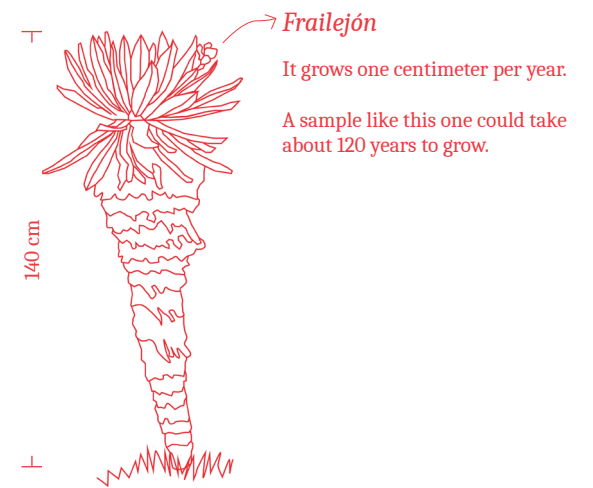


Afterlife of gold mines
in the *Páramos*

Sergio Andrés
Gómez Barrios

2022



Frailejón

It grows one centimeter per year.

A sample like this one could take about 120 years to grow.

Thesis structure

1. Introduction and research questions
2. The Colombian páramo and gold mining
3. Precedent study: Norway
4. Precedent study: Mines
5. Precedent study: Outro
6. Páramo restoration
7. Site

Introduction

The following landscape work will be in the Colombian páramos, that is currently at imminent risk due to global warming and economic pressures. A study of Norwegian precedents will be made to apply large-scale improvement strategies and landscape artifacts designed to enhance the landscape values of the site.

Research questions

How can we improve the complete ecosystem of the páramos of Colombia (Páramos, high mountain and rivers?)

Large scale

How can we protect the páramos of Colombia in balance with the social context (local communities and tourism) with aesthetic landscape values?

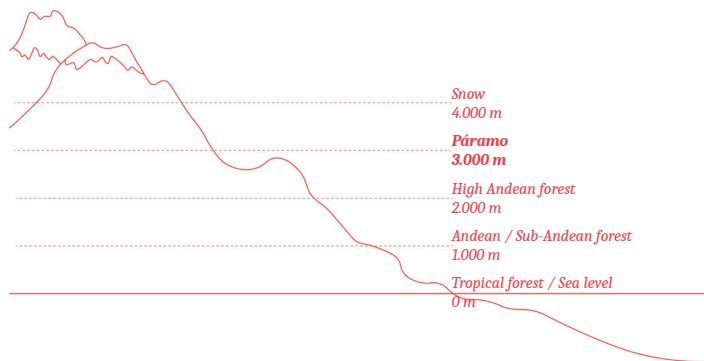
Detailed scale

How can designed spaces give a new opportunity to communities that live in páramos and will be left without an income?

What is a Páramo?

The páramos are natural ecosystems geographically located under two principles that must always go together, the first refers to latitude, and the second, to altitude.

According to the latitude, the páramos have to be located between latitudes 23°, that is, the equatorial zone of the planet. In terms of altitude, it must be located approximately between 3,000 and 4,000 meters above sea level. Specifically in the American continent between perpetual snows and high Andean forests.



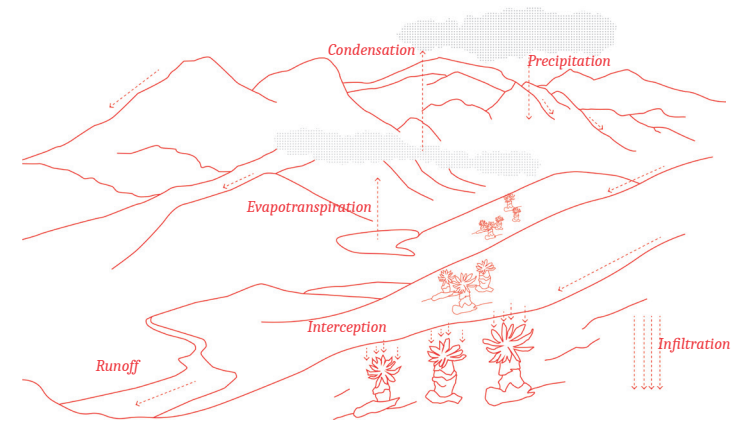
What is a Páramo? Ecologically

The páramos of the northern Andes are the source of rivers... These rivers or water flows return to the Andes in the form of flying rivers, as they transport water vapor from evapotranspiration from the Amazon rainforest. With the winds it reaches the Andean páramos, there it condenses and returns water to the páramos to be filtered, stored and gradually released, in this way the underground aquifers and surface water flows are recharged.

