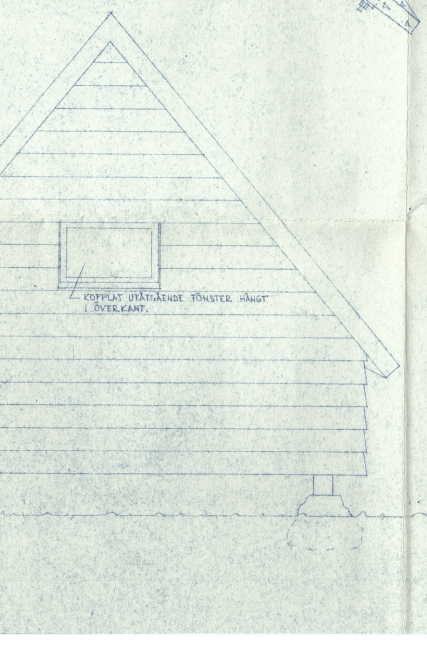
Case Studies

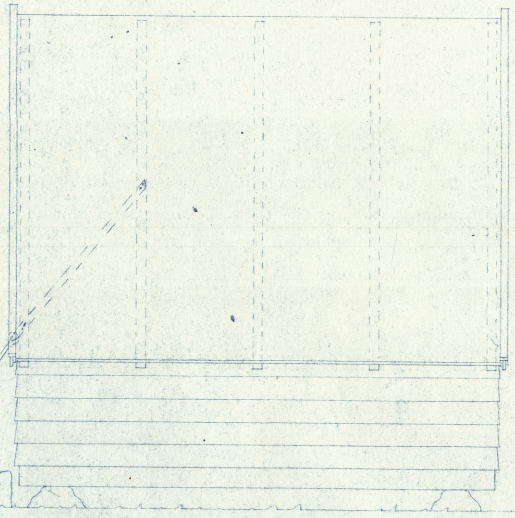
Shelters and Kebnekaise Toppstuga



Cabin designed in 1960. Same design used even today,







SIDOFASAD

ALLT TRÄVIRKE SKALL VARA FRISKT OCH VÄL LUFTTORKAT SAMT STRYKAS 2 GGR. MED TRÄKONSERVERINGSMEDEL. SITT OCH LIGGBÄNKARNA OLJAS OCH STRYKES 2 GGR. MED BÅTFERNISSA.

RITNINGEN VISAR:

HUVUDFÖRSLAGET MED ISSOLERING AV MINERALULLSPLATTOR

ALT. I LIKA HUVUDFÖRSLAGET MEN MED LÄNGDEN 6 M 4 ST BÄNKAR

ALT. II LIKA HUVUDFÖRSLAGET MEN UTAN VÄRMEISSOLERING OCH UTAN INVÄNDIG VÄGG- OCH TAKBEKLÄDNAD

ALT III LIKA ALTERNATIV I MEN UTAN VÄRMEISSOLERING OCH INVÄNDIG VÄGG- OCH TAKBEKLÄDNAD

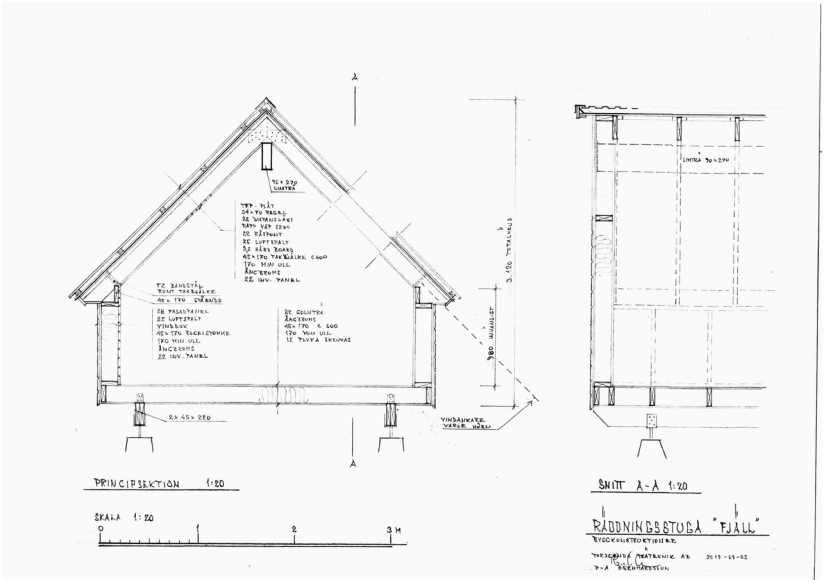
ERNST AUBY
ARKITEKT S A R
19.1.-60 2.T.

Current cabins of the Swedish nature are either managed by STF or the country administrative boards. I spoke to the cabin responsible at STF, Johan Påve, who sent me the drawing of the original cabin model designed in 1960. The design is still used today (with some adjustments), with the most recent example in Unna Reaiddávággi in the Kiruna mountains.

These cabins are built-in wall modules for fast erection and efficient transport. In theory, they could also be flown in by helicopter, but STF is funded by the public, and their economy does not have room for higher expenses. The cabins are tiny, around 10 sqm, and very simple, much more straightforward than the herder cabins. They consist of a basic entrance with hangers, a direct wood stove on the side, two beds without a mattress, a table attached to the short wall, and a small window.

Another example is the Västerbotten county administrative board's cabin. Johan Lindberg explained that they had learned from experience that a vestibule is of immense importance off-grid. When a storm comes, and you are in a rush to find shelter, you do not want to find a cabin with the door left open or broken. It is good to have that transition space. Afar from that, the cabins are pretty similar.

Cabin in Västerbotten.



Section for a standard cabin used by the County administrative board Västerbotten.

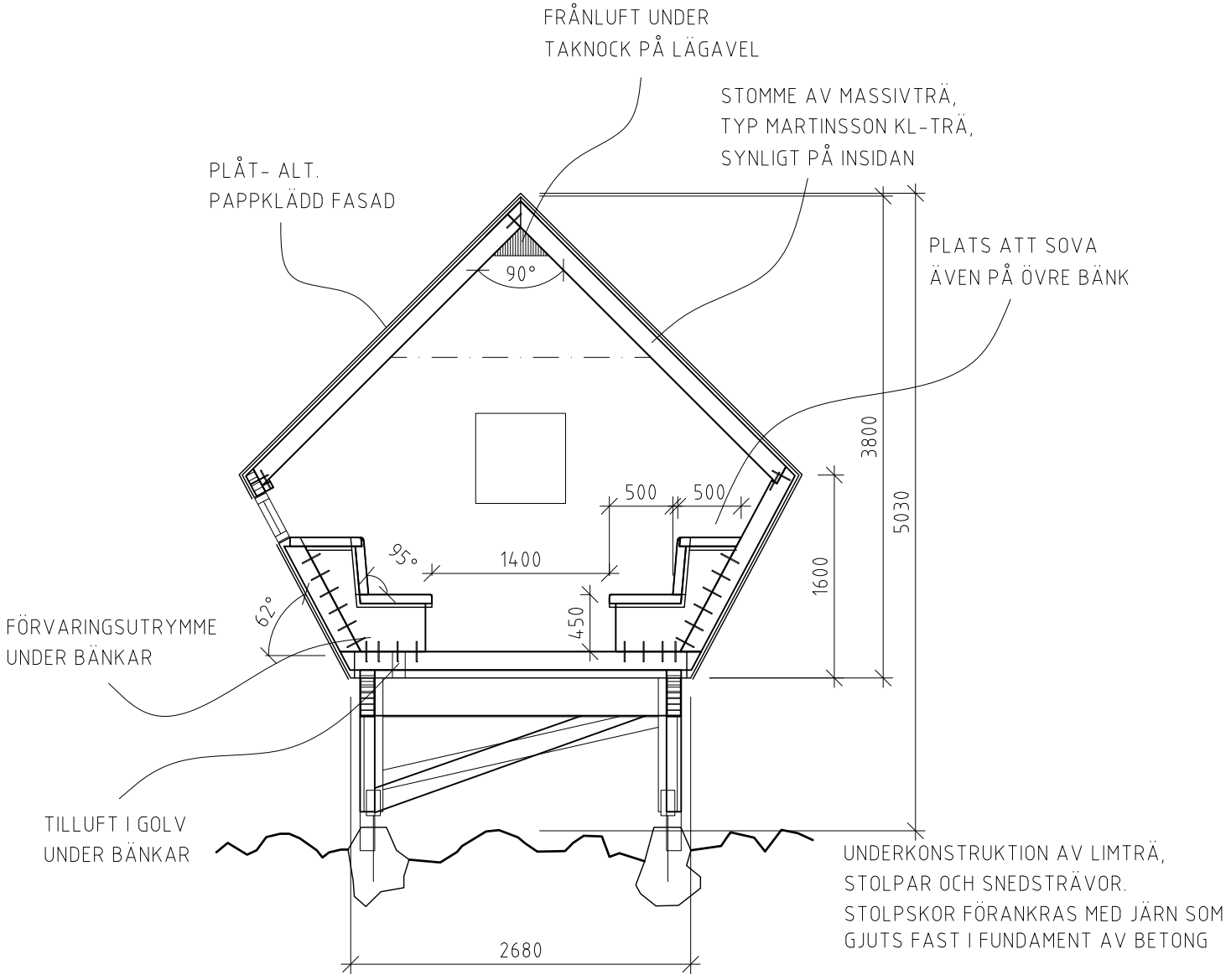
Murman arkitekter got the noble task in 2014 to design a new safety cabin on Sweden's tallest mountain, Kebnekaise. The client was a cooperative consisting of STF, Swedish outdoor company Naturkompaniet, and the Norrbotten county administrative board. The cabin was designed to be as simple as possible, yet the construction came to break a whopping 4 000 000 kr, with a material cost of a more modest 360 000 kr. The reason for the insane final price was the location, a rocky site 2 000 meters above the sea, without the possibility to set camp. Material and construction workers had to be transported by helicopter, and in case of bad weather, the staff had to go down by helicopter. The closest bed is in the mountain station, 1 300 meters vertical distance.

Murman's design is a simple extruded pentagon (which the architect claims repel snow) made of CLT elements, clad with wood. It is elevated from the ground, preventing snow from piling up on the facade. Ventilation comes in from under the fixed benches and exits from the top of the short edge wall. There is a vestibule, an exterior wind shelter seating, a latrine, benches, and a stone board to put hot skillets.

The choice of CLT elements makes construction relatively easy. They ensure an air-tight shelter that still maintains the heat good enough for appropriately dressed hikers to feel comfortable, something crucial considering the lack of an external heat source. A common problem in other cabins was vandalism and dismantling of interior and exterior planks for firewood. CLT boards prevent that from happening.

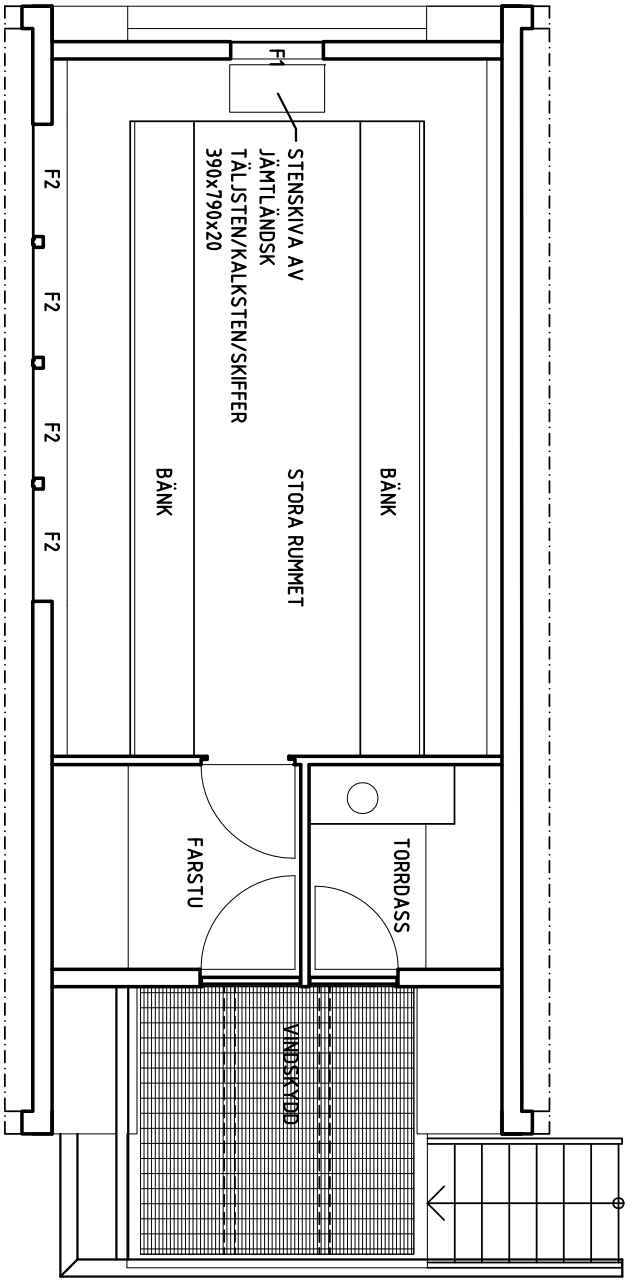
One of the downsides of the design is the latrine. No real plan for the management is proposed and becomes, therefore, a waste of space.

Another issue would then be the short edges, where snow tends to pile up.



Section displaying fundamental adaptation to the cabins location. Courtesy to Murman Arkitekter.

Kebnekaise Toppstuga constructed. Courtesy to Murman Arkitekter.



Plan view of the cabin. Courtesy to Murman Arkitekter.

The Goahti

There are not many books about Sami architecture, Sami building code, or even indigenous architecture. Norwegian architect and Sami researcher Joar Nango noted this and decided to collect inspirational books on the theme. The result is a nomadic library that he calls Girjegumpi, which hosts volumes strongly related to the subject and "travels" to new cities worldwide to spread the word about what indigenous architecture is in general and what Sami architecture is in particular. His library went virtual on January 30, 2021, and it helped me get inspired.

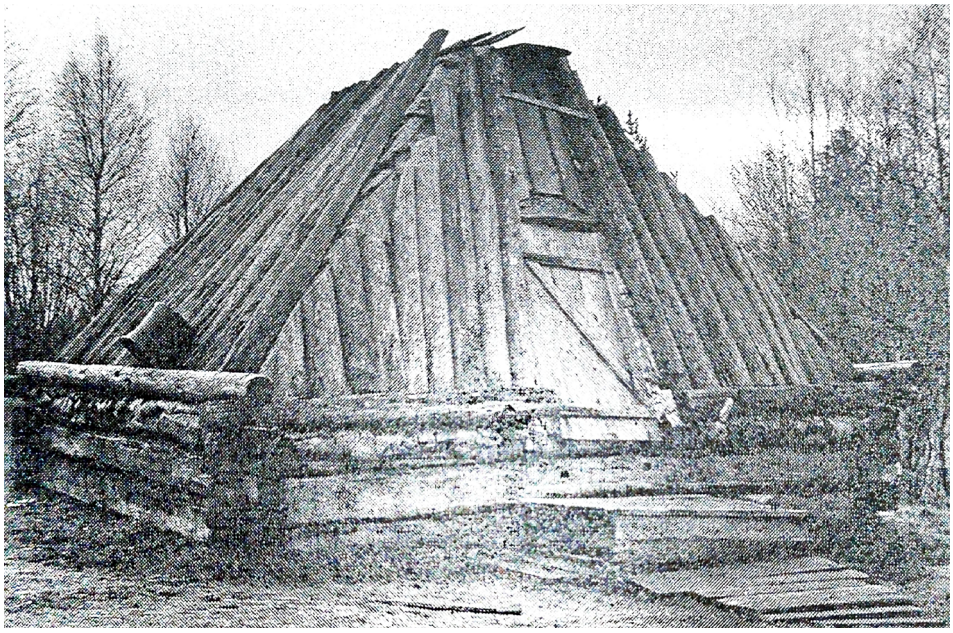
Through other people, books, and communities, I realized that the Ájtte Sami center in Jokkmokk possessed most of the descriptions and documents related to Sami architecture and structures. Through interviews carried out by antiquarian Yngve Ryd, all possible detail about the goahti was found.

One of them is all the ventilation procedures. From holes either through the wood or under the walls enter the air, rising through the riehpen, the rectangular smoke hole in the center. The riehpen also works as the chimney from the fire. If the opening is not rectangular, the smoke will fill the goahti instead of escaping it.

The square foundation allowed for a stable structure in all directions. As a consequence of its height, the door became elevated as well. A minor inconvenience, but it kept snow outside. A small gutter above the door guided the rain away from entering the goahti. The floor was the ground underneath, plus a rocky center for the fire.

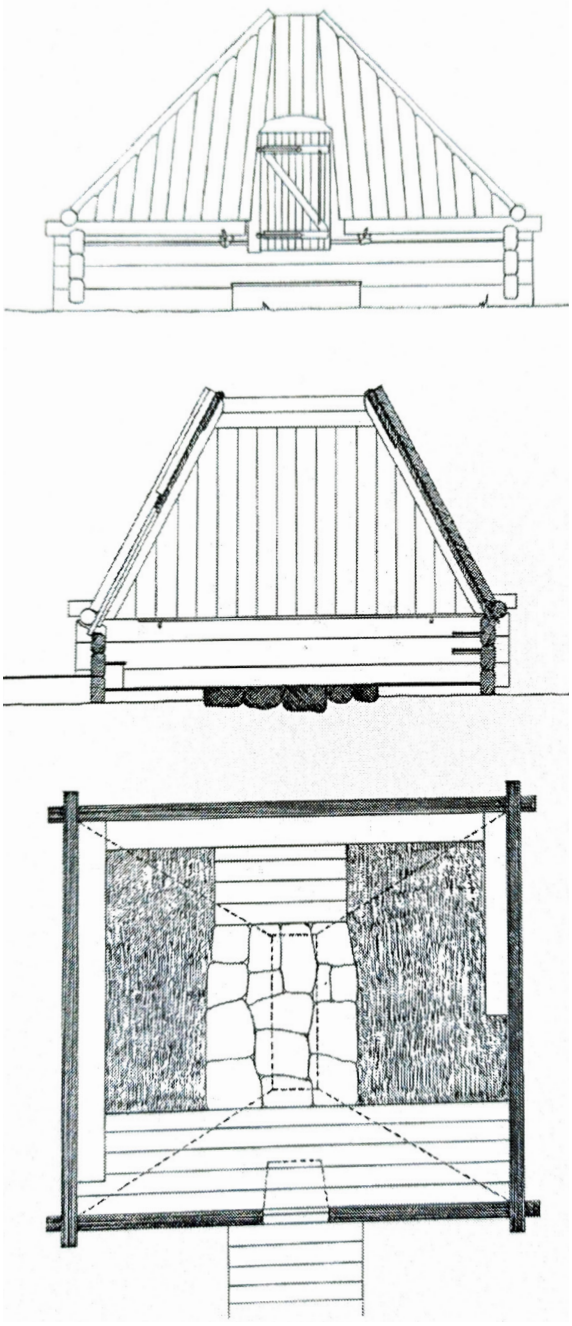
Goahtis was built in layers. The inner layer consisted of peeled timber logs, some bent for better load-bearing capacity, like above the door. On the logs, sheets of birch bark were placed, working as a water repellant. Holes were stuffed with moss before split logs covered the goahti and kept the birch bark in place.

Today's goahti has not the same touch as the old times. The last traditional goahtis very built in the '90s but saw a fast decline in the '50-'60s when the Sami started to look beyond the reindeer and look for employment in the mines. Recent goahti's similarities with the old one end'50-'60s with the shape and plan. They are instead constructed by wall blocks and fast assembled on site. The door has its own roof, the floor is wooden, the fire is replaced by a wood stove, and the whole cabin sits on concrete blocks.

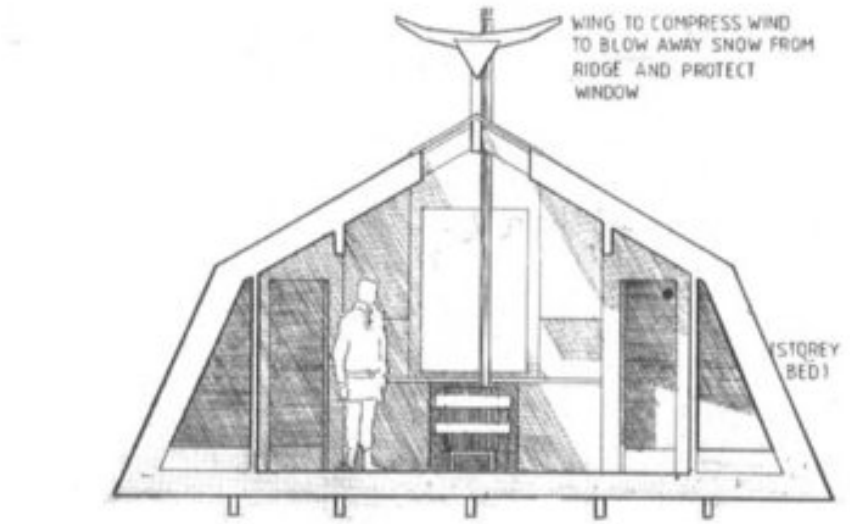


Timber goahti in Strömudden, Arvidsjaur.

