Pubudu Nipun Hettiarachchi

AVALANCHE-SCAPE.

Abstract

Introduction

As a response to the emerging issue of increasing avalanche risk in coastal villages in North Norway, this diploma explores the possibility of implementing a sensitive design for a whole landscape as a protective measure where possible rather than using conventional avalanche protections.

Snow avalanches have been a constant threat to small fjord villages in northeastern fjord coasts in Senja for a long time. There have been several disastrous snow avalanches in these villages in recent history. Climate change, with changes in weather patterns, exacerbates the risk and leads to seeking new avalanche protection.

On the one hand, the superposition of a big 'wall' is an efficient operation for fast implementation in a limited area of construction and the ability to quantify accurate post-risk assessment. However, they imply the destruction of features that qualify the character, ecology, and heritage of the existing landscape, reducing the use of the land solely for protection.

Due to the horizontal extension structures, they are a barrier to many other things, such as the regular ecological movements and people and the view of landscape features and the horizon. Furthermore, the construction of such a big wall requires considerable materials and energy inputs.

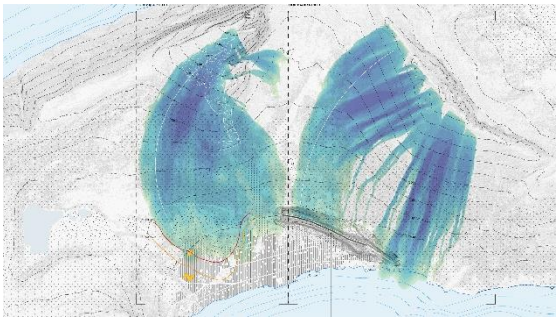
On the other side, the design hypothesis takes avalanches as one of the most critical natural disturbances to mountain ecosystems to regenerate, spread, and maintain biodiversity and imagines a design extended to the whole landscape as a dynamic device of resistance and protection.

The design starts from the close-up reading and interpretation of the features that qualify the existing landscape, 'work with nature,' and local communities integrate and possibly enhance aesthetic, ecological, and cultural values of the landscape while reducing materials and energy inputs in the process of change.

Case Study of Fjordgård

The landscape of Fjordgård has been in transformation before Iron Age settlements. In the 1700s, it was a Sami settlement that relied on agriculture and animal husbandry. Later, in the 1960s, the industrial fishing industry transformed the fjords and eventually neglected the inner landscape.

More recently, the very mountain that poses threats to the village, "Segla," featured in popular magazines such as The National Geographic, boosted tourism, creating and driving its urban transformation.

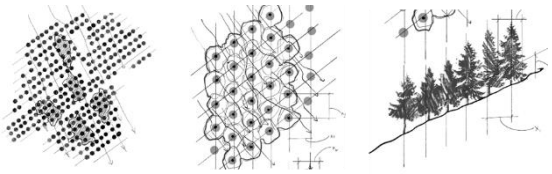


Fjordgard has a long history of avalanches. In recent times, the 1958 event caused casualties and infrastructure damage. The

northern part of the village has an avalanche protection wall constructed in the 1980s and reconstructed in 2020. Due to the increased risk of avalanches, safety measures are now being prioritized in the village. The village is seeking a new form of avalanche protection for the southern part of the village.

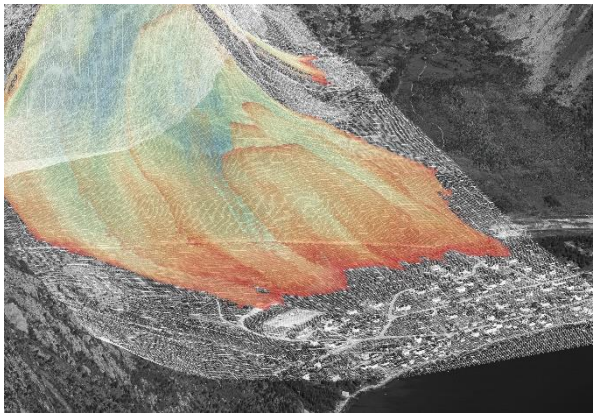
Designing Protective Landscapes.