The páramos are strategic ecosystems that regulate and provide about 70% of Colombia's water resources, store large amounts of atmospheric carbon in their soils and have high levels of endemism.

The water that comes from the páramo benefits 16 of the country's large cities and about 16.8 million people (35% of the national population).

Source: Páramos Colombia: Biodiversity and management, Alexander von Humboldt Biological Resources Research Institute, Pages 11-18-50.





Agricultural Land
in Páramo area.

(1)



Illegal mining.

(2)



Protest against mega
mining in páramo areas.

(3)



Massacre in Páramo La Sarna,
Boyacá, Colombia.

(4)

What is a Páramo? Socially

The páramos of Colombia currently present several potential risks of ecosystem loss due to multiple social and territorial factors that have been forged decades ago and are still in dispute.

Depending on the region of the country, there are territorial disputes directly related to the páramos, in Cundinamarca and Boyacá, for example, a decline in the endemic topsoil and vegetation of the páramo can be found due to the high number of potato farms found in the region. In Santander, the dispute over the territory started from the exploitation of gold in paramo areas where gold has traditionally been exploited and on a small scale, but in recent years foreign companies have wanted to enter and exploit through open pit mega mining and later underground mega mining.

In addition to commercial factors, the armed conflict in Colombia has also played an important role in the displacement of populations.

What is a Páramo? Imaginary of Colombian culture

For decades, the armed conflict limited free movement in the country and, therefore, its discovery. Due to this, there is a lack of knowledge of the national territory and its ecosystems by Colombians, that is why until now, in recent years it has been discovered how such a biodiverse country actually works.

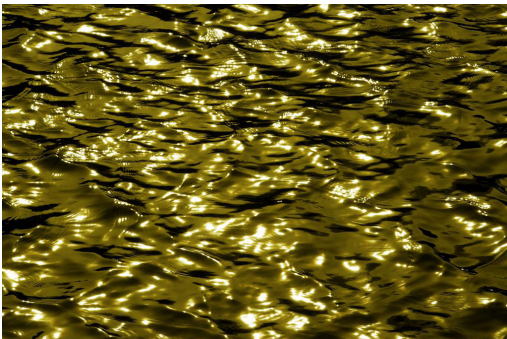
The first time Santander became aware of the páramos (or at least mine), was due to calls from environmental leaders in the area, alerting the community of the possible deterioration of the páramo and the region's drinking water derived from these, due to an attempt by foreign multinational companies that wanted to extract gold within the páramo limited area. This was the beginning of a dispute that still continues today (and that is not the reason for this document) that generated different cultural expressions in defense of it: music, photography and art.



Páramo de Sumapaz.
Painting by Ricardo Gómez Campuzano, 1959.

(5)

Nuestro oro es el agua. Our gold is the water.
Photograph by Freddy Barbosa



(6)

What is a Páramo? Oral tradition

“Like in our house, my grandfather, we came with my grandfather, in the lagoon of the house there was a little yellow boy* bathing, and my grandfather came and told me to go get salt to pour it, and it was gold, the water is yellow in our lagoon, and how it was an enchanted lagoon, he came and told me to go and bring salt and he threw it on the shore and the boy came, and as we sprinkled the salt on him, we found him there bathing and turned into a golden stone, the boy turned into stone, he remained just a stone. We have it in a box to sell it, we are going to sell it, the boy is great. Well, there we found it in the last days of January” (Carlos Amado, child, Iguaque, Boyacá, Colombia).

“...The only thing I've heard is that she left, Bachué* left the lagoon with a child and came here to all this territory, and that moved to Bogotá. Once the child was grown, they had many children. When they were old they came again to remember where they came from and they got there and once there they turned into snakes. That's what they say, but I didn't see” (Juan Bautista Ruano).