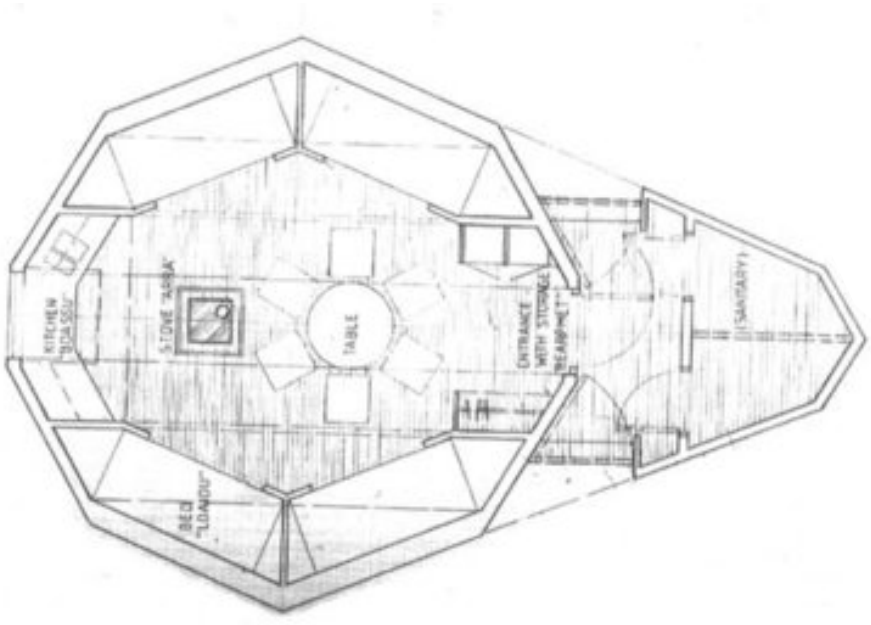
The riehpen replaced with a chimney. Ruotesvagge, Sarek National Park.



A traditional goahti's structure. Elevation, section and plan.



Modern goahti interpretention. Courtesy to Lars Sundström.



Modern goahti interpretention. Courtesy to Lars Sundström.

The Hamberg cabins

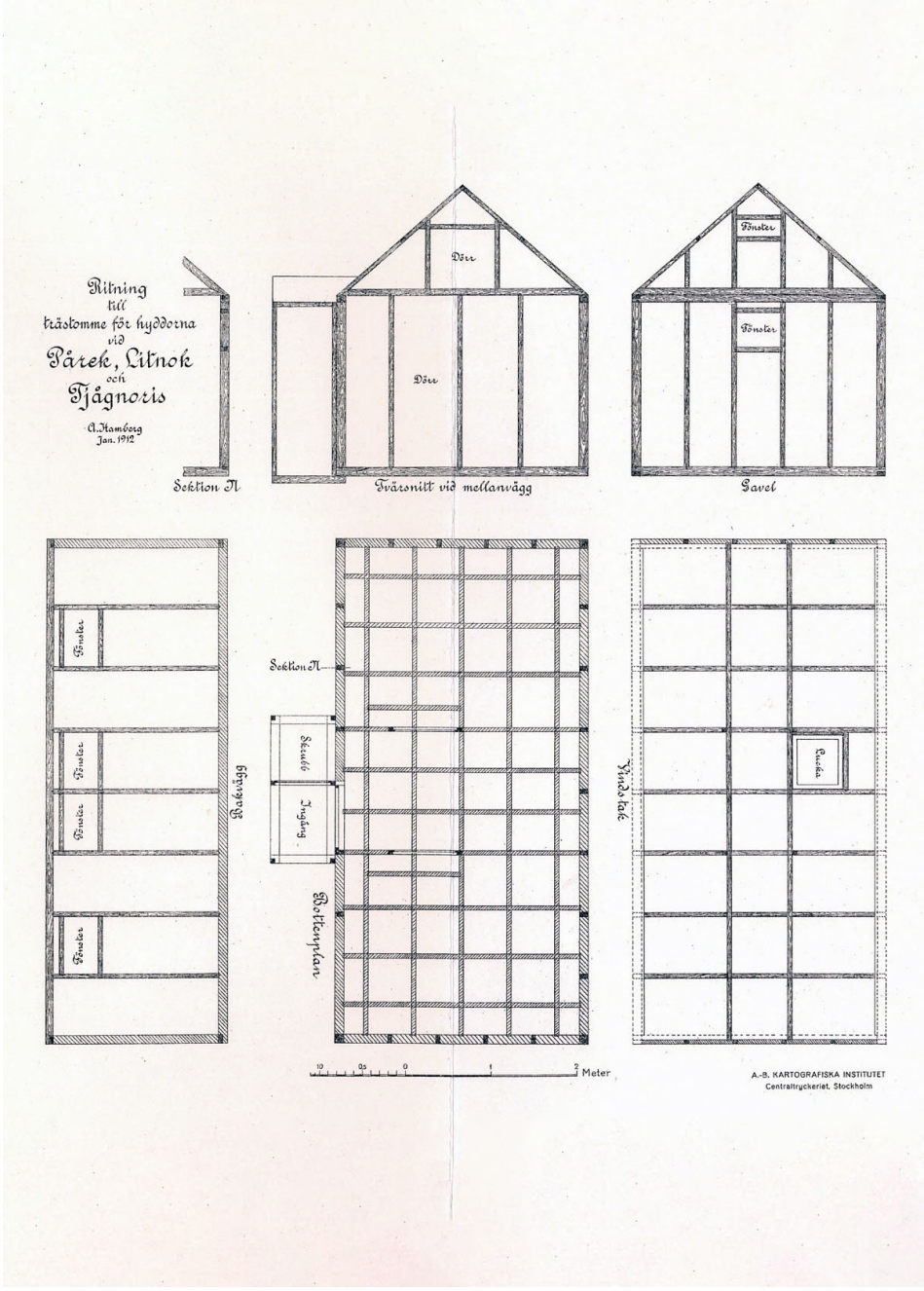
Axel Hamberg erected five cabins at the beginning of the 20th century in the name of science. The cabins in Pårek,/Boarek, Litnok, and Tjågnoris/Tjåggnjoris where all the same, while Skårkis/Skoarkki was larger and Pårtetjåkkå/Boardetjåhkå was better adapted to exposed winds.

They all have a stone foundation with a wooden structure on top. Thanks to the engineering behind the construction, the weight was kept as low as 2 600 kg (Pårek cabin), including 90 kg of cotton insulation. A typical weight for that size of building at the time was more than three times as high. On Pårtetjåkkå, the exterior walls are 100 mm thick and interior walls 50 mm. The other cabins have even thinner walls due to their location in the lush valleys where the winds are weaker. Galvanised metal sheets clad the walls, which also were dimensioned for the standard sheet dimensions at the time. Hamberg felt that the cabins did not display a "homey" feel with bare metal and painted them red, possibly resembling a traditional Swedish home.

The red metal cladding defines the built environment in Sarek. While Sami structures tend to be more united with nature, Hamberg's charismatic cabins own their ground without stealing attention from the landscape. Even if the cladding is more expansive than wood and does require some maintenance like painting, they have sustained the cabins for more than 100 years, making it a cheaper material long-term. The tiny windows are covered by wooden shutters of the same red color when unmanned.

In 1967, the Tjågnoris/Tjåggnjoris cabin was dismantled and transported to Jokkmokk and Ájtte's Alpine garden for an exhibition. It was later demolished, and a copy was instead built in the same park that is open for public visits. The rest of Hamberg's cabins has been locked for some time but have been sporadically used by scientific researchers now and then for the excellent part of the 100 years since their erection. In 2017 the Laponiatjuottjudus decided to have an "open house" a few days every year when the public can visit.

Pårtetjåkkå/Boardetjåhkå on a clear day, 1 830 meters above sea level.



Drawings of the Pårek,/Boarek, Litnok, and Tjågnoris/Tjåggnjoris cabins.

The Skårkis/Skoarkki cabin in the midst of the Rapa valley.

PART 2

Design Process

Design Development

Prior Interviews

As one of the most significant contributors to my design decisions, I feel a need to present and dissect the dialogues through phone calls to give an understanding of their importance. Already before the conversations presented on the following few pages, Some other, less relevant to the project outcome, yet valuable but challenging to explain vividly, was also conducted. They include calls to STF cabin responsible Johan Påve as well as the mountain rescue service and some county administrative board representatives. The interviews/dialogues are presented here as monologues with critical comments to keep it qualitative.

The interviews started comprehensive and have developed into relatively frequent conversations with a few vital people due to the project's location, especially since I failed to reach the site and document it according to my own needs. But starting with calling Johan Påve directed me towards the laws, regulations, and Sami people's right to influence.

Trying to reach any Sami representative, seemed to be very hard at first. I had to call at the right time for them even to pick up the phone, and then the answer was usually short and fierce. Later, I found out that I called at the wrong time, around lunch, when I thought most people had lunch. But reindeer herding is a job without natural breaks, and the work is done when the weather tells you that it is done. Usually, afternoons were a good time.

I also had to ask the right questions to create a conversation. It simply did not happen naturally, and I suppose I only had myself to blame for that. Questions that were engaging and allowed for some storytelling rather than the standard flat yes/no questionnaire sparked something in the people I spoke to, and they spoke freely about their problems and opportunities with tourism.

22/2

Representative for Laevas Sami village

"The King's trail becomes like a living fence for us during the summer months... During the winter we are 200 km east of Kiruna so it is only the summer months that are a problem for us."

"How the reindeer move depends entirely on the weather: hot summers they are higher up and come down at night, cold summers are they mostly in the valleys. Due to climate change, we are forced to spend a lot of time in the mountains even during the winters."

"Most tourists have respect and stay away... but this summer some came with zero control, who carried out their needs here and there, leaving rubbish and going into reindeer herders' cabins and generally see the mountains as a playground."

"Reindeer herding is conducted in the same way as before, the same land and the same behavior of the reindeer. The biggest difference is using motor vehicles instead of skis and on foot."

"The cabins up in the mountains, private and storage. We transport as much as possible in the spring on a scooter. Then it's goods, petrol, yes everything that can be stored for a longer period. We then take the rest by helicopter, so we live in the mountains all July."

"Then we have the Sami village's common reindeer herder's cabins. There we have storage where we have both wood and fuel, LPG."

"In general, we have seen that it is very difficult to combine tourism with reindeer herding. On the one hand, the cabin must be open to tourists and then stuff is left in the cabin. Then you come to the question of who should maintain it, make sure there is firewood, LPG, and so on."

"Common facilities rarely work."

"We who are up there have two reindeer herder's cabin on each side of The Mårma cabin at intervals of ten kilometers."

"Sometimes you can stop for a bit and rest and drink a cup of coffee and drive on to the reindeer herder's cabins."

"The reindeer usually cross the rapids at the wind shelter... otherwise the rapids will become wilder further down and then the reindeer cannot cross."

10/2

Communicator at Laponiatjuottjudus

"The general opinion in Laponia is that tourists do NOT disturb."

"The cabins in Laponia are connected to the summer settlements, where people gather in the same place and dwell respectively."

"The reindeer go west in the spring and early summer... the animals of wind and move towards the wind... if it blows from the west they go west... especially in the early summer, they move past areas where there are people '... in the summer they stand most still where they are... in the autumn it blows from the east and they go back."

"Calving time is sensitive and has become extra sensitive with climate change as the calf may have difficulty getting hold of grazing."

"Place reindeer herder's cabins where the reindeer usually move... the reindeer is a habit animal and usually goes the same way... near a creek that has flowing water even in the summer."

"A reindeer herder's cabin is something you do not live in permanently. They are perhaps most easily compared to a rest cabin or a simpler mountain cabin."

"It is political... the Sami do not want to share space with tourism in too many places... they already share so much with the tourists that a combined reindeer herder's cabin/rest cabin can be difficult to implement in practice."

"Contact the Sami villages directly '... maybe the Sami villages differ from each other in their view of your idea."

12/2

Photo/tourist guide Nikkaluokta

"Mårmadalen has no popular currents, as it is a bit remote and thus it does not disturb reindeer herding very much."

"What mainly disturbs is the snowmobile traffic... the disturbing-distance varies with the reindeer's cycle... early in the winter the reindeer have not seen any snowmobiles in six months, then the snowmobiles disturb at a long-distance... if you talk about March / April, the females are very pregnant and if they start running crazy, they can drop the calves. They then need grazing peace .."

"If you know where the reindeer

22/2

Representative for Gabna Sami village

"When we meet hikers, the reindeer disperse, they do... If there are problems, it depends on where you encounter them. If it is a critical point, there can be huge problems, such as a difficult passage."

"The rest cabins are located in the places that should not adversely affect reindeer herding."

"It is clear that it would be possible to use the rest cabins. If you are there in the area and working, they could be used to live before you travel home."

"It would certainly have been possible to socialize with tourists during the same period."

22/2

Mikael Kuhmunen

President Sirges Sami village

"There are no rest cabins for hikers in Sarek. There are reindeer herder's cabin but not rest cabins. This is because there should probably not be rest cabins in national parks."

"We have a reindeer herder's cabin that has been mistaken for rest cabins. It has happened that there are people who have broken in and slept there. It's less pleasant, but it only happens once in a while. Most often, hikers probably feel greater discomfort and shame than us."

"You should have real clothes! If you imagine my wardrobe... outdoor clothing, clothes to be outside, several changes."

"Then you should have a good and caring woman who can fix and wash clothes."

"You need a lasso... It's starting to disappear more and more but... it's an art, lasso... A lasso you swing, you do not throw a lasso. The reindeer herders who say they throw a lasso are not reindeer herders."

"The reindeer need grazing land, especially untouched... the threat to the grazing land is forestry, new inventions such as dog sledding, snowmobiling that has started to become a scourge in recent years, tourism and mines, the very expansion of society... it takes up so much land and forestry is splitting up our pastures... in today's situation it has almost become, as a result of climate change... those who deny climate change are the same as throwing lassos, they are not reindeer herders."

"Everything is possible... we have rest cabins along the Padjelanta trail are and that you care to find out, there are no problems."

"It's not just the reindeer but in May and June the mountains are nurseries for all animals."

"If you ski, you have no significant impact on the reindeer. Then you travel slowly for a long time, and then the reindeer have time to pull away when they see and hear you."

"We try to zone the area... the most critical thing is when the reindeer come back from the winter pasture and up on the mountain... in the winter they are always affected by, they are not in their best shape, the sows are pregnant... do not disturb the reindeer then."

"It is not possible to combine a reindeer herder's cabin with a rest cabin because visitors do not manage the open rest cabins along Kungsleden. You fire up the interior; you do not clean up after yourself; you leave beer cans and liquor bottles. There are probably a few, but it does not matter. It spills over to everyone.

"A reindeer herder's cabin is a workplace. Don't you want me to come to your workplace and use everything there just because I'm a visitor? Reindeer herding is a job and it must not be forgotten."

"It had not gone with two different entrances either. People out in the mountains are pretty disgusting. They poop behind the knot instead of pooping 100 meters behind the stone. Houses attract pooping people.

"If there is a privy, someone needs to take care of it. Garbage also needs to be taken care of. Should that job be put on the reindeer herders? Nor is it the task of reindeer herders to ensure that there is firewood and LPG."

15/2

Marit Sarri

Site manager STF Kebnekaise

"Mårmastugan is not in the best condition. It is absolutely in need of renovation. The door had to be repaired. Holds together with the help of temporary, temporary solutions."

"The reindeer herder's cabin are used in the reindeer herders' work."

"Reindeer herders do not always use the cabins, they have their cabins."

"You should talk to the reindeer herders themselves, it would be a mess if I answered that."

and we usually use them during the reindeer herding work... and I usually do it during the time that the tourists have disappeared and in that way it is possible to combine... the parts that it is possible to combine while the tourists are there as well, but there will be uncertainty from both sides when you come during reindeer herding work, then you assume that you will have space. Of course, it is possible but then it applies to get a place... it is unfortunate if someone has to move regardless of whether it is a reindeer herder or a hiker... so it may not be that successful... but of course, everything goes according to space."

"Most reindeer herders have a dog with them. And then there are the mountain hikers who are allergic to dogs, but there are also a few reindeer herders who are allergic, including me. But I'm not allergic to my dog, strangely enough."

"Well enough, it is possible to combine. It will probably be used in reindeer herding as well."

"Reindeer herder's cabin are placed in strategic places, where the reindeer are left. In places like this, we do not want hikers at all. The cabin itself is like a barrier and it is then full of people there so... so there I want to say no, it is not possible to combine inside the core areas in pleasant areas... but on the outskirts, along the hiking trails, the outskirts of dips / thrive / grazing area, but not in the middle of Sarek."

"The number of visitors to Sarek has steadily increased. Fresh numbers I saw said 7500 visitors in 2020. That makes it for us. In part, it was the gathering work of the reindeer that was made more difficult due to increased activity by hikers. So it's like a disturbance."

"We go on foot when we collect reindeer. I think we are the only ones in Sweden who do it in the mountains. There we are also extra sensitive to hikers because we travel on equal terms. Had we used motor vehicles, we would have been less sensitive to hikers because then, if the reindeer turns around, we will have time to collect them and keep the herd together. The reindeer has four legs, we have two, so they pull at a higher pace for longer distances."

"At the same time, we have made a conscious choice. We can use motor vehicles but have chosen not to do so because we want to save nature, we see what value it has."

"The seasonal bridges are moved by helicopter because they are going out on the bare ground and over streams."

"The more extensive road network you have, the more stuff you need... you need a snowmobile to watch the reindeer... we need the latest because everyone else has the latest... we need to be on the same terms as the others... When other

22/2

Representative for Swedish Sami's National Association

"It may be wrong to call it a collision, however, there has been a fairly large increase in the number of people moving in the mountains... the problem is ignorance of the Sami and reindeer herding."

"The collisions that occur are about a lack of respect for the reindeer... photograph the reindeer and disperse them as you approach."

"Sensitive periods involve, among other things, calf marking."

"The vultures can shed their fetus to survive a threat during the spring and winter."

"The reindeer is a starving animal and starves through the winter."

"You must not have a dog lose in reindeer pastures."

"Many reindeer herders are tired of always having to talk about their needs, their culture, and so on."

"As much as possible should not be visible but it should blend in."

"One should be aware that one does not give one's architecture the typical, traditional Sami characteristics without having anchored it. It can be seen as an encroachment on the cultural heritage."

23/2

Representative for Jåhkågasska Sami village

"Have you talked to Henrik Micael at Laponiatjuottjudus? They can spend more time and resources than we can so talk to him."

"For us, we very rarely or in principle never experience any disturbances from hikers and skiers... we do not have that much of that product or any large quantities... major disturbances are often from motor vehicles, it can be snowmobiles that disturb you have reindeer up on the mountain, especially early in the November-December season before we have taken the reindeer down from the mountain."

"Helicopter to some extent if there

actors started using snowmobiles, they made tracks that the reindeer began to follow. We had no choice but to get a snowmobile."

"In general, we have a great need for machines and communication equipment."

"You do not need an espresso machine. A coffee pot is good enough."

"A power plant can be to have, but for that, you do not need an espresso machine."

"In the middle of Ultivis is a good place for a reindeer herder's cabin."

"A reindeer herder's cabin is maintained in the usual way, if it needs to be painted, it is painted. Train snow can be found everywhere, so a cabin must be tight. The cabins that are not used so often decay. Indoor puddles are formed that are not seen after and over the years the wood rots."

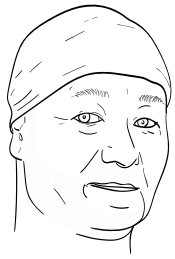
"Routesvagge is a reindeer herder's cabin that is dilapidated, so we need a new one there."

"I want as few tourists as possible. At the same time, it will not be possible to avoid a certain demand and then you have to choose to steer the tourists away from the reindeer industry.

"I could have imagined a place between Akka and Sarek."

"There is a rest cabin between Vaisaluokta and Kutjaure [Kårsåjaure]. There, in such cases, the cabin could be used by both hikers and reindeer herders. Reindeer herders had used it most outside the tourist season. There had been very little use during the summer."

4/3



Mikael Kuhmunen

President Sirges Sami village

"What is needed spatially is four walls and a door, windows and ceiling, a stove, a place to cook, beds, tables and maybe chairs. Then a place to hang clothes, a drying room."

"Dass and storage, it's actually... yes I was going to say that it's obvious."

"The drying room should be a separate room, where you pull through the chimney so it gets warm inside. And preferably that the chimney is encapsulated in something so it does not come into direct contact with clothes. There will be quite a lot of clothes in those spaces. There must be very good

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is traffic around a certain area. It is mostly flights in summer and autumn and then it is easy for the reindeer to find food so it does not do too much."

"Individuals can disturb if you are gathering the reindeer, but it is enough that they sit down so as not to disturb."

"It can be worse, like in the Kiruna mountains where they have competitions, races, and the Kungsleden."

"Yes, it would have been interesting with a combined cabin if you solve the need for resources in getting firewood and LPG there. If you from the Sami village's direction are to somehow keep that one going with firewood and LPG and at the same time keep an eye on the tourist, you will not have the strength and can not afford it in the long run... remove rubbish from there."

"But yes, I see no problem, more as an advantage if there is a rest cabin that can be used by us in reindeer herding... but we often use it at times when there are not so many tourists out..."

"There must be a stove, it almost must, so you can cook there and make coffee."

"If there is no heat source in the cabin, it will not be used by the Sami."

24/2

Henrik Micael Kuhmunen

Manager Laponiatjuottjudus

"What you say is quite interesting in the sense that, I belong to a Sami village and work in the administration, and there are quite a lot, many reindeer herder's cabin, in Jåhkågasska and Sirges, and there are for example reindeer herder's cabin in Sarek that are locked in the first hand, but now... there have been some problems, they may have mentioned, that people have entered. Then there is probably also that, there is a lot and many to keep track of and refurbish them. And some have just started... Some reindeer herders' houses have simply started to decay. Since then, the need has changed. Before you

ventilation in the drying room."

"The problem with reindeer herders' cabins is that some like heat, others do not like it. But you learn quite quickly to like heat when you have wet clothes because that is the only thing that matters to get them dry."