Among many avalanche protection methods, Ecosystem-based disaster risk reduction (Eco-DRR) methods have been used since the age of early settlements to protect against avalanches. Eco-DRR refers to the conservation, restoration, and management of ecosystems for disaster risk reduction, aiming at sustainable and resilient development of communities. As climate change demands more sustainable approaches to new challenges, stakeholders are increasingly turning to these methods over singular-purpose conventional methods.



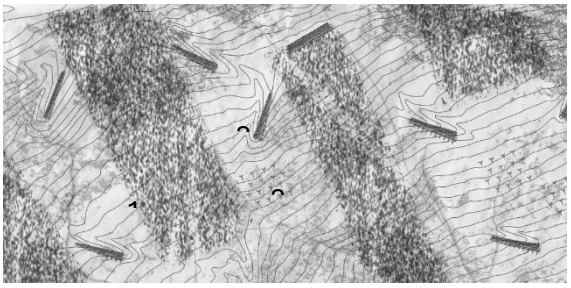
The proposed landscape design strategy aims to establish Eco-DRR in avalanche protection, integrating cohesively with the larger macro context to transform the landscape into a protective spatial device. The design process is divided into 03 basic stages:

1. Collection of differentiated guiding models or spatial models from projects developed for situations that present affinities with the case study.
2. Single spatial model performances are tested and evaluated separately by running a set of simulations with RAMMS, setting hypothetical values of avalanche flows for the case study area.
3. A synthetic spatial concept, output of phase 2, is selected and explored through design in the context of which cultural, ecological, and aesthetic factors are integrated.



In the preliminary stage, the existing site values and properties are included as extra layers of design generators, expecting dynamics of the snow flows and avalanche disturbances to the ecosystems, creating a changing landscape over time. The proposed strategy includes three main elements that work together in the landscape as an instrument of safety.:

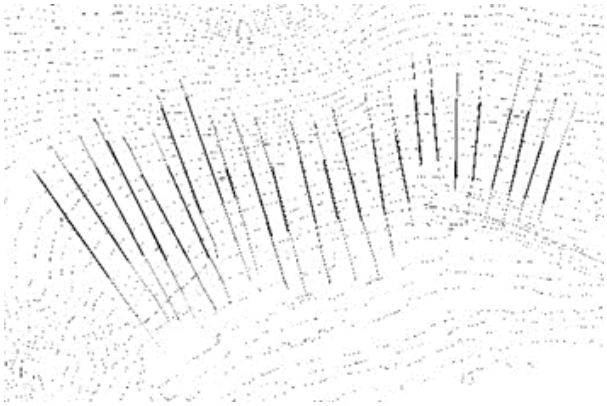
1. Woodland stripes.
2. An obstacle system
3. A berms system.



The rows of wooded stripes are placed to slow down the speed of avalanches. These rows emphasize the concave shape of the terrain and are placed in the direction of the avalanche flow, making long stretches to

retard velocity effectively. The surface hydrology pattern and the possible catchment areas determine the distance between each row.

As the wooded stripes retarding avalanche flows, the gaps in between allow the avalanches to flow through, creating an edge effect on the margins of the woodlands. To further deflect and retard avalanches while keeping the natural disturbance to the surrounding woodlands, wooden walls, and a tripod system are used.



Morphological changes in the terrain are made as permanent mechanisms to direct the Avalanche flows and meltwater toward the end destinations. They are used combined with the wall system. New waterways allow rainwater and meltwater to run to the open areas below. They are creating new hydrological dynamics, creating new pathways and trails.

The system provides safety, enhances ecological and aesthetic values, and creates a dynamic landscape experience for visitors and residents. It also addresses the need to care for the landscape by providing a clear purpose.

The system uses structural elements to support small plants withstanding avalanche forces during growth. These elements are moved or substituted over time. The system also recognizes avalanche disturbances as a form of succession and uses them to start replanting. This management will allow the woodlands to become more diverse regarding age and productivity in the ecological process.

Summary

The project's goal is to promote safe and sustainable management of snow avalanche threats, providing an opportunity for the community to inhabit the local landscape.

A design prototype of a large landscape is explored as an alternative to substituting a large-scale technocratic infrastructure for snow avalanches in a long-term process. Redirected flows create dynamic landscapes as ecosystems and sets of spaces that visitors and locals can engage in actively.

Multiple landscape entities working together as a system enhance the safety, the ecological diversity of the area, and a coherent overall image and rich space of experience.