Yellow boy: Boy covered in gold.

Bachué: First mother of the Muisca Indians.

Source: Between Fogs. Myths, Legends and Stories of the Páramo, Proyecto Páramo Andino y Editorial Abya, Pages 67-71.

Flora and fauna Iguaque's Sanctuary, Boyacá, Colombia.



(7)

Páramo: Vegetation loss

51% of the country's páramos are under some form of protection and 86% maintain their natural coverage, indicating a high degree of protection and conservation.

In 2009, the transformed area of the total páramo complexes was 13%. This value is similar to 2012, however, the proportion of secondary vegetation increased from 0.6 to 0.9%. This trend indicates that, despite the degree of protection and conservation, the pressure on the páramos remains. This pressure is related to agricultural, cattle and mining activities, so an analysis for each site that relates the patterns of change in coverage with the dynamics of these activities is important.

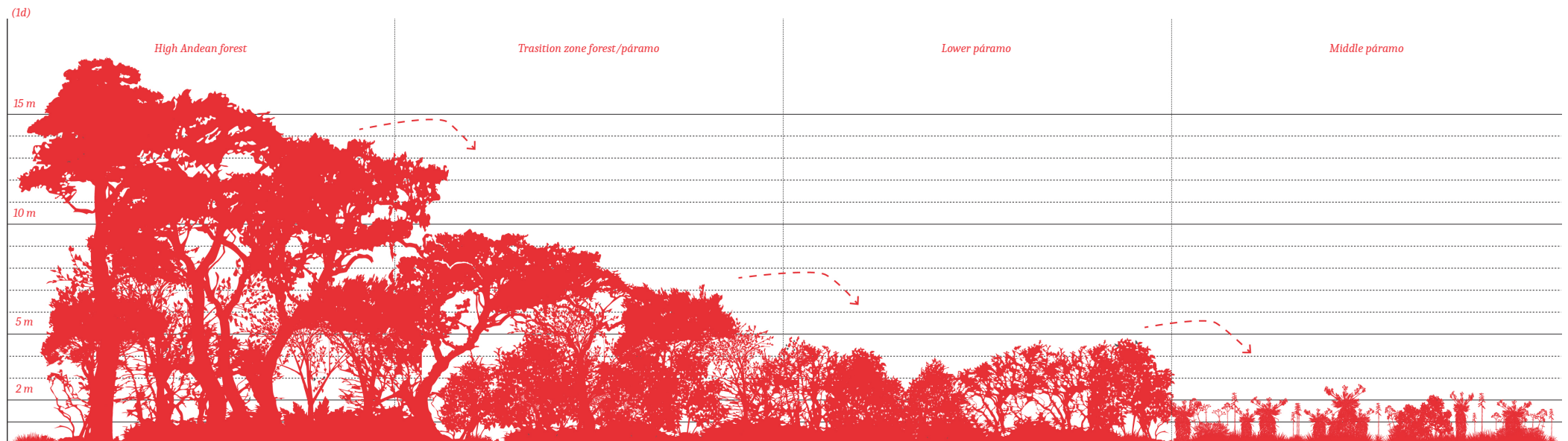
Source: Páramos Colombia: Biodiversity and management, Alexander von Humboldt Biological Resources Research Institute, Page 18.

Páramo: Endangered fauna

The Andean bear is the only bear in the southern hemisphere of the planet that is found mainly in high mountain forests and páramos, extending from Venezuela to northern Argentina. It is a species that plays an important role in seed dispersal. It is currently at risk due to the loss and fragmentation of its territory, as well as the hunting of the inhabitants of these areas due to retaliation for the deaths of livestock and damage to its farms.

Due to global warming, species of birds, insects and amphibians, in response to high temperatures, have begun migration processes towards lower temperatures, which in the tropics means going up altitudes because in the latitudinal range the change in temperature is not drastic.

These displacements could cause the extinction of several species, since, in the search for low temperatures, they could find inhospitable surfaces such as urban centers, poor soils or agricultural lands. It could also go towards isolated peaks that, if the temperature continues to rise, will not find a wide temperature range.