"It is difficult to solve a hot drying space that does not make it unbearable in the rest of the cabin. It almost has to be another heat source, but that creates problems in itself."

"A cabin costs quite a lot of money, the material costs well over SEK 2-300,000, but then you have transport."

"The bigger the cabin the better. I have had small cabins, but you should probably have at least 35 square meters. At the same time, the smaller it is, the faster it heats up, but that depends. The more it is used, the bigger it should be."

"You should have some leeway when you come in with snowy clothes, so you do not step on each other."

"You are probably about four when you are out working."

"What I was thinking when I said between Akka and Sarek was under Nijak."

"We have an old cabin in Ruotesvagge that the tourists have imagined is a rest cabin. And they can not lock it because it is always broken. It has become like the decline and it is not because we have used it but because mountain hikers have used it. And they leave badly behind. That is probably the experience we have. We use the cabins so little and we are afraid of them, but the public does not behave as well and they decay. And it is above all winter tourism. In the summer, the need is not as great. Those who enter Sarek get angry that the cabins are locked. They think they should be open to having somewhere to go."

"There are quite a lot of tourists here and there are good tent sites and so on, so then they have occupied the cabin."

"But we have moved our accommodation north under Nijak. It is a simpler cabin, only 2.2x2 meters, so really only a roof over your head if it rains. But there, two gangs gather that gather reindeer in the summer. A bunch from the south and a bunch from the east. So it's like a good strategic point for a cabin."

"The problem is that this is a national park and no permit will ever be given for this. BUT it had actually worked from our perspective. In any case, I do not think that the county administrative board would give any permission, and neither would Laponia. That is the concern."

"We do not want cabins in new places that attract tourists. We do not want any cabins for tourists,

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go, now you have a scooter and can go further."

"Many reindeer herder's cabins have existed since the 60s and 70s. So it has changed, but at the same time things can change back, so there is a need for these cabins... As you say, that reindeer herders' cabins are open and are actually used as wind protection, so the idea is not completely stupid .. then there are questions about how to take care of it, firewood and everything else, but that's another matter. They are already used today as wind protection so..."

"In Sarek, there are restrictions that you should not build so much. We have a bridge and a windbreak in Sarek, but that's it. In Padjelanta we have twelve cabin camps, and closer between them."

"It's an exciting thought, then it's like... Yeah... now it's your degree project and you're almost free about things. Then if it happens you should of course... that you have talked to the Sami village, it is very good, I mean we should also work. Reindeer herding is important to us, in natural and cultural heritage. I mean working against them and us. And I think the idea is also quite exciting in the way that it is possible to add money to the idea, then you can talk about placement later."

"Then there is the permit and everything else since then."

"Exciting with the idea of wind protection for tourists and reindeer herders, why not?"

"I know a reindeer herder's cabin in Ruotesvagge that is starting to get a little dilapidated."

"Most reindeer herder's cabins, at least the older ones, were built here in Jokkmokk by Blindfarsbygg (?), 4x4 meters, 1.5 meter high walls with pyramid roofs. In those cabins, there were four bunks along the walls. Stove in the middle of the cabin. Double doors. In the foyer, you could have firewood and stuff and let out heat. Then you also have so you can hang out in the hallway, store fuel, and so on. Then it should work that you are there a few pieces, eat food and sleep together. You can also have extra mattresses under the bunk beds in case that. In the summer you ran and lived in these. Then they should be quite stormproof. Sure they have lower walls, the old model. So it's something to keep in mind, that it should be stormproof. It was also important where the door was placed, that there was no snow in front of the door."

"If you also see round stones in nature, it turns, it's like there's no snow closest. The wind behaves in a certain way when it hits a rock or a building, turning and so on, something to think about in the winter. Most often it is westerly winds, it is normal, blowing mostly from the west. And plan a little after that. But this year it has blown more

especially not in undeveloped places. But at the same time, Sarek is actually relatively exploited in the valleys, it passes some tourists there .."

"But it would actually have been a good idea to have a cabin there under Nijak."

"We build where we want to build. We do not need to apply for a building permit, but there is a difference between a reindeer herder's cabin and a reindeer herder's home."

"A reindeer herder's cabin must not be larger than 20 square meters. The bigger ones are not really legal."

"But why should we not be allowed to live as big as we want? We are human beings too, we do not want to live cramped, so we do not care about that."

"It is true that it can be said that the cabin is used in reindeer herding in the first place to get around the regulations and avoid building permits. But if it turns out that tourists use the cabin, it should be demolished. And that is precisely why you need the county administrative board's permission. And I am absolutely convinced that they will never give permission for this within a national park."

"When I talked to them earlier about this barn we built, they did not want it there because it is a national park and it is thought that it should be unexploited and inaccessible. I have to agree with them to some extent, but at the same time, people think that our cabins are theirs. They use them, rest on them, and so on. That's right, people are drawn to buildings, it gives security."

"But I can talk to the county administrative board and mediate for you

"We have 12V in the cabin we have there. If you can imagine that the electricity only belongs to the Sami village, that you can not charge equipment there for the public, there is a greater chance that the county administrative board will agree to it."

"The tourists steer the reindeer from Sarek. If you were to build a cabin, it would certainly be in the heart of our area, but would at the same time concentrate tourism to one point instead of surrounding the reindeer from all directions and edges. That way, the idea is very good."

"Is it a cabin that we actually benefit from and then there is a tourist there in the spring when we come with the reindeer, then we can get along, there are no problems."

"A reindeer herder's cabin must not be larger than 20 square meters. The bigger ones are not really legal."

"But why should we not be allowed to live as big as we want? We are

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from the east. So now there is quite a bit of snow in this area actually."

"You are not allowed to drive a scooter in the national parks. On the other hand, there is a cabin location in Gisuris and a ski trail from Änonjálmme, from Akkastugan to Kutjaure there is a snowmobile trail then you ski over Kutjaure. At Kisuris there is an open emergency cabin so you can live there. And from there to Kisuriskåtan it is... meters away..."

"But it's only February. thinking March April, or a little later."

"We are in the forest lands now, but we are going west later then, we will be in Padjelanta a bit like Easter break."

"I think one of the success factors in this is the Sami village. Work closely with them and so on. We take care of, like, the state cabins and so on and they are a bit like that they do not build new. And a little like that mentions that it's like a new idea that is very exciting. And the Sami village is like, if they can say, for example, that we want to build a new cabin that can be open to tourists, you can get around the system by primarily being a reindeer herder's cabin that strengthens the reindeer herding industry."

"Instead of it being locked and people breaking because it is there, it can be open. That's a good thing."

"Then you can think about who lives with the tourists, who lives with the reindeer herders. Locked space? If you are a reindeer herder, you always want to know that there is wood, for example."

"Talk on with the Sami village. Check what the Sami village needs."

4/3

Henrik Micael Kuhmunen

Manager Laponiatjuottjudus

"The reindeer herder's cabins must be practical for reindeer herding both summer and winter. Heating, cooking with LPG, must withstand wind. Be practical in the terrain. And so placement of course, that they are in good places, good dry hills. But also that it is strategically placed according to the needs of reindeer herding and that it holds a few men, 3-4-5 men... Stable foundation."

"Strategic location means where there is a need for the cabins. That they are at a suitable distance from the next cabin. Or where they fulfill a function."

human beings too, we do not want to live cramped, so we do not care about that."

"It is true that it can be said that the cabin is used in reindeer herding in the first place to get around the regulations and avoid building permits. But if it turns out that tourists use the cabin, it should be demolished. And that is precisely why you need the county administrative board's permission. And I am absolutely convinced that they will never give permission for this within a national park."

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"Is it a cabin that we actually benefit from and then there is a tourist there in the spring when we come with the reindeer, then we can get along, there are no problems."

"You can build them on concrete blocks. You have to build high! You have to have air underneath because it dries and you can't get mice into the cabins."

"I think that if the cabin will sink a bit and if it is then built high, it is easy to jack it up... double concrete blocks."

"Good ventilation is good to have inside as well. When there are people in there or when it has been untouched for a while, it's good to have. You should have windows, but not primarily to ventilate. Roof valves are needed and should be open at all times, but the problem with them is that, in a mountain environment, snow enters. You can have different storm covers so that the air can move in the cabin."

"Some of our tourist cabins have a roof valve, but condensation forms in some of them and it drips in... Otherwise it's quite practical, but I'm skeptical of them... Sometimes we have buckets underneath if it drips. But a valve high up on the wall can solve that."

"I do not know what a reindeer herder's cabin costs, but you can check with Mikael about that. Most often, almost always, they are built-in ladders and transported out and assembled on site. Otherwise, it takes so long to build with loose timber. Everything is modules, and it has to do with cost."

"You have to be able to lift that too. Some men will build it, at least two, maybe even more, but you should be able to handle those blocks."

"If you build with loose timber, it takes many weeks to build from scratch. Almost no one does it with a reindeer herder's cabin."

"It is wood you build from, traditionally... Tuorpon Sami village has started with sheet metal exterior walls. Then it does not have to be painted."

"The Hamberg cabins that we handle are over 100 years old and clad with sheet metal and they have held up much better than the cabins that are 30-40 years old. There is one in Jokkmokk, in the mountain garden."

"There are usually a latrine and storage at the reindeer herders' cabins. Usually, you dig a pit then for the privy, but now you are not allowed to dig pits anyway in Jokkmokk municipality if you have to follow all permits and so on. It should be composted and so on, but I think it is very impractical, especially in the mountain world."

"The pit will be full at some point in the future, and then it will be difficult to move the privy if it were to sit together with the building. You can move a privy a few meters."

"It's nice to play on the horny form in a reindeer herder's cabin, it's beautiful and certainly interesting in terms of architecture."

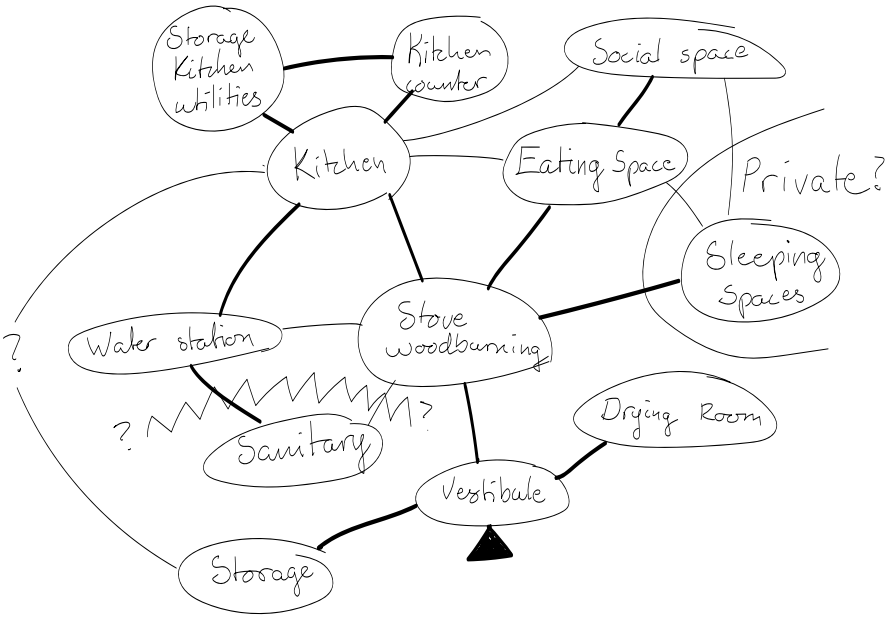
PROGRAM

The program combines not only the tourist cabin, but also traditional Sami space organization. The fire is central and gather people in such a way that stories can be told and experiences and wisdom traded.

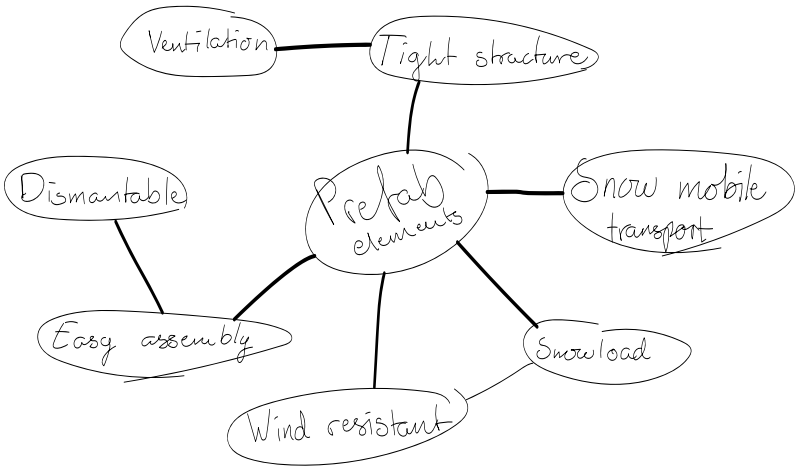
Some important features, issues and tools came up during the research:

- A vestibule is necessary for transition between hot and cold, and for safety in case one door is broken.
- The wood stove should be easy accessed from the entrance and play a central role. It should be a smaller type that can be put close to wooden surfaces, and if possible used for basic cooking.
- Budget is limited. Mentioned numbers varies from 3-500 000 kr excluding labor.
- The drying room should also be easy accessible from the entrance. It should have a heat source for faster drying.
- The (four) beds should be simple, yet function as benches or tables.
- Space for buckets of water for washing, drinking, cleaning.
- Elevated structure (for ventilation) with minimal environmental impact.
- Basic storage for firewood, fuel and appliances.
- Kitchen is very simple and requires limited space for kitchen utilities, buckets with water, and cleaning items.
- Social space is central and largest of the spaces.
- No requirement or possibility for running water or electricity.
- Fast and easy construction on site, preferably without professionals.
- Material small and light enough to fit on a snow mobile or to be carried by helicopter.
- Space layout should have a Sami connection, with the kitchen opposite of the entrance, the beds along the walls and a center space for dialogue and story telling.

Sanitation/latrine will not be considered due to a status quo-situation. The municipality has prohibited pit latrines, and the site does not make it possible for compostation, and bucket-system becomes impossible long-term. A latrine will therefore be erected by the Sami without official permission or not at all.



Program and relations.



Construction and requirements.

Concept

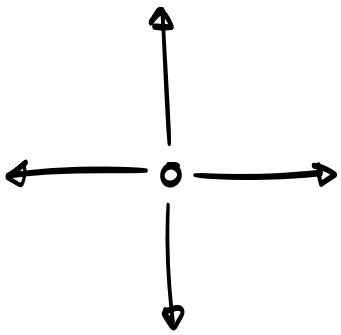
Traditional Sami architecture and social pattern is centric, focused on the centre. That could also be seen in the Sami perspective of time. We say "time goes", which is a linear, vectorised perspective of time. The Sami expression goes "times comes to me", turning the interpretention of time into a state of mind. We also say "10 kilometers in that direction" or sometimes "10 minutes" to define a distance. It does not necessary mention the effort required to reach the distance. It comes closer with the distance measured in amounts of coffee brews or how far one can hear a dog bark, both typical Sami expressions according to architect Lars Sundström.

Simultaneously, our architecture differs too, between us "colonialists" and the Sami, at least traditionally. Our houses have windows, preferably every direction and we tend to focus on the outside and the setting than ourselves and the inside, while the Sami houses (or huts) focus on the centre, the core and exchange of stories and knowledge.

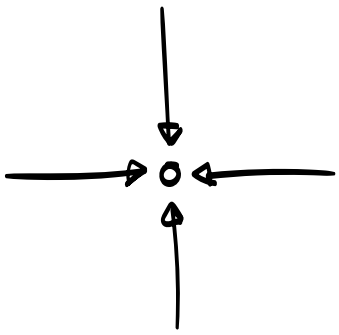
Applied on the overall Swedish society, the Swede is interested in seeing more of the world but oversees local and indigenous people, while the Sami focus on himself and his own kin, while neglecting/discarding the surrounding society. They repell each other.

Another way to put it is to see us "westerners" or "colonialists" as extrovert and the Sami as introvert. The concept of the design could therefore be explained by that the extroverted tourist is put in the centre, forced to meet the introverted Sami, placed surrounding the tourist. They attract each other.

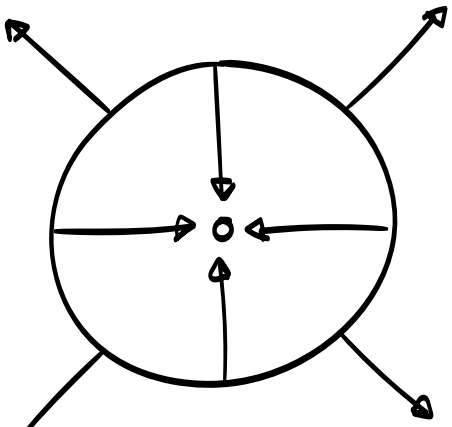
The aim with the concept is to encourage a discussion and exchange of knowledge about the world, nature and humanity. It also sparks the design process, emphasising on a social core that will connect every other space.



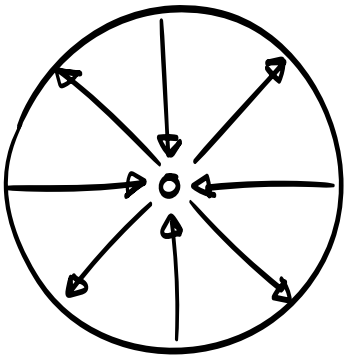
Extrovert



Introvert



Current situation



Concept

Physical Models

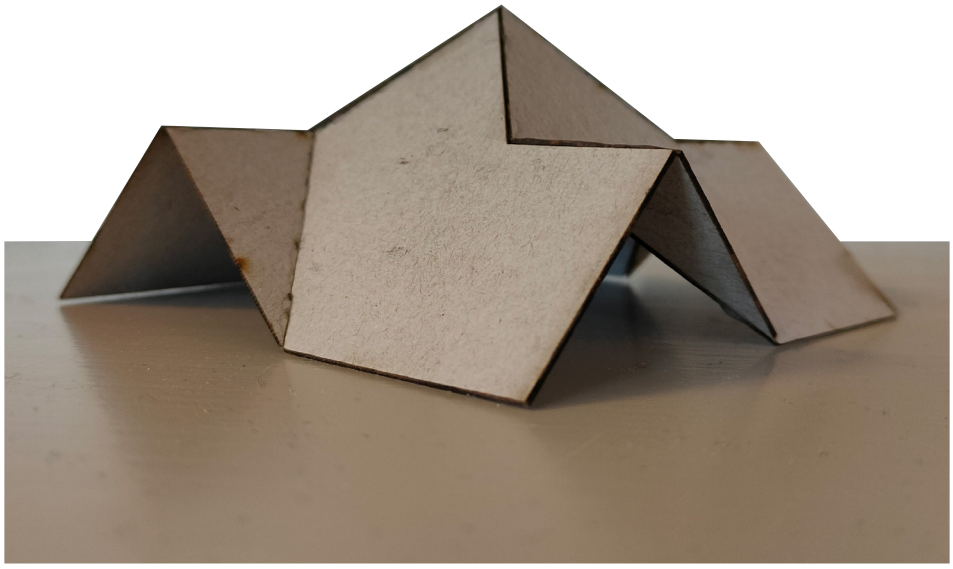
Exploring spatial organisation and visual expression with models has been of high important for this thesis. From laser cutting site models to hand cut mock-up models, the layout and physical appearance evolved into a rather clear object.

Starting by exploring a common shape by folding, and then adapt the program did not result in something of great value, but I got to understand how important the definition of the entrance is.

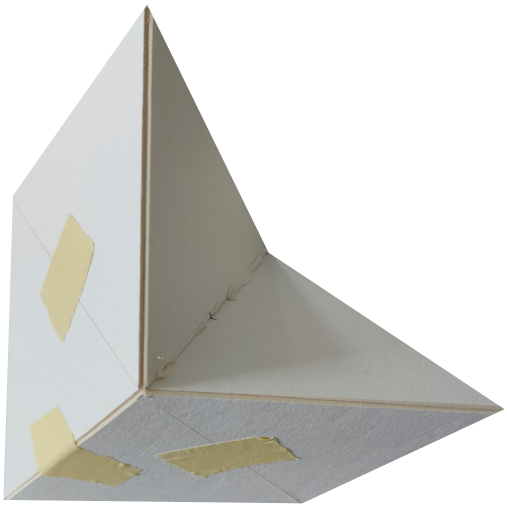
Since I failed to reach the site, making one or many site models was essential to understand the relations between valleys, rivers, mountains etc. The site models are quite complicated to make by hand, and I therefore decided to cut them with laser for higher precision. A consequence of cutting with laser is the soot on the edges, and combined with glue makes it difficult to keep clean from prints and smudge. However, the laser also allow to add textures to indicate what type of ground it is.

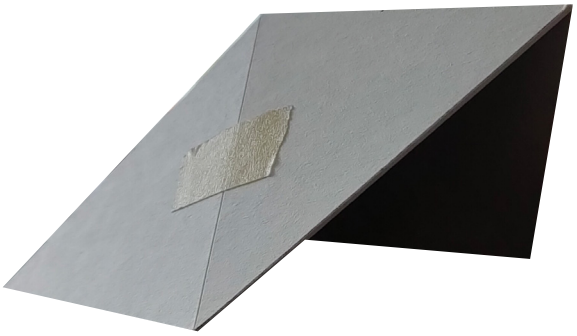
Going to spatial organisation, a compact, space efficient and versitile design was the intention. By having the Kisuris cabin as a set maximum floor space (27-28 sqm) the challange came to put the wood stove as central as possible while still being connected to the drying room through the flue, as well as ensure a space that was comfortable to use with smallest volume possible. The shell could therefore not be too tall, for mainly heat related reasons. The bigger the space, the longer to heat.

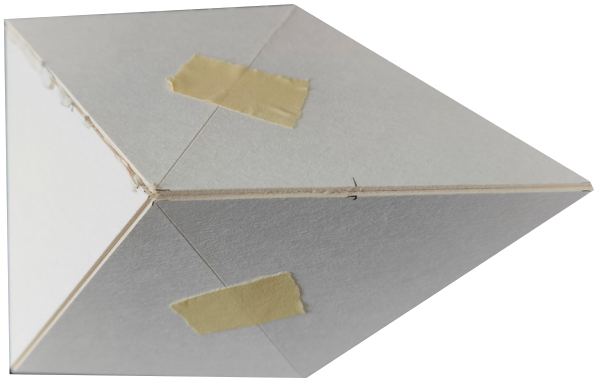
Simultaniously, experiments in modelling software was also conducted, with focus on plan and roof appearance.

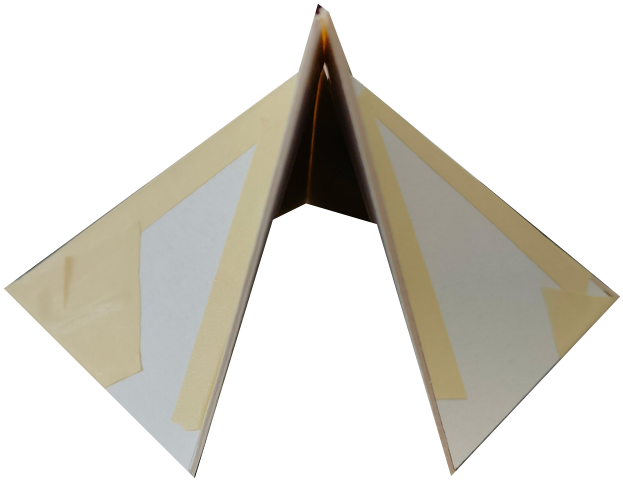


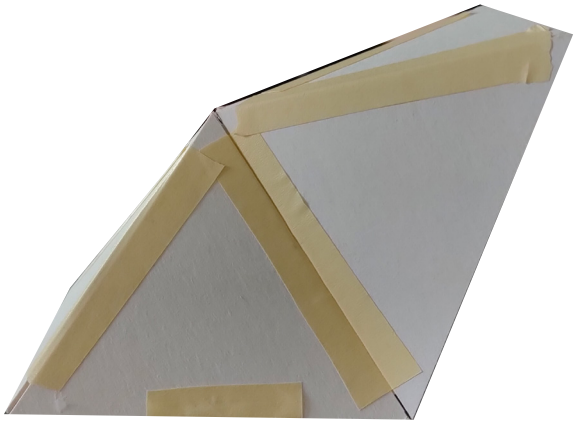
Conceptual shell model, combining the goahti with a saddle roof.

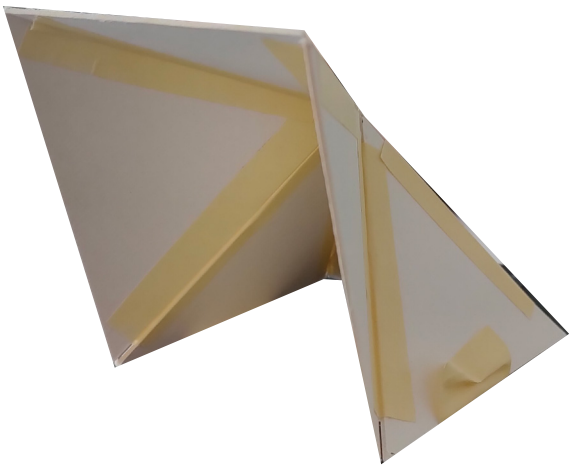




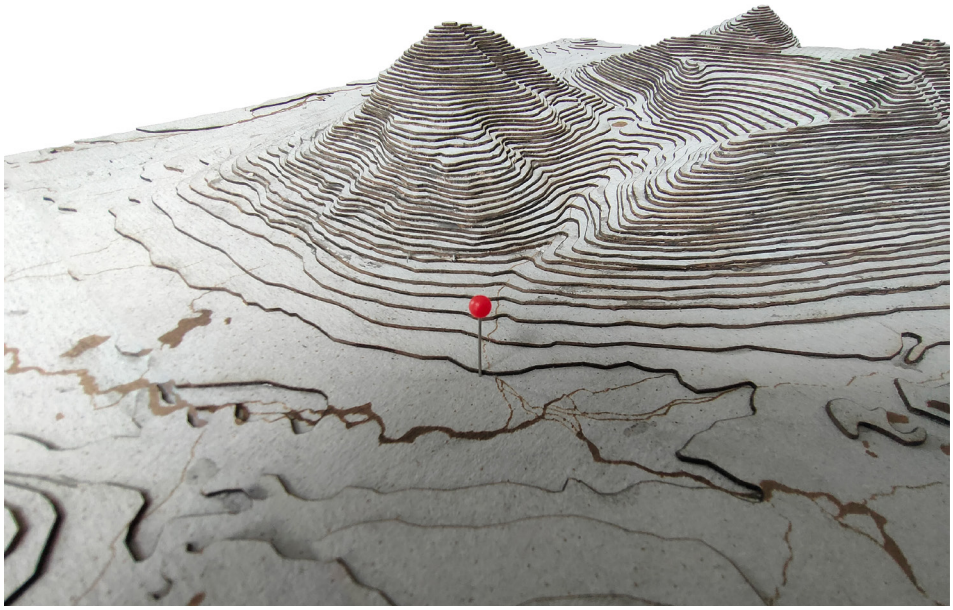






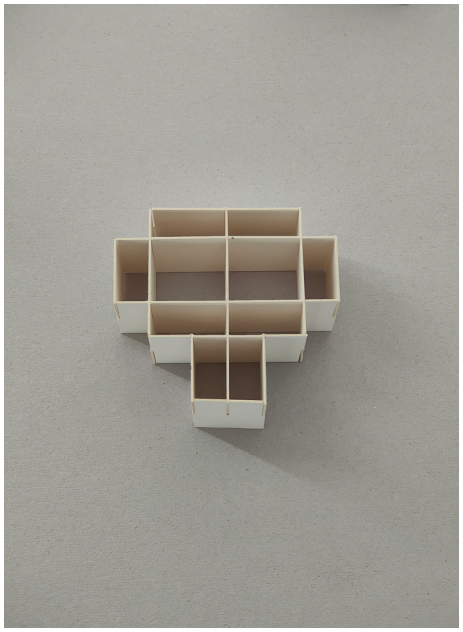


Conceptual shell models with the goahti as inspiration.

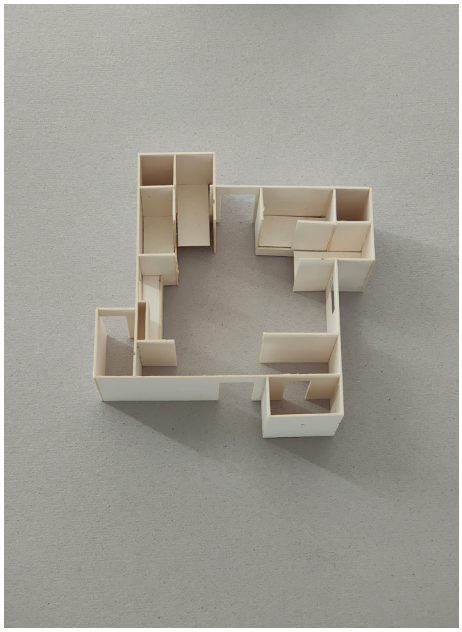


Site model, 1-20 000. The red pin is represent the present cabin, "laddbodan".

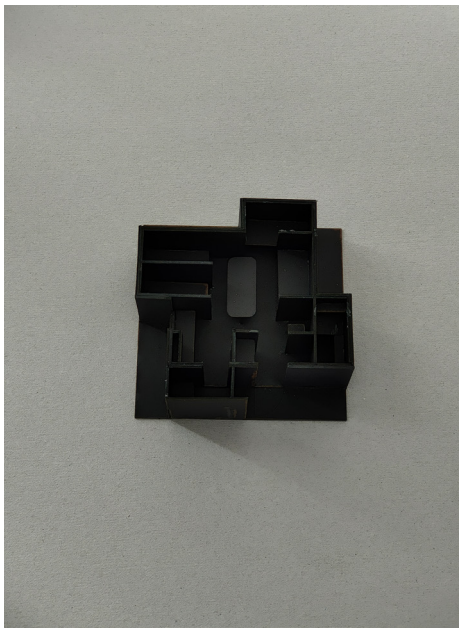
The footprint of the needle is far larger than the one of the cabin.

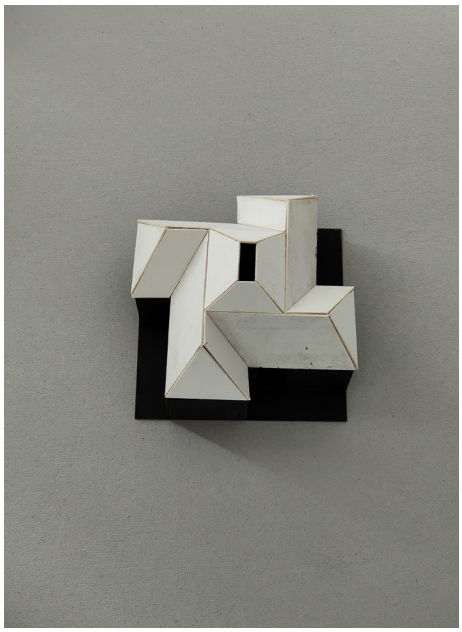


Exploring interlocking elements.

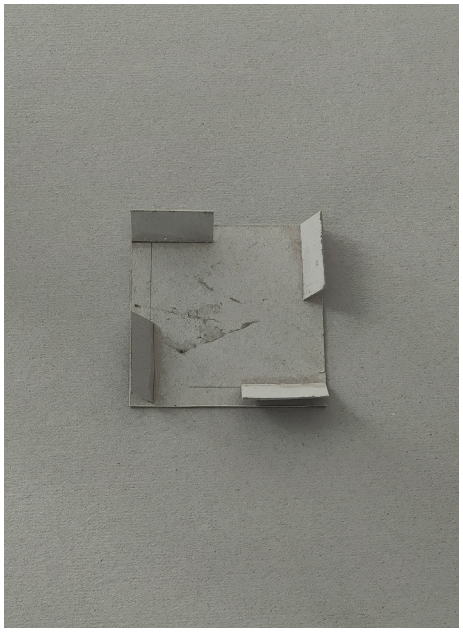


Early layout, including a latrine.



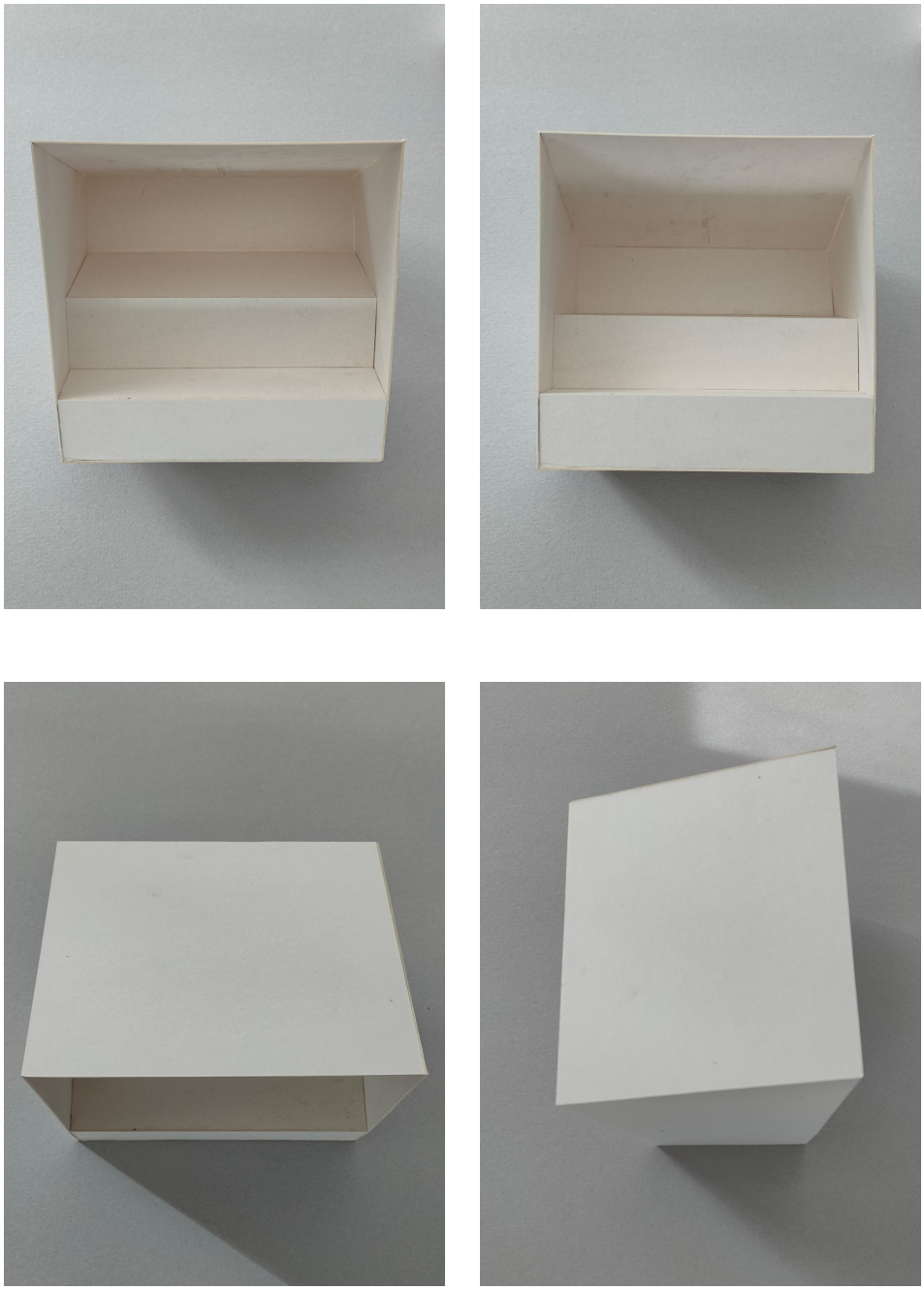


More compact layout, but disconnected shell solution.

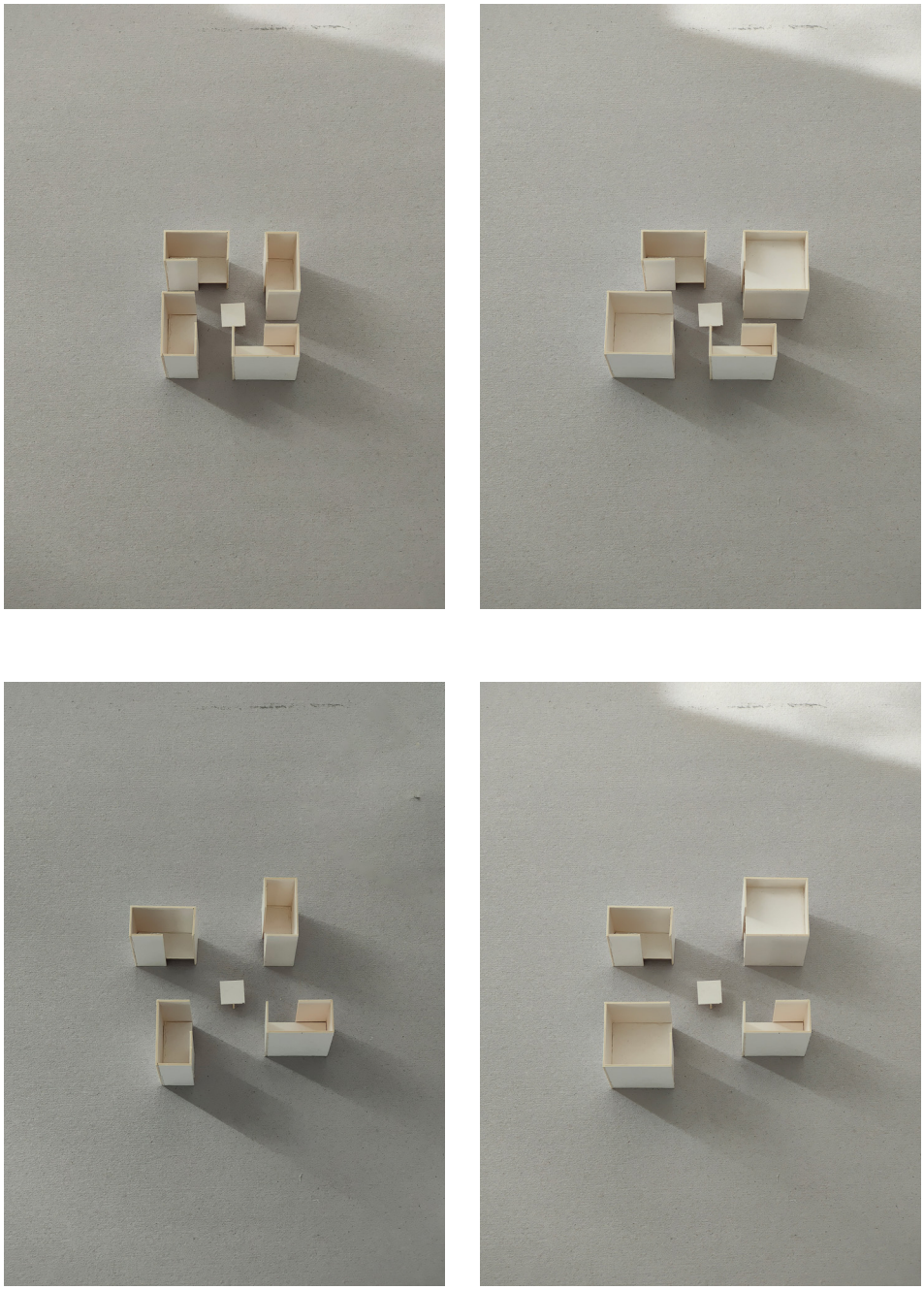


Shell model, exploring connections to the slab.

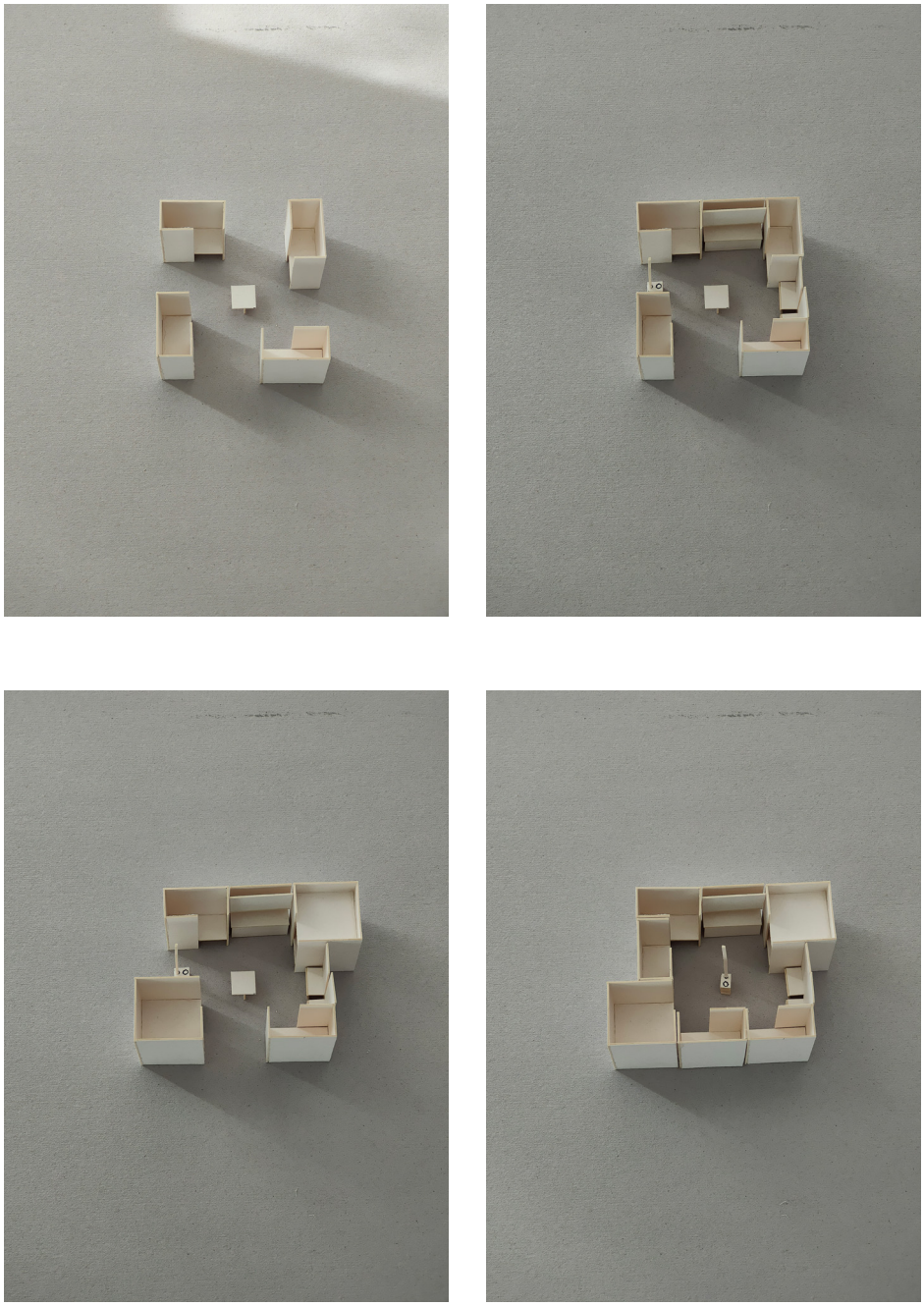
Exploring interlocking elements, laminated logs.



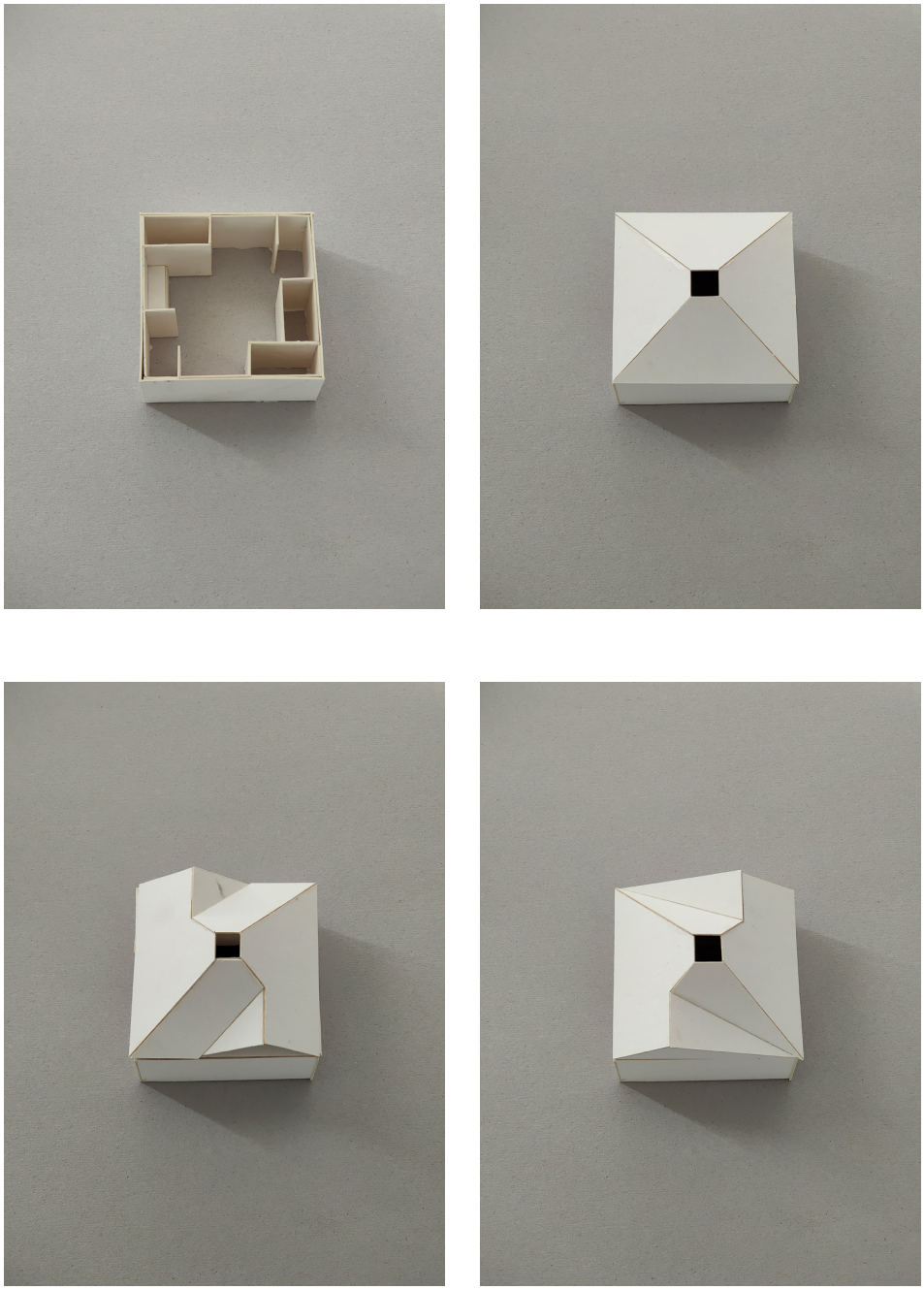
Exploring angles and features in a sleeping module.



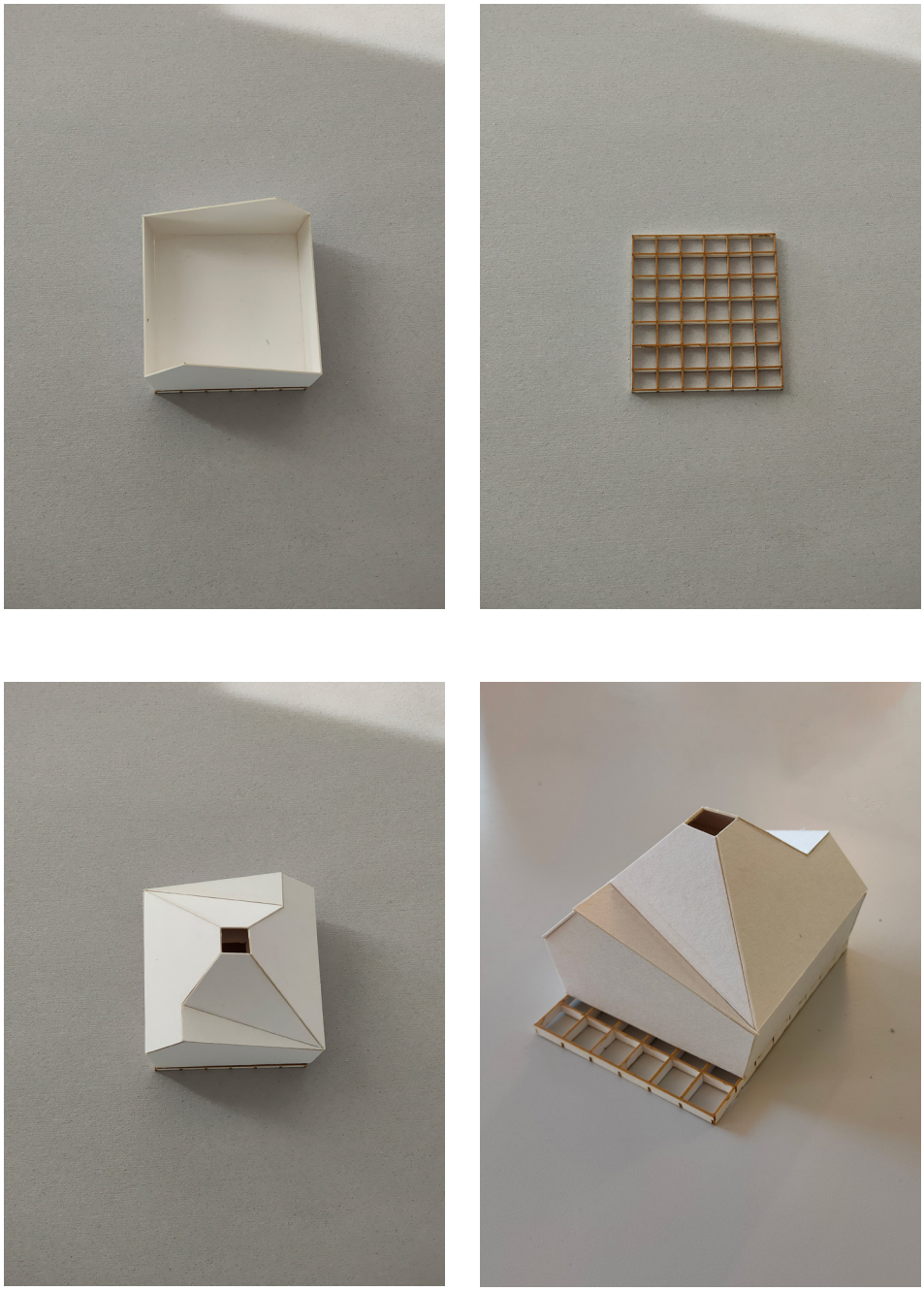
Circular square, testing of different sizes, orientations and relations.



Circular square, testing of different sizes, orientations and relations.

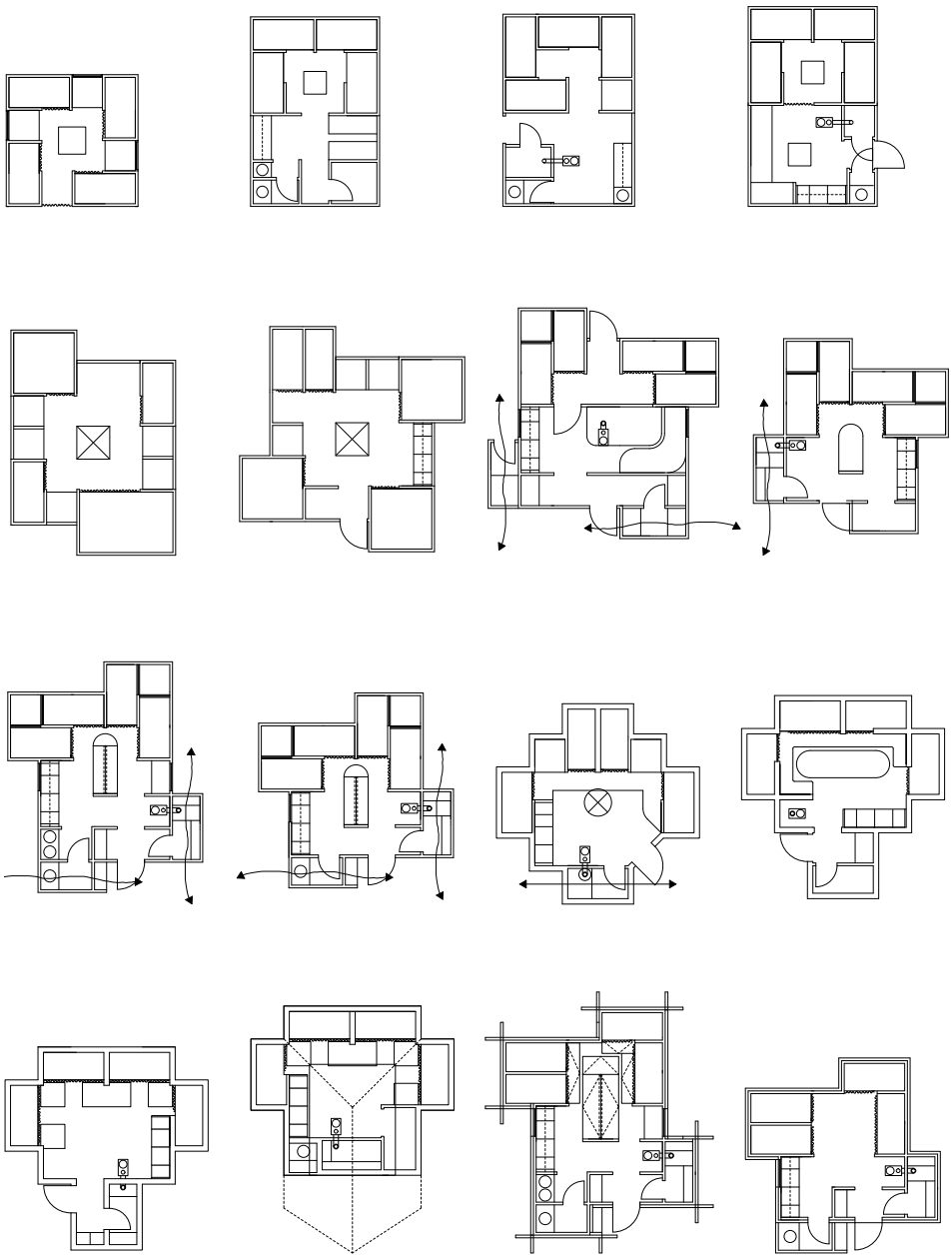


Plan framed by different roof structures.



The final model on top of a foundation grid.

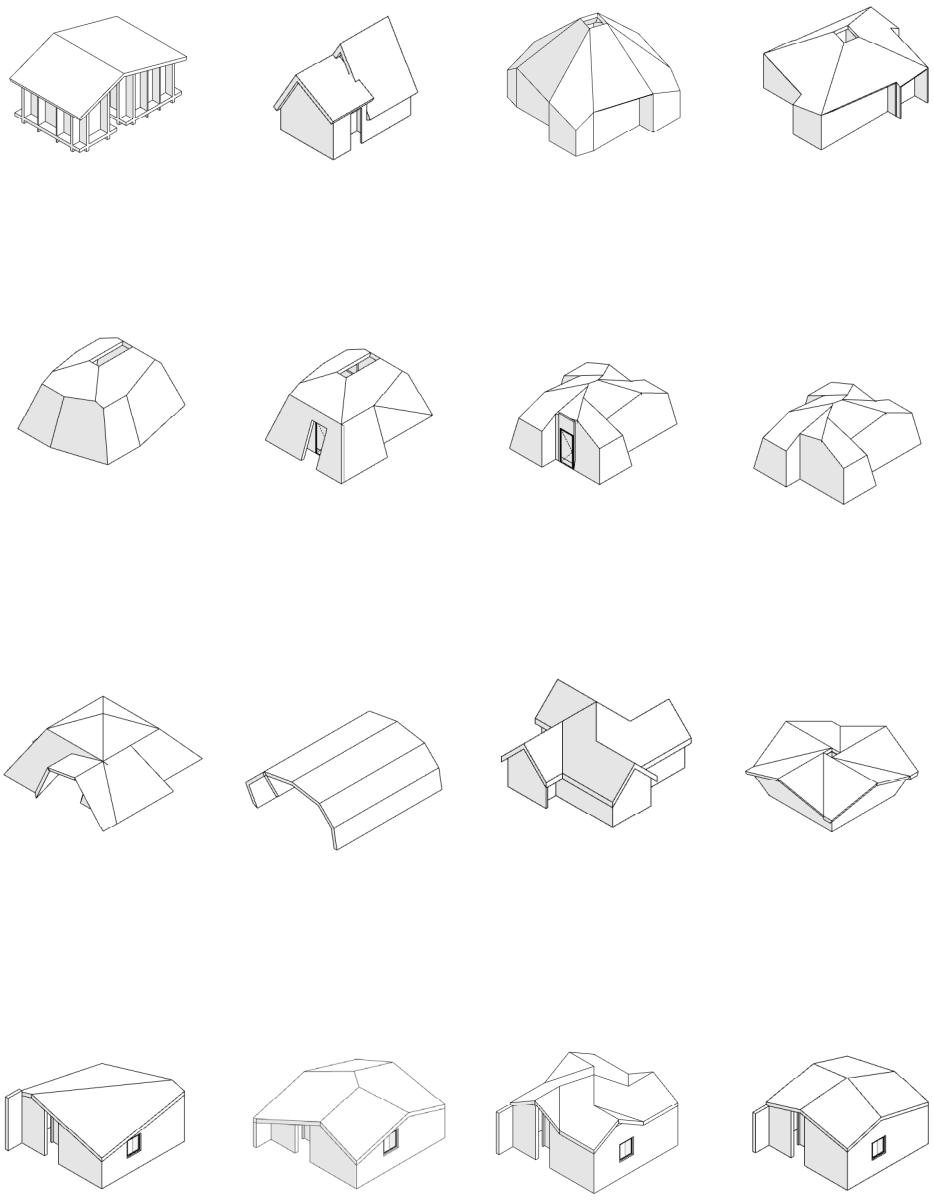
Plan Development



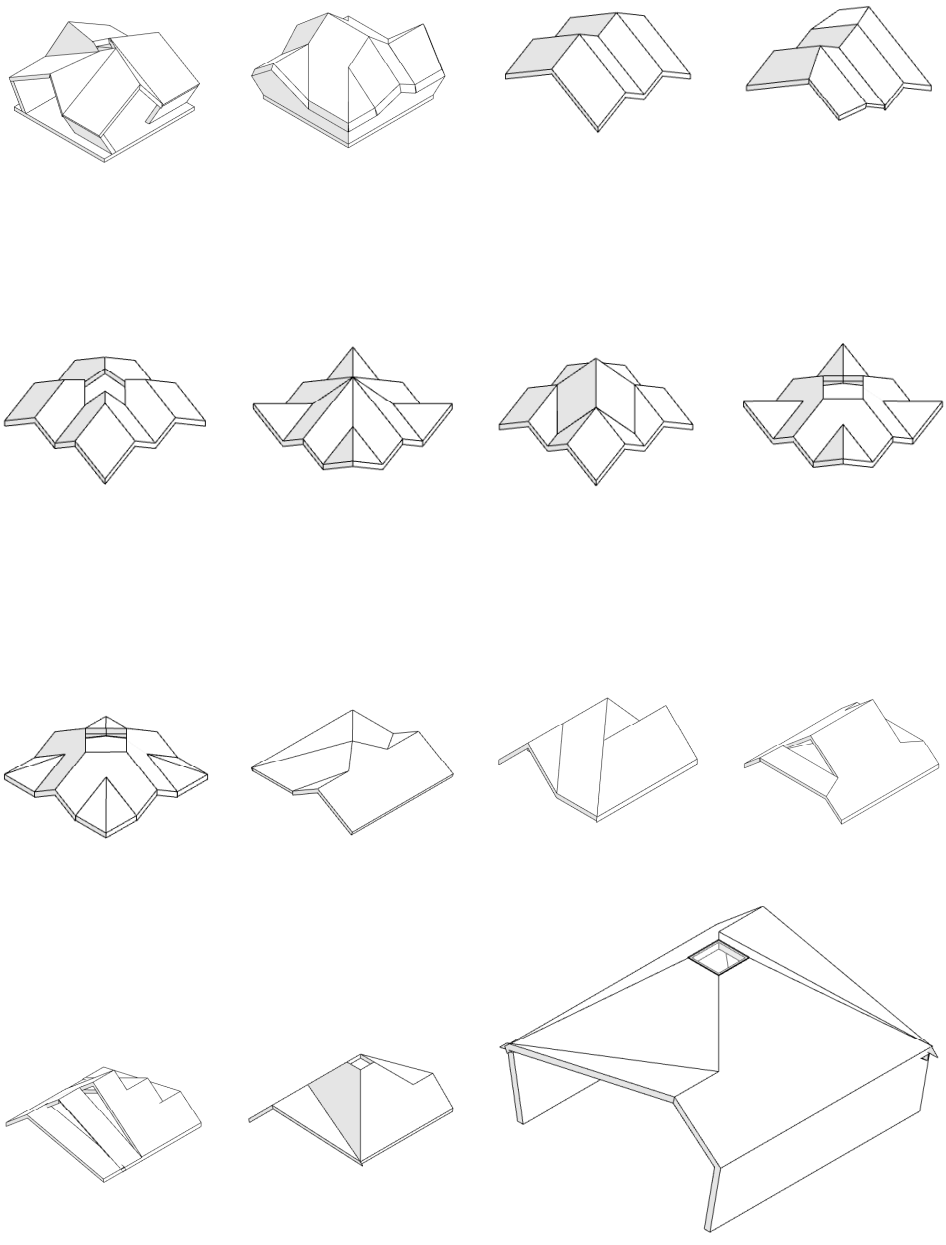
Experiments in plan.

Experiments in plan.

Roof Development



Shell experiments.



Shell experiments.

Design Proposal

Overview

The design took many aspects of the research into account. First, the solid, monolithic shape is not only inspired by the Sami goahti, but is also a consequence from the choice of using CLT as the main building material. As previously stated, CLT allows for a high prefabrication factor, sustainable material, fast construction, tight walls, insulation, smooth surfaces and warm aesthetics. However, CLT is not a material to have exposed in Sarek, one of Sweden's wettest places with an annual precipitation average of 2 000 mm. To maintain it, I decided to clad it with corrugated metal spray-painted in a red color, referring to the Sami flag and the local Hamberg cabins.

The cabin does not have any additional insulation but is heated by the bodies from the visitors, or the wood stove if necessary. One simply do not reach this place without proper clothing and gear. The shelter will always be warmer than the outside, yet not to a housing standard, which is neither the point. Ventilation is achieved from underneath the bed slabs and exits through valves towards the fixed skylight. The drying room has its own independent system with a separate ventilation exit.

The metal cladding is attached on laths that are simply nailed or screwed directly on the CLT elements. The metal extends downwards beyond the slab and the glulam beam foundation to protect it from snow and rain as well as forming a more solid appearance. Storm wires has to be attached to the cabin and the ground for horisontal wind forces that with ease can reach 25 m/s. The glulam beams sits upon site-found rocks or, preferably, steel screw piles. Screw piles allow the cabin to adapt to almost any terrain, which makes construction very easy for this type of project when frozen ground might make structures sink into the ground. It is then much easier to adjust and make it level with screw piles. They can also be installed without use of machines, they do not require any preparation or excavation, they do not harm the ground more than making a hole, and they are reusable. Thereafter, a socket for horisontal mounting is attached to the screw pile to fix the glulam beams. The screw piles also allow for ventilation underneath and prevent snow from piling up on the sides of the cabin.

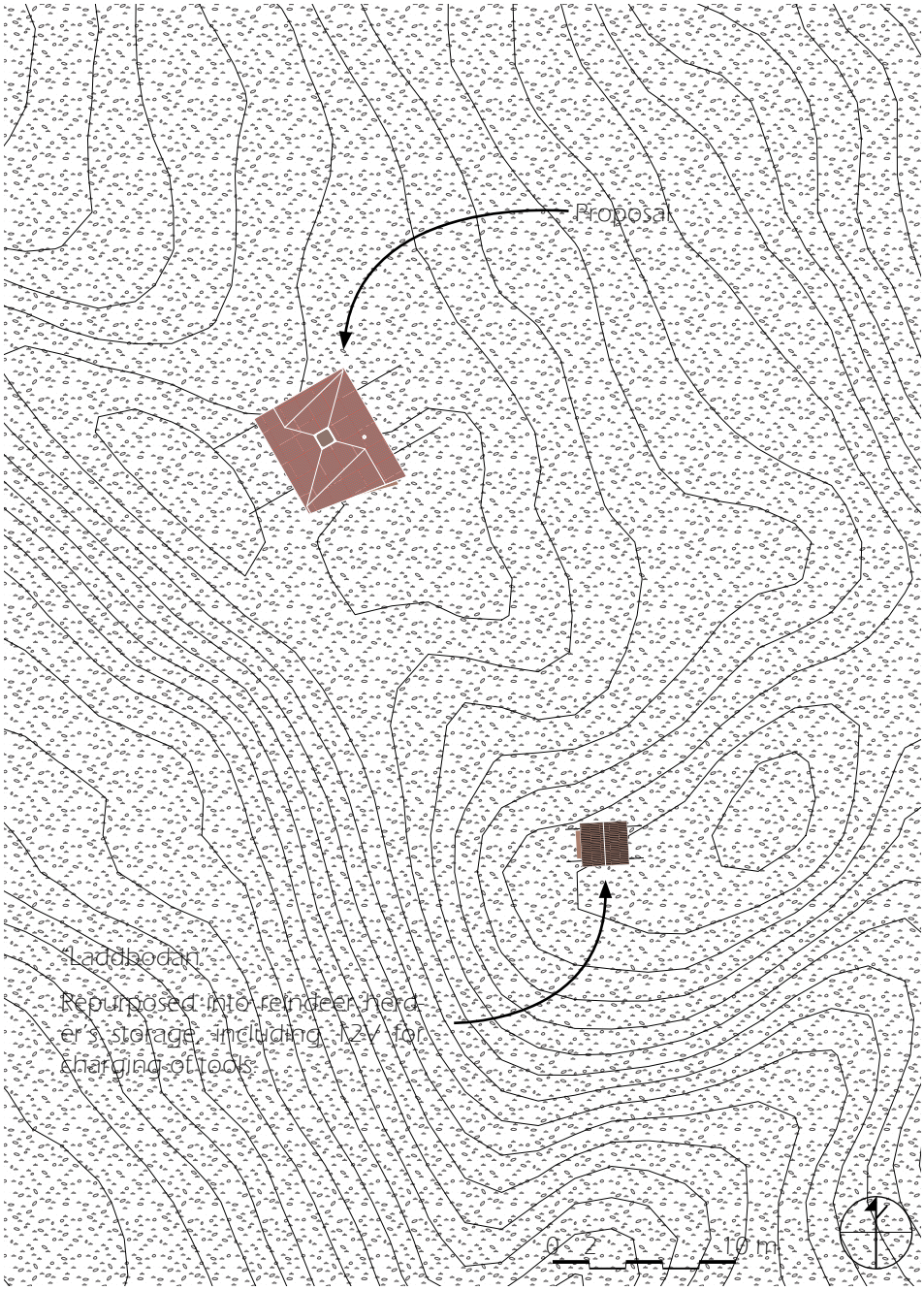
Summer view and Nijákjågåsj.

Proposed Placement

Considering the current cabin, "laddbodan", being very small, yet of importance to the reindeer herding as we speak, I propose to keep it as is, but instead of using it for stayovers, use it as a charging station for communication equipment and drones, as well as, storage for firewood, equipment such as lasso, LPG, maybe spare clothes, maintenance tools, etc.

The proposal is situated 2 meters downhill of laddbodan and approximately 25 meters north of it. The ground here is full of small hills shaped by melting snow, rainfall, and landslides. The soil is 3-4 meters of moraine and suitable for various ground-attached foundations. The surface is generally dry, thanks to the inclinations on all sides. Water sources are not sparse here, but the closest clear summer stream is around 50 meters away, and during the winter, one has to go downhill 350 meters to Nijákjågåsj, the wide creek.

Harsh winds from the west hit the cabin's west facade and guide them around the corner. The south face is protected by rotation of 30 degrees and a partially extended shell that forms a porch for sunnier days.

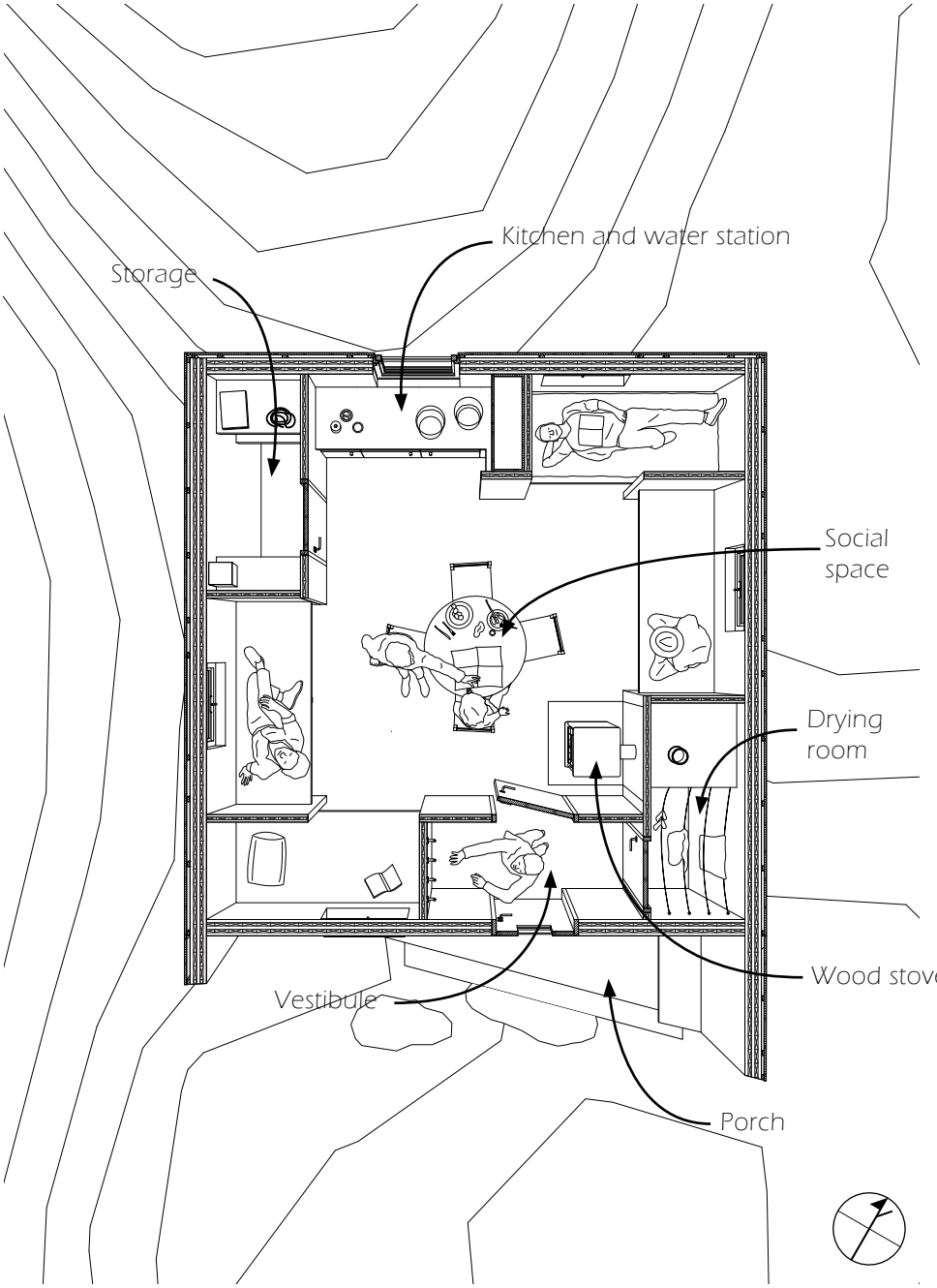


Site plan. Every curve is 50 cm elevation.

Plan

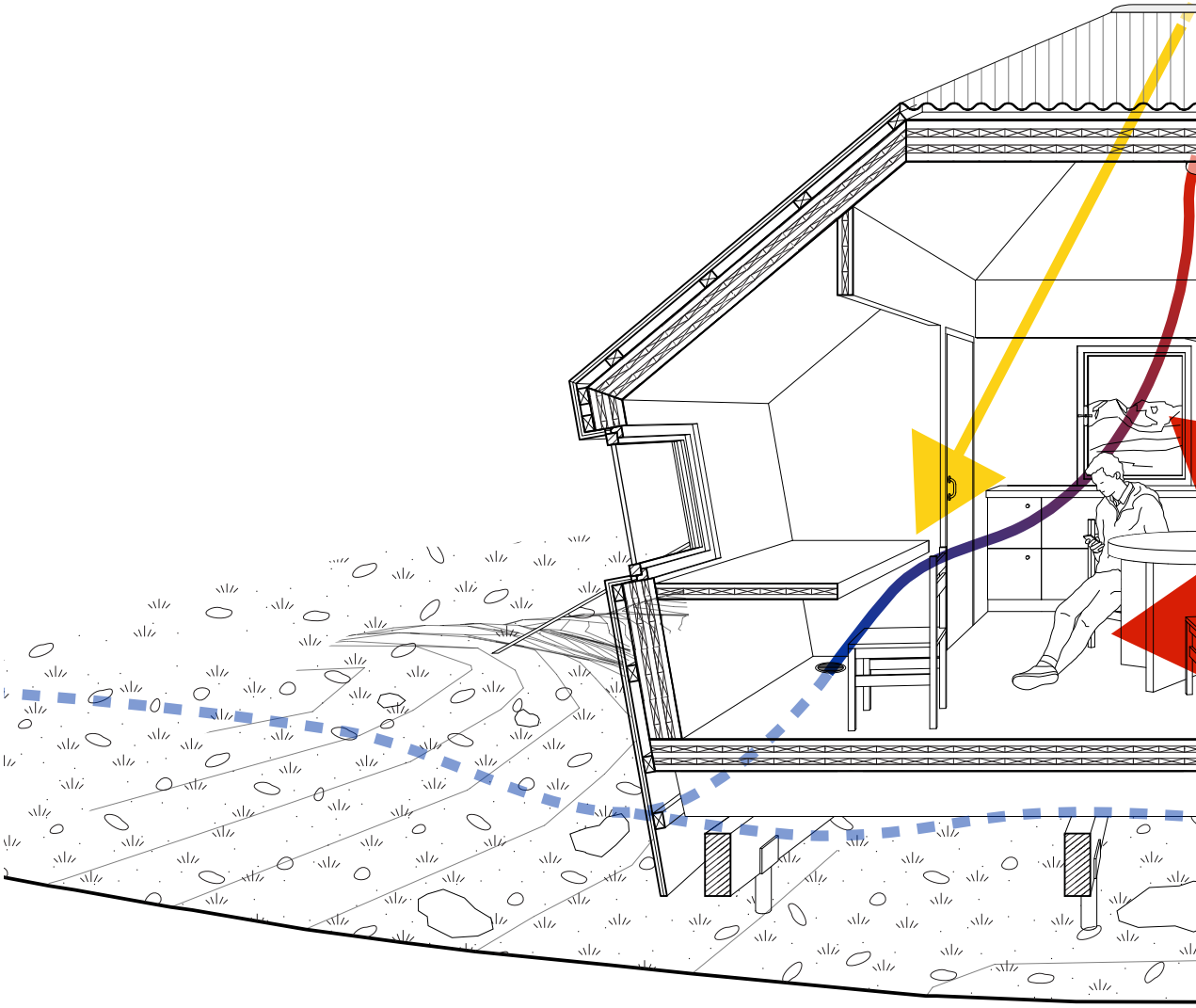
In plan, the cabin is a circular square of roughly 23 sqm of floor space. Bed spaces are along the edges, and the entrance and kitchen are opposite each other. Once again, the inspiration for the layout comes from the goahti. However, the program required some more spaces, at least a drying room and storage. The drying room had to be adjacent to the entrance, and the flue had to heat the space, which required some puzzling. The drying room was finally placed in the corner, where the ceiling is low, and ventilation is achieved easily. Opposite the drying room is the storage, where smaller batches of firewood, cleaning tools, chairs, other materials, etc., could be placed. It also can be a washroom or an extra bedroom, but the proposal is storage where the Sami could keep private stuff. It is therefore vital that it has a door with a proper lock.

I imagine the project to be highly self-made when it comes to items like the kitchen, windows, doors, fireplace, and such. The foundational screw piles adapt to the ground while supporting the estimated 10 tones heavy cabin on its small section. I estimate that around 23 of these screw piles are necessary, but it is a possible exaggeration. The real number is plausibly lower.

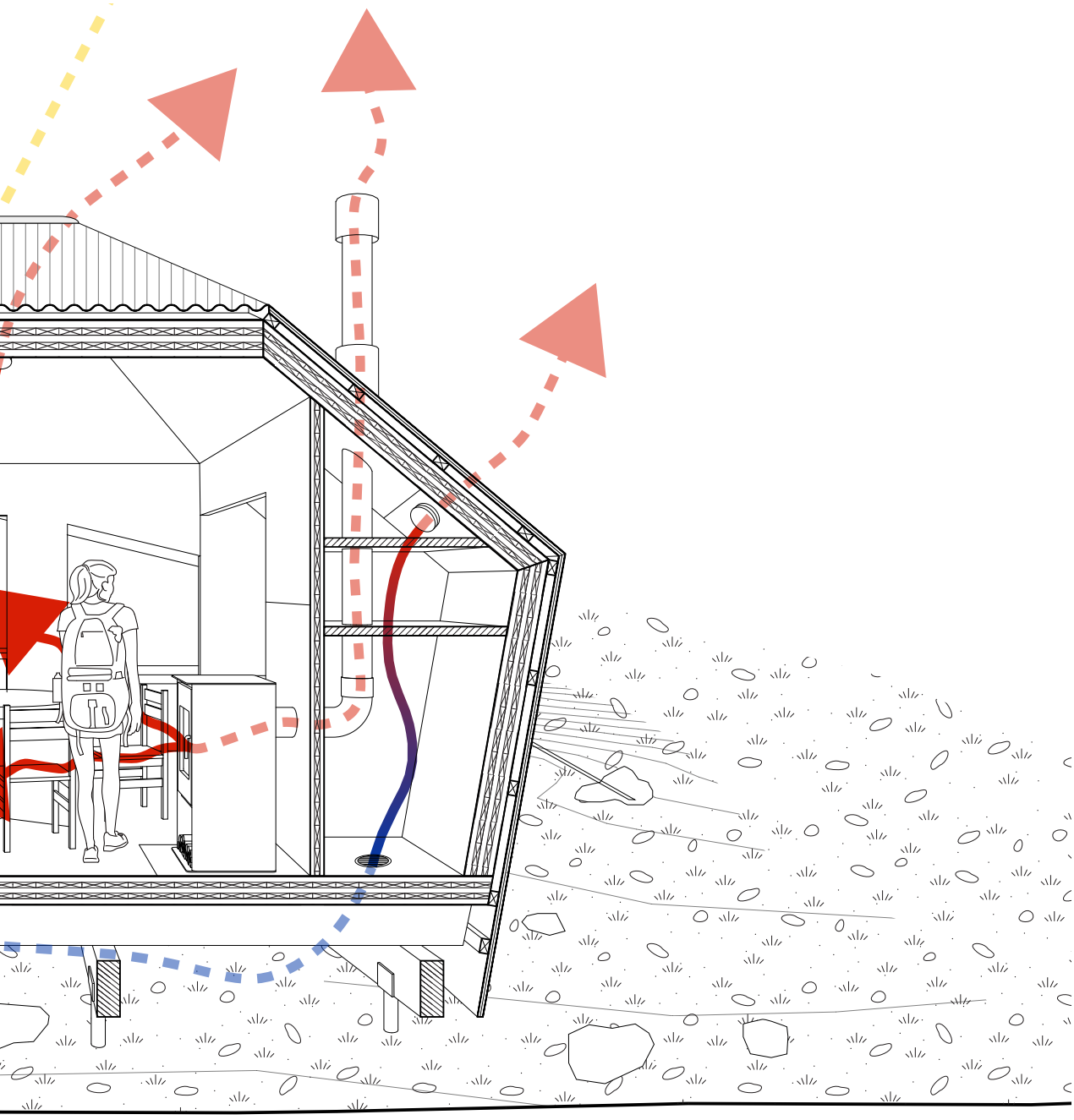


Plan in perspective.

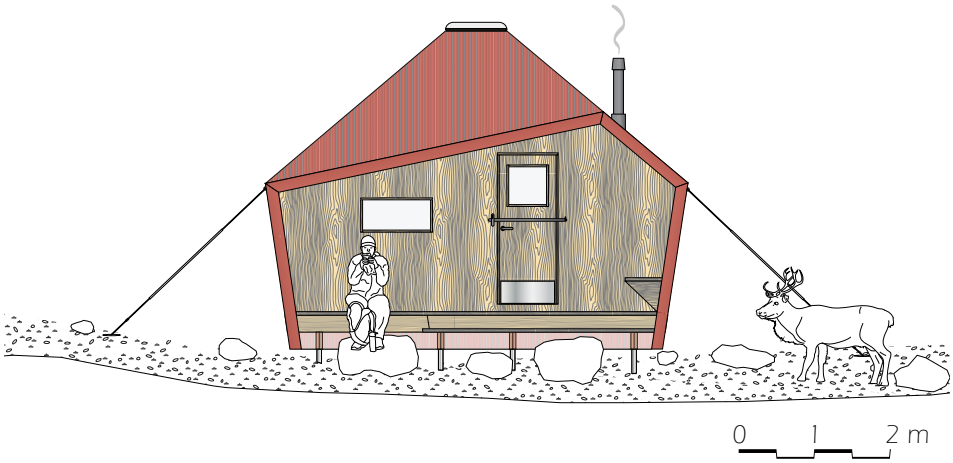
Section



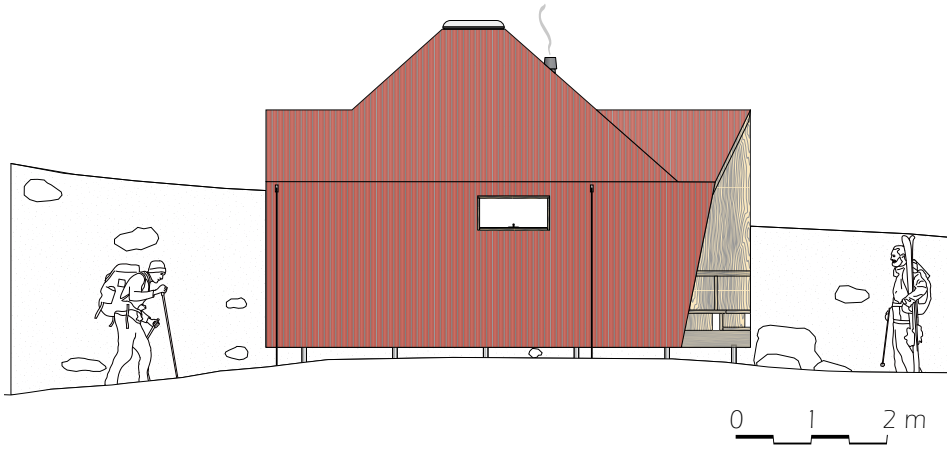
Section in perspective. Ventilation, heat distribution and main light source displayed.



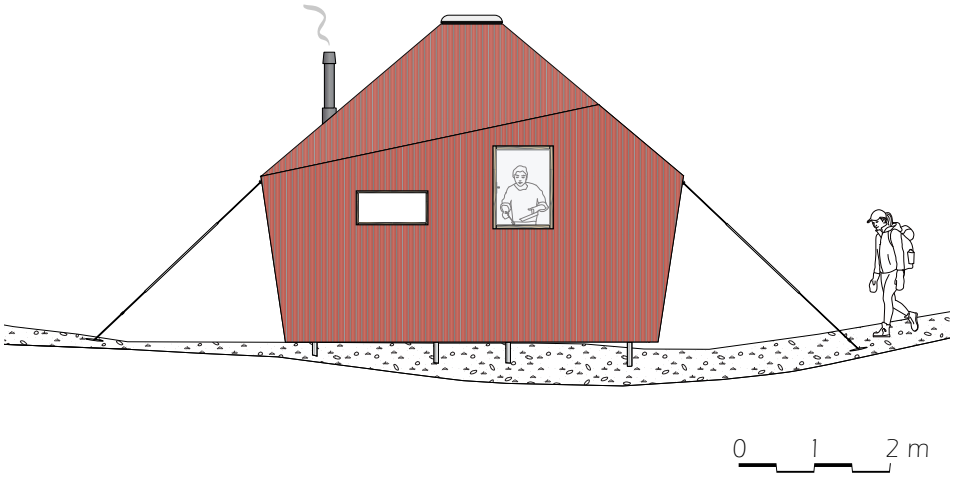
First Encounter



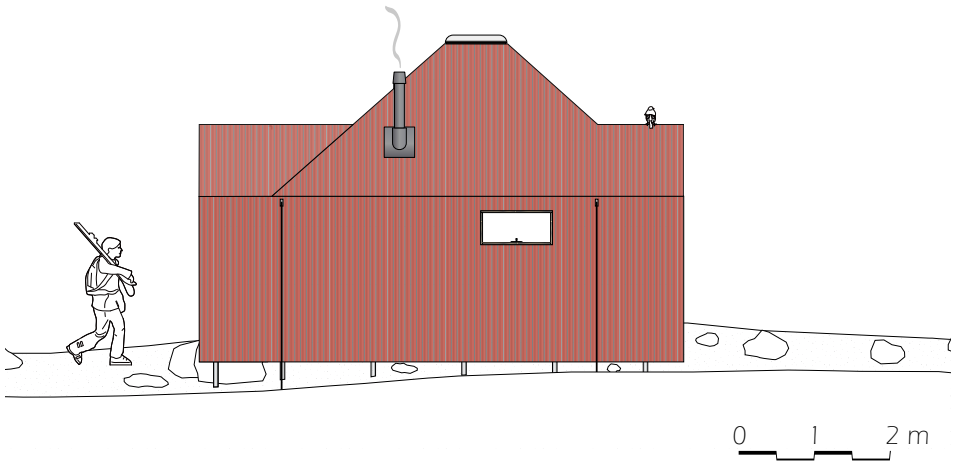
Facade south-east.



Facade south-west

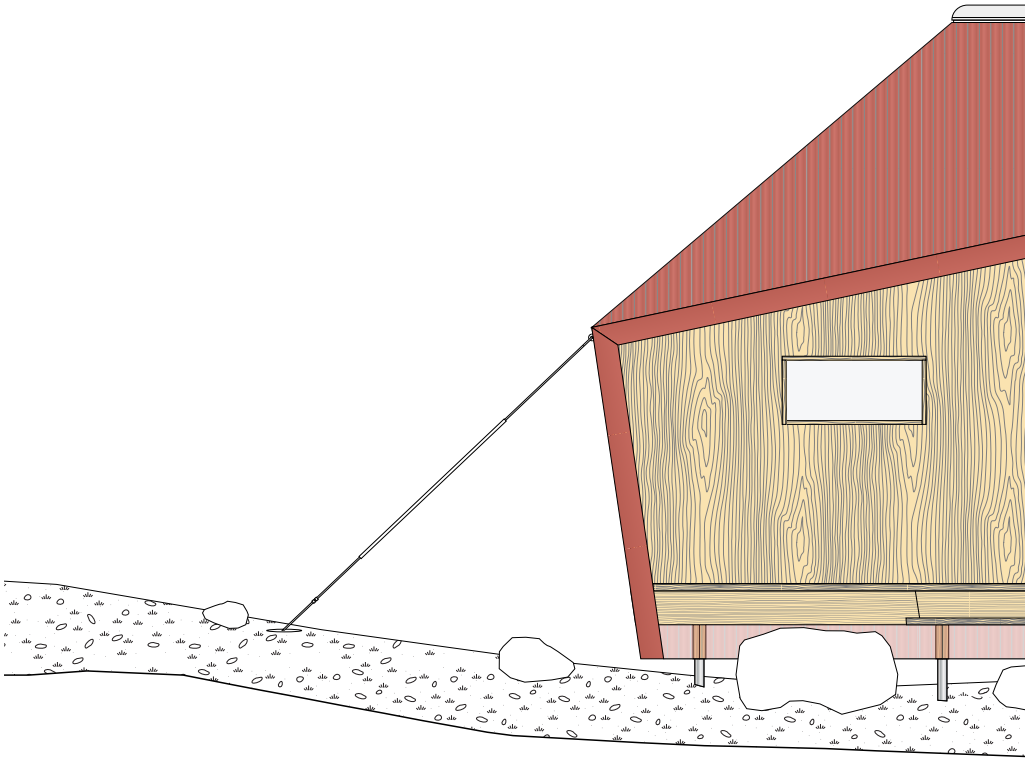


Facade north-west.

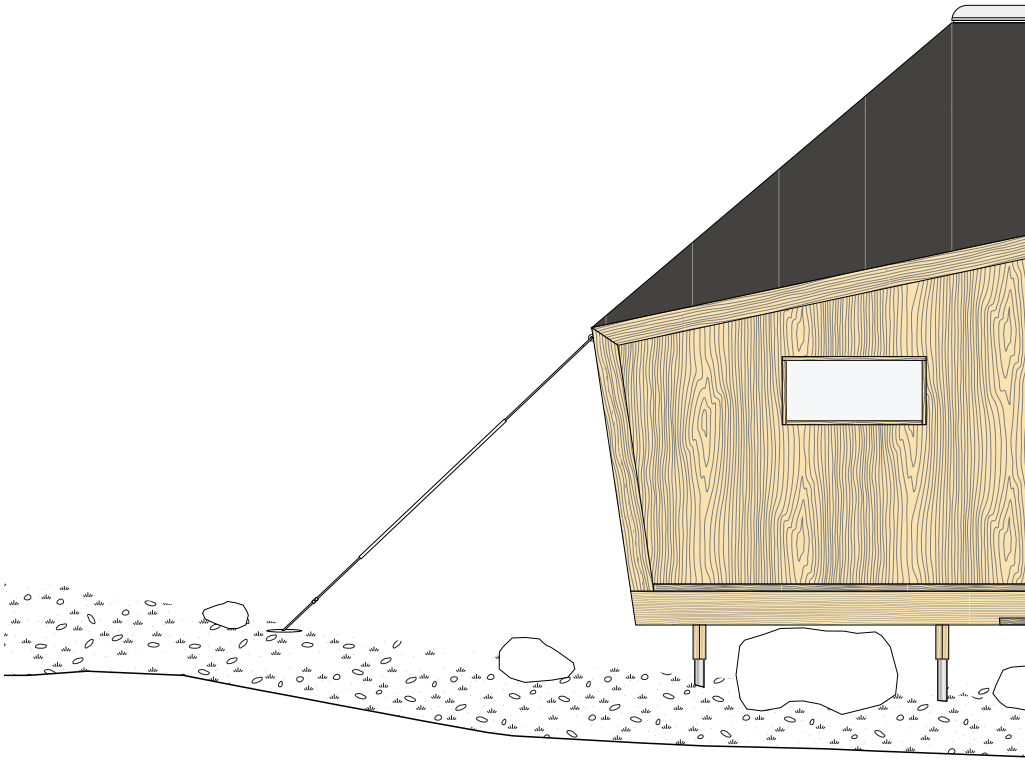


Facade north-east.

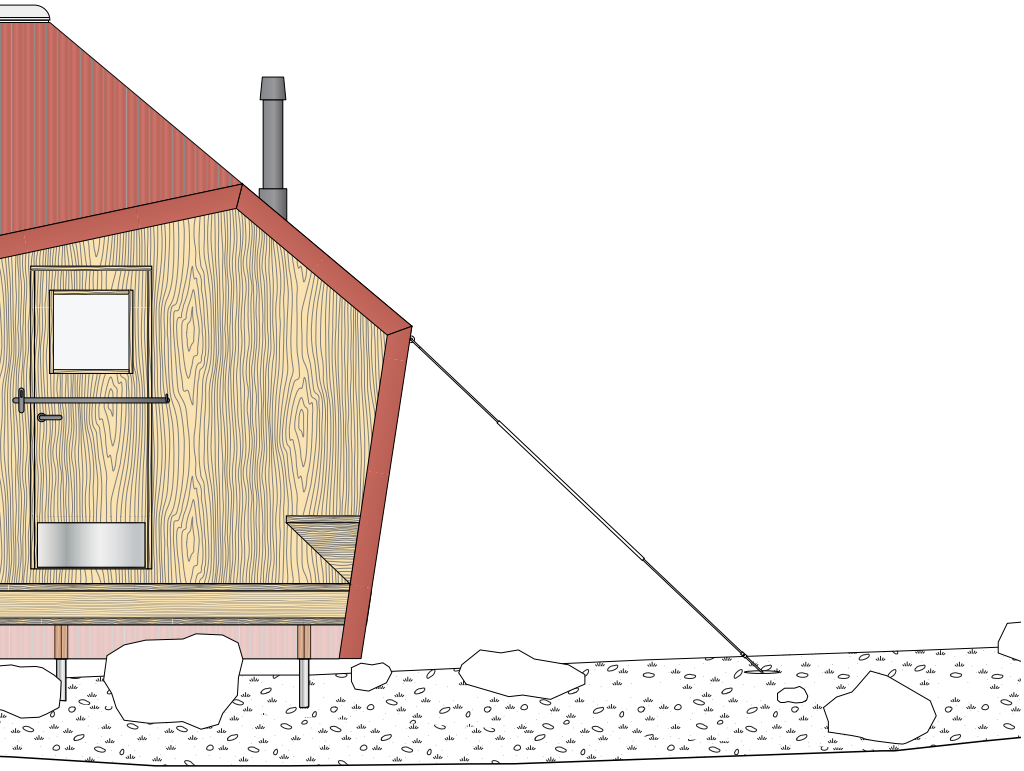
VARIATIONS

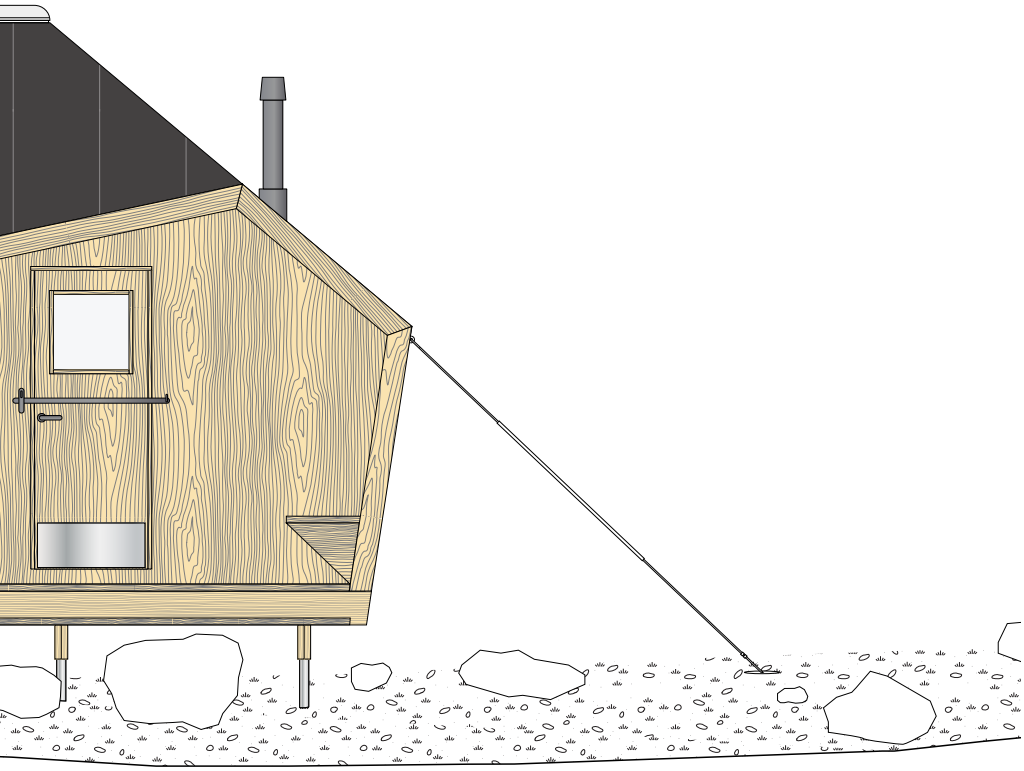


Facade with bitumen roof felt, battens, and sheet metal,
the durable solution.



Facade with only bitumen roof felt, the cheap solution.





View in winter landscape.

Interior view.

Construction and Realisation

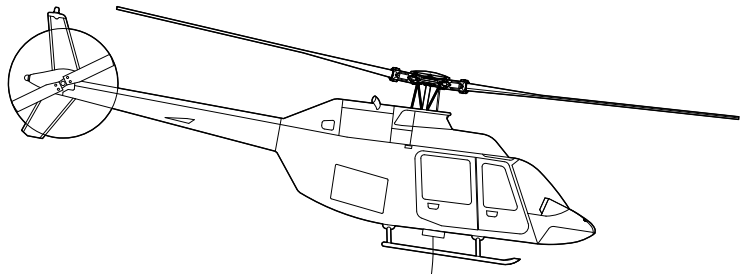
A large portion of the design has been to adapt to the constraining conditions of the site regarding the transportation of material, along with the tight budget. The material would also have to be assembled by four men only without using any larger machines.

My local contacts told me that the most common and cost-efficient to do was to bring the material in spring on snowmobiles. A helicopter was used only during emergencies in the summertime.

Asking the local helicopter company gave me a good hint of what transport by helicopter would cost. Compared with the annual estimated income for a full-time working reindeer herder, the difference is severe: snowmobile is around a tenth of the cost compared with a helicopter. However, the pros of the helicopter are heavier lifts, easier and controlled assembly on site.

By choosing snowmobile as the transportation method, the project is forced to design CLT- elements of smaller size, light enough to be handled by four men. I count on approximately 120 kg, preferably smaller. The closest CLT manufacturer is Martinsons in Bygdsiljum, more than 500 km from Ritsem (one could discuss the environmental impact of wood in this case, but that is not an (important) part of this thesis), and a well-recommended width of the boards are 1 000 - 1 500 mm. To minimize waste, the panels should be as similar in size as possible.

The roof boards will have to be lifted by the on-site men. Their size should therefore be lighter than the slab- and wallboards. This will be possible by splitting the CLT panels and CNC them into interlocking elements. It will increase the cost but save the backs of the reindeer herders that most likely would construct this.

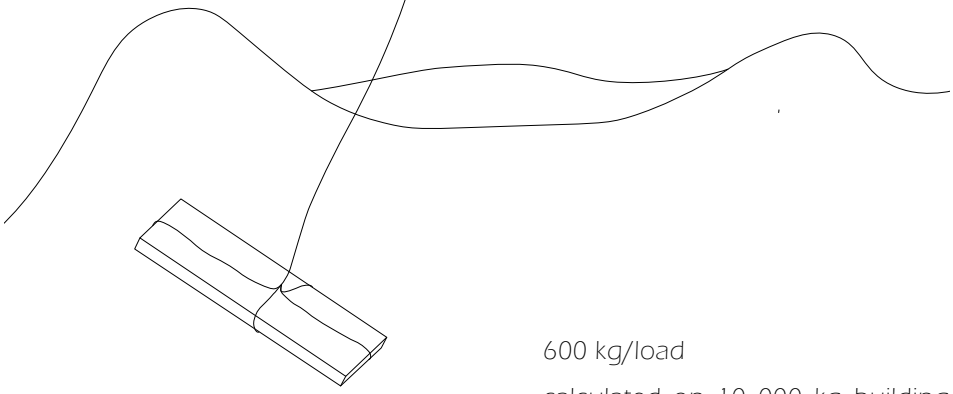


1 000 kg/load

calculated on 10 000 kg building material, 10 round trips.

approximately 10 hours.

168 400 kr tax excluded



600 kg/load

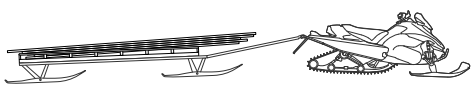
calculated on 10 000 kg building material, 20 km/h, 70 km roundtrip, 50 round trips.

approximately 80 hours including load and unload.

29 000 in lost income +

5 600 - 33 600 kr in fuel

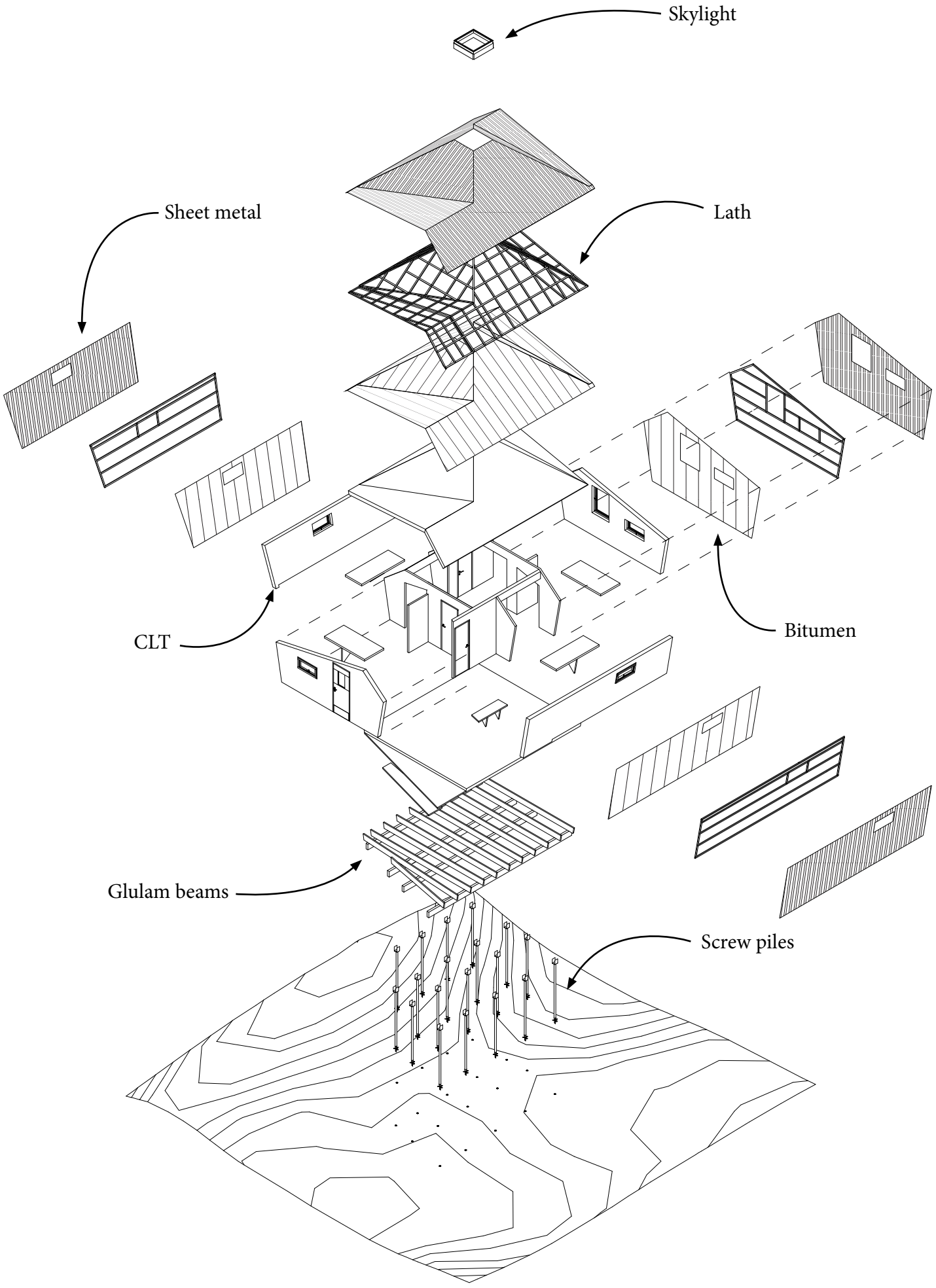
34 600 - 62 600 kr tax included



A hard decision has been the general appearance. The roof is then clad with bitumen roof felt. This is a common material for the very plain and spartan cabins that the Sami use in Sarek. It is easy to repair, keeps underneath tight, and is very cheap. It, however, requires some annual checks for repairs. On top of it, sheet metal is placed for appearance and outstandingly low maintenance over the years. A batten grid is placed between the bitumen to create ventilation between the roof felt and the sheet metal.

The roof felt does sustain the cabin from rain and snow just by itself. The cabin's design does not allow for installing a metal roof for laymen, so professionals have to be brought to the site, which I can tell from experience, is a project by itself. I, therefore, propose the bitumen roof felt to be a good and expressive start-off.

Jonas Lindgren at Martinsons informed that CLT cost between 600-1 200 kr/sqm, where my chosen elements of 150 and 70 mm components cost 750 kr/sqm, respectively 600 kr/sqm. On top of that, CNC-milling cost 20 kr/min; a reference window opening of 1x1 m cost 200 kr to mill. My material calculations can be seen on page 138-139.

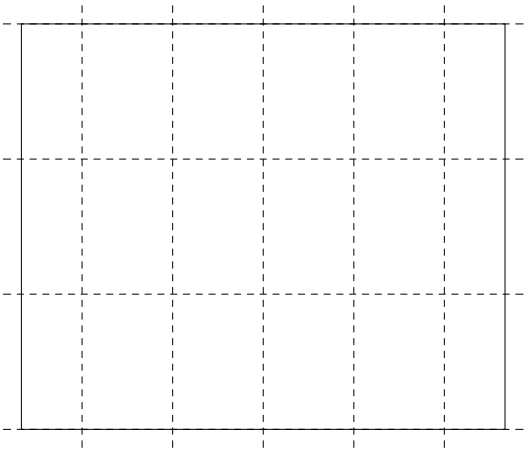


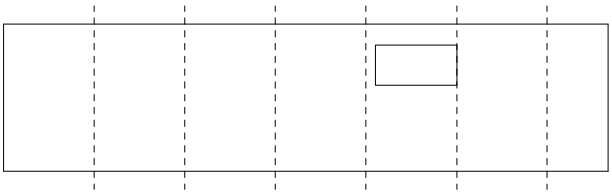
Exploded axonometry.

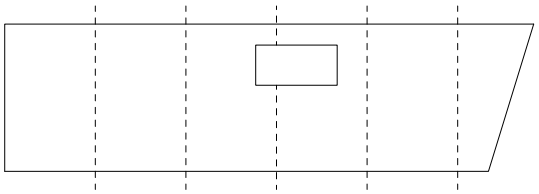
External Slab, Walls and Roof

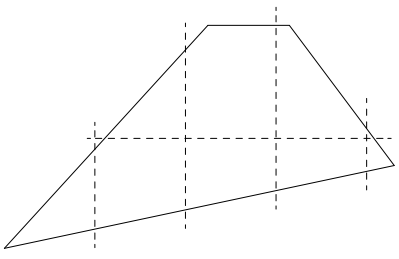
1 meter wide elements, a maximum of 120 kg elements.

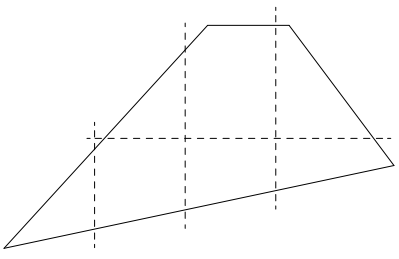
Cross-screw attachment and glued together on site.

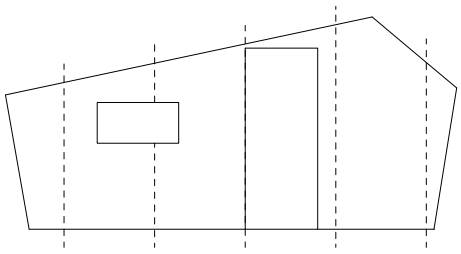


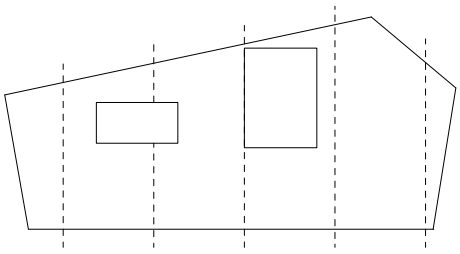


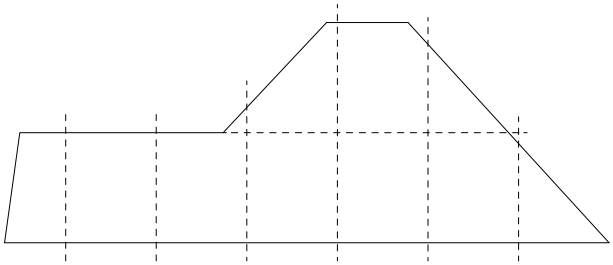


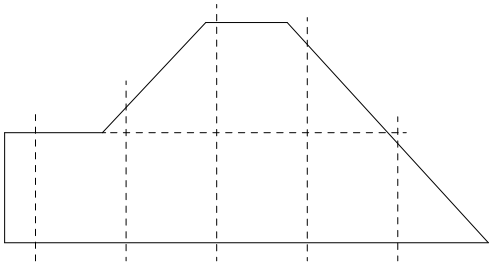


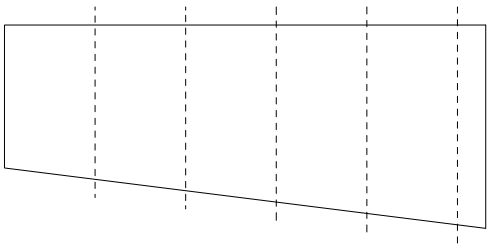


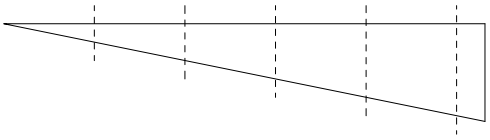










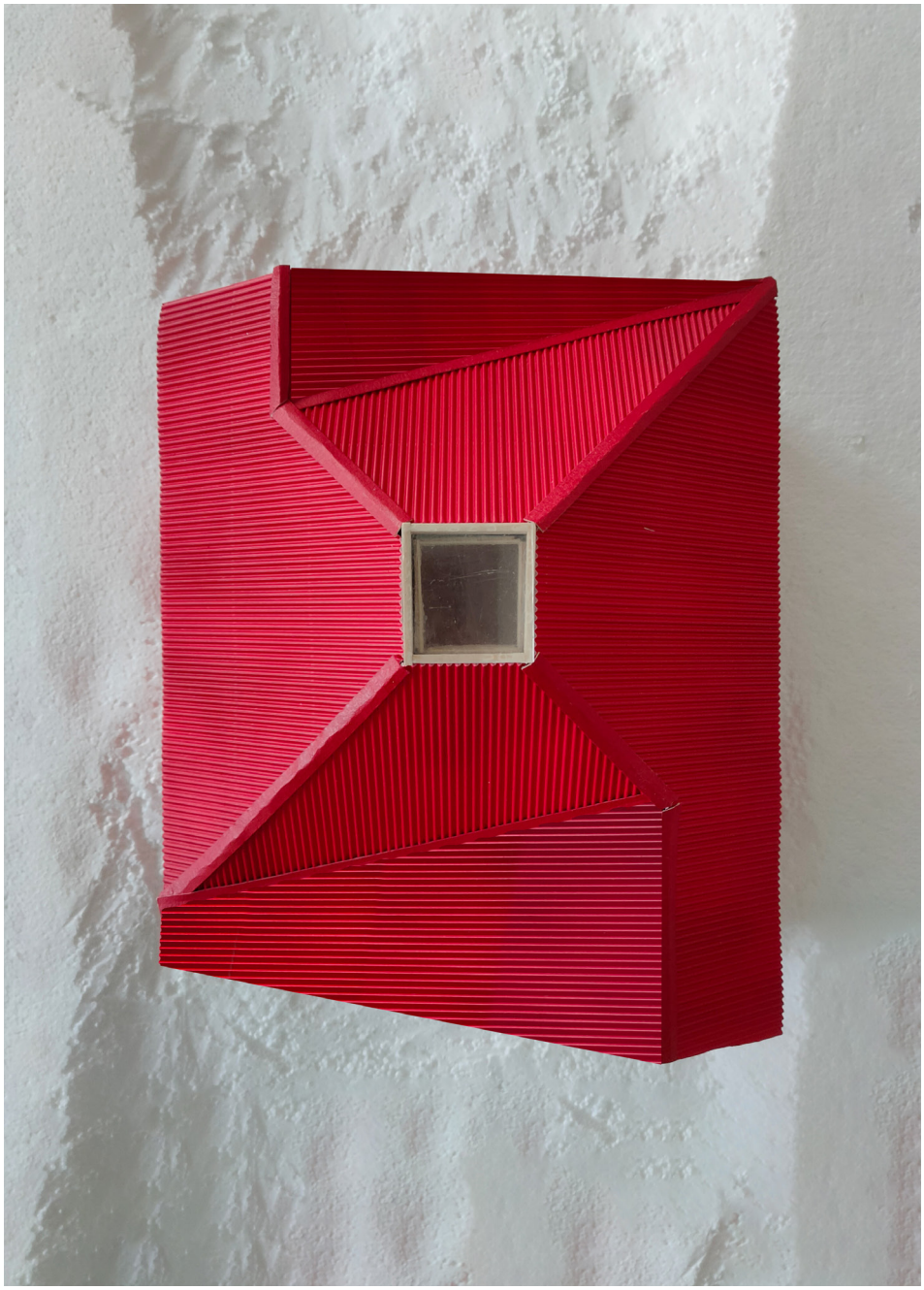


Final Model

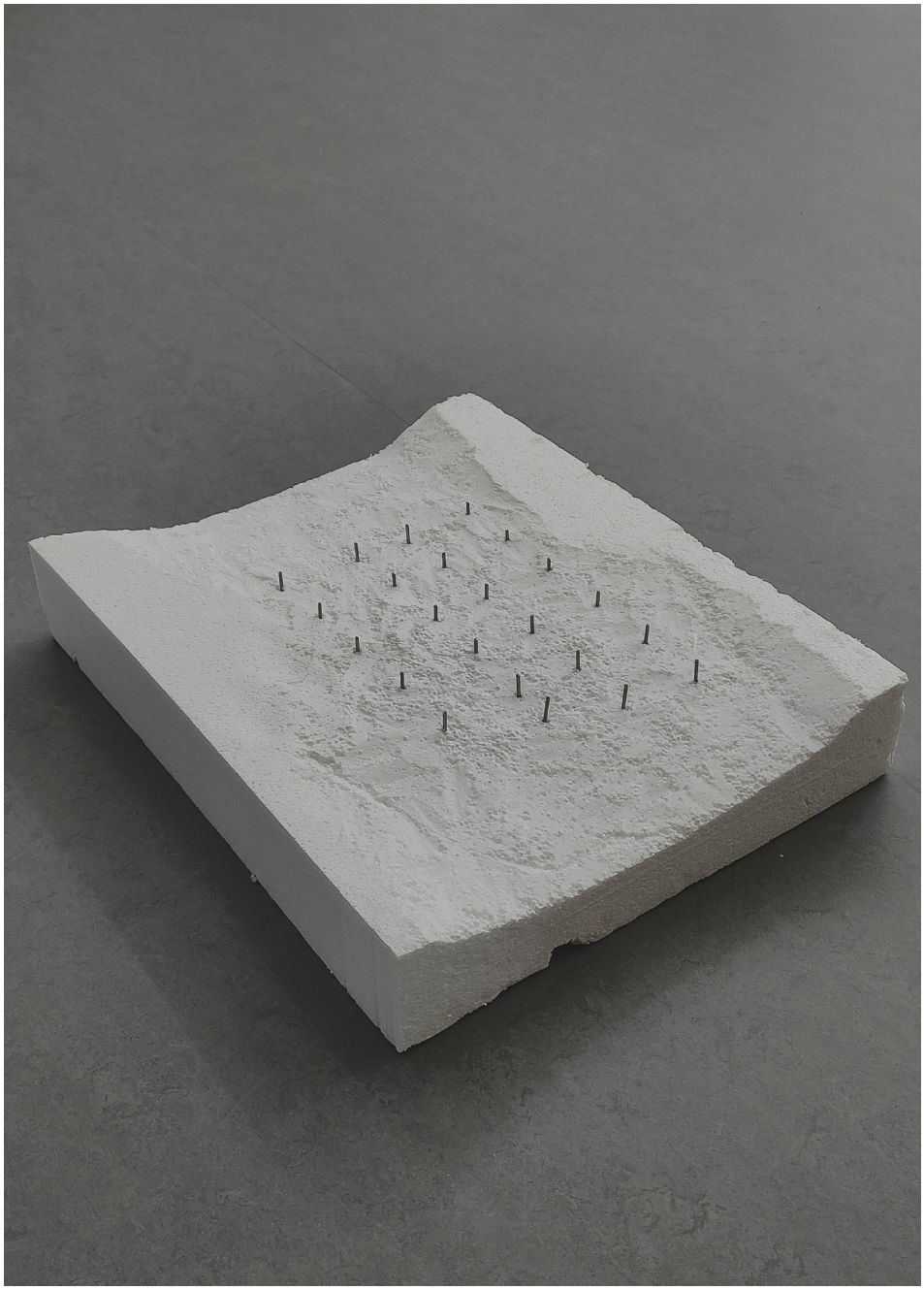
The final model was thought to be built in a larger, more detailed scale. Since the consideration of building a model was initially thought to be built in 1:1, that thought was soon discarded due to the cabin's increased size and use, from a 10sqm open shelter to a "luxurious" 22,5sqm cabin.

Decision fell on plywood to resemble CLT elements. After a two-day tryout in 1:10 scale, the chosen scale came to be 1:20 due to the machine parks' limitation to material thicknesses (15mm in 1:10, 7,5mm in 1:20). The final model went faster in 1:20, much faster in fact. After the slab and walls were glued together, the roof was done separately for interior exploration. Also glued, it was harder than the walls when it came to angles. Some mistakes resulted in the necessity of using wood plaster to fill holes and missing edges, which after all turned out better than expected.

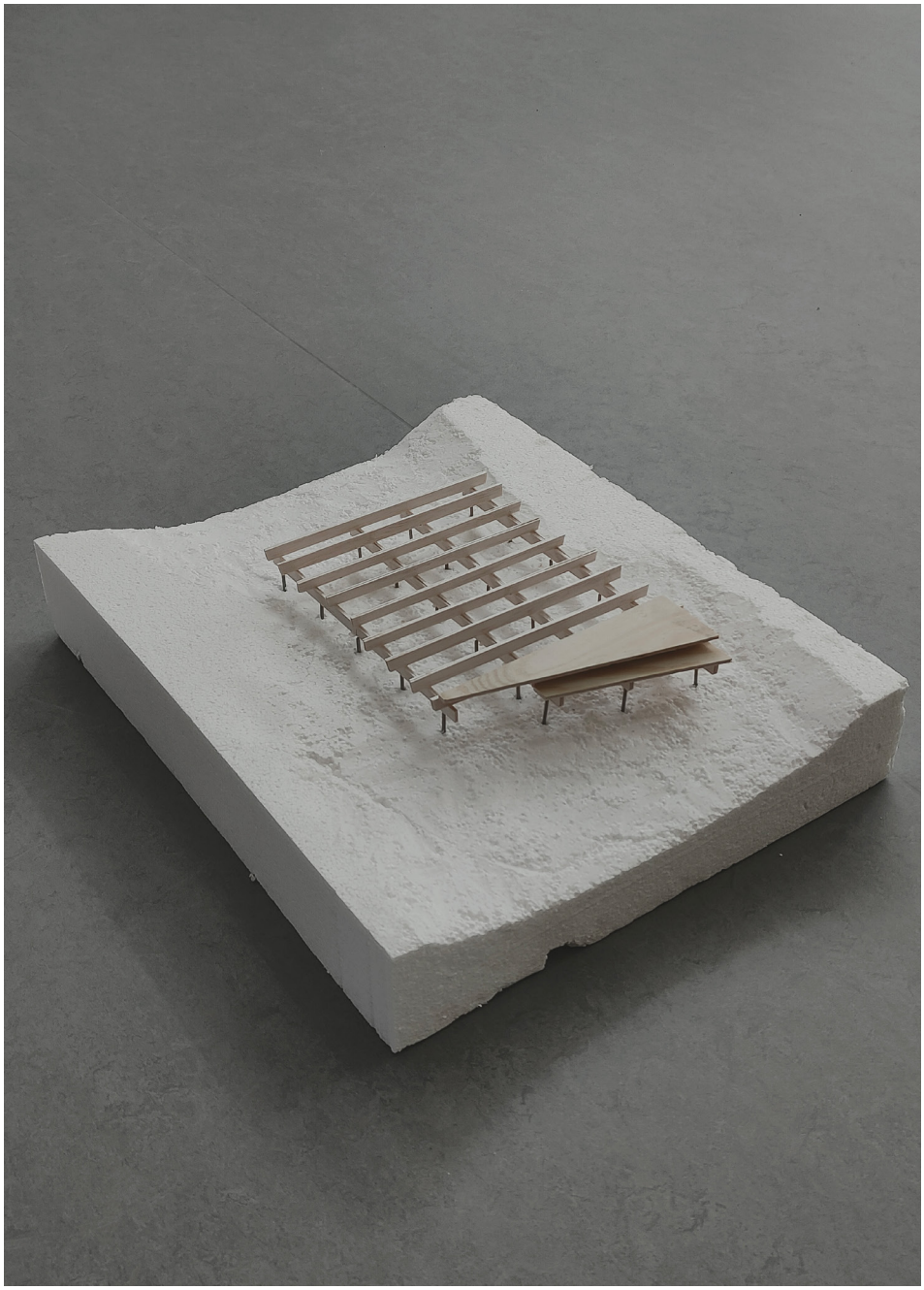
Like the proposed cabin, the model was then clad in bitumen roof felt, only that on the model it was in the form of thin black paper. Balsa wood was used for the foundation and the battens. Ribbed paper was then spray-painted red to look like sinus shaped sheet metal and attached on the battens. Folded paper hid the ridges, spray-painted the same red. Balsa framed the riehpen and transparent plastic was glued to form the skylight. The screw piles took the form of 3mm steel poles, nipped off to desired length. They were later driven into a bed of Styrofoam, shaped like the immediate site landscape. The white color of the Styrofoam looked like a snow-covered site, but the lack of rocks made it less lively. Instead, focus was on the bright red structure which lied on naked steel poles.



Top view.



Screwpiles.



Glulam foundation and porch.

External and internal walls.

Roof and skylight.

Foundation detail.

Construction detail.

Cost Calculation

The material cost has been calculated with the help of the online tools available, such as Träguiden's Lathund and phone calls with Martinsons, Fiskflyg, Dala-profil, and Paalupiste. The other expenses are simply taken from fast search to get an estimated price, like windows and kitchen modules.

Due to the fact reindeer herders are running a company, and the cabin is de jure a building used by that company, the value-added tax (VAT) does not have to be added when purchasing the material, and vice versa for any possible future external, professional labor. Therefore, I decided to present the cost excluding VAT, which is an additional 25% of the price in Sweden.

I could not find storm wires online or through phone calls, so I can not specify those in the calculation. However, they affect the cost, but I think the additional +15% for screws, nails, etc., will cover that expense.

CLT

Estimated price per cubic meter CLT from Martinsons, including project planning, average CNC milling and labor:

Normally:

7 500 - 8 000 kr/m3

At current price level:

9 000 - 9500 kr/m3

This project's CLT volume:

19,2 m3

Total CLT cost:

150 - 190 000 kr, excluding VAT

Foundation

Glulam beams 42x225

total length 98, 3 meter

187,5 kr/m ex vat

14 745 kr ex vat

Screw piles Paalupiste Helix 2,2m

780kr/p ex vat

x 23p

17 940kr ex vat

Screw pile console 90-130 mm

160kr/p ex vat

x23p

3 680 kr ex vat

Roof

Bitumen roof felt:

42+38 sqm

120 kr/sqm

9 600 kr ex vat

Lath

288,5 m

10 kr/m

2 885 kr ex vat

Sinus 18, sheet metal:

44 + 40 sqm

200 kr/sqm

16 800 kr ex vat

Doors, Windows & Skylight

Front door, M8x20:

4 000 kr ex vat

Door, M8x20:

2x1 000 kr ex vat

Door, M7x20:

2x750 kr ex vat

Window, pivot, M9x5:

4x1 800 kr ex vat

Window, sash, M8x11:

2 100 kr ex vat

Skylight, 900x900 opening:

6 000 kr ex vat

Wood Stove and Kitchen

Jötul F 165 or similar with small footprint and ability to be near a burnable wall.

17 600 kr ex vat.

Kitchen, Ikea Metod or similar:

1x40 module:

1 600 kr ex vat

2x60 modules:

2x 1 500 kr ex vat

1x end module:

1 150 kr ex vat

2xcupboard 80 module:

850 kr ex vat

Screws, Nails and Extras

+ 15 % of material cost calculations

Transportation

calculated on 10 000 kg building material, 20 km/h, 70 km roundtrip, 50 round trips.

approximately 80 hours including load and unload.

29 000 in lost income +

5 600 - 33 600 kr in fuel

34 600 - 62 600 kr tax included

Martinsons delivery to Ritsem:

12 000 kr ex vat

PART 3

Reflection

From the Heart

I do not think that I have ever wasted so much time on research, materials, models, and such that I had no use for. Sometimes I just produce without any thought, hoping that I will benefit from it later in a phase I hope to reach. That was not the case in this thesis, which could be an effect of its specific nature. However, as my examinor Johnny Åstrand reminded me, sometimes one might learn more from mistakes than success.

Not reaching the site was probably one of the biggest mistakes and wastes of the project. The best time to go to Sarek is July-August-September, but since I had not decided what to do by then, I, therefore, tried my best in March, which was, obviously, too early. I even got recommended by several Sami people to go in the second half of April to have a better chance with warmer weather and longer days...

An initial aim of using physical models for design experiments happens to be the most crucial tool for concrete design development. My tendency to get stuck by the computer and modeling software was inevitable this semester as well, but my inner voice pushed me to continue the modelmaking, and I think it paid off. I was also encouraged to contact media, magazines, and newspapers to go viral and exploit the project. That has been in my mind since the start, but nothing of that nature was carried out.

While CLT is an excellent material, it also brings challenges to this project. It requires a lot of preparation for prefabrication, and it is not reversible. Therefore it demands plenty of attention and detail.

The final proposal is, despite how much I tried, however not entirely site-specific. The design is adapted to its surroundings but might work in similar landscapes, where wind resistance, site assembly, low maintenance, adaptations to nature, and dramatic weather changes are essential. The design might suit as well. Another mountain shelter mentioned Kebnekaise Toppstuga, where a lot of the technical inspiration was extracted from. However, one could argue if that very design is particularly site-specific.

But, on the other hand, due to the somewhat misfortunate attempt to reach the site, the thesis went deeper into the site's surroundings, history, and current state, which someone makes the final proposal specific for, at least, Sarek National Park. The inspiration from Sirges, the Hamberg cabins, and the national park's restrictions regarding building code has heavily affected this project.

But a reflection should also deal with the project and its theory. Just to reach the site, for example, is not an easy task no matter the season, and one could argue if it is suitable to erect a building here with an estimated material cost of more than 300 000 kr. But placing that sum next to the value of the equipment one needs to make it here is perhaps motivated.

Considering the project's realistic nature, a possible follow-up is further dialogues with the stakeholders, including a forgotten contact in Jokkmokk municipality. Since there has not been any follow-up with the stakeholders since mid-May, there might be some disagreements or necessary adaptations to the program, the choice of materials, or something else. Generally, my contacts have not really been involved in the design development more than giving tips for inspiration. The design proposal might therefore be received with various positivity.

I believe the final proposal offers plenty of room for adaptations. The CLT could be block walls, the most common off-grid construction method among the Sami, STF, and the Norrbotten county administrative board. The plan layout could also be adapted, but the social core should stay intact. One could translate the proposal as a "liquid" design, floating within its own boundaries. Still, what I have proposed is what I believe is the best for a durable, functional, simple, yet aesthetically pleasing design. It is "only" a matter of money and law-abiding.

Now, it is not up to me to decide about this cabin. The laws restrict the Sami to sublet the cabin to any other part than other Sami if it is even approved by Jokkmokk and/or Norrbotten county administrative board. From what I got from Mikael, he said that they primarily concern the laws regarding reindeer herding. Sarek National Park's nature is not affected negatively by any built structure. If one could argue about the need for such a cabin, its affection for its environment, the reindeer herding, and the tourism, the outcome might favor this thesis's objective.

To be continued

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Carl-Johan Utsi

Västerbottenkuriren

Sveriges Television

Calazo Maps, map service

Lantmäteriet/Swedish Land Survey Authority

Tham & Videgård arkitekter

Martinson

Fiskflyg

Cover Image

Boalnotjåhkkå on March 15th, photo by the author.

Names

Where the names are presented for the interviews, written consents has been collected.

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