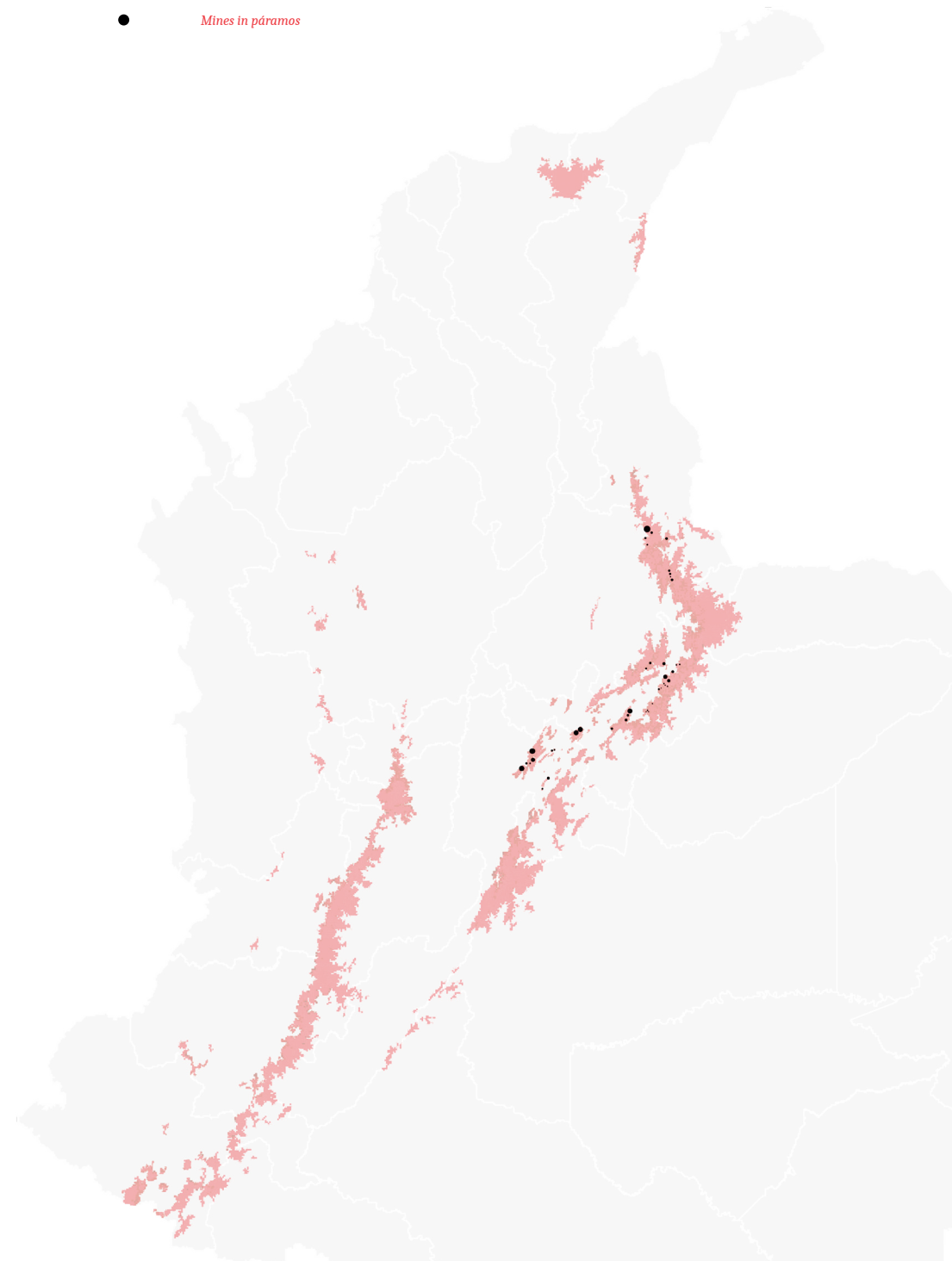


Gold mines in Colombia

Between 2002 and 2010, the area titled for mining activities went from 1.13 to 8.53 million hectares, where 122,000 titles were delivered within páramo areas, therefore, in 2010 it was decided to delimit the páramo ecosystems as a strategy in view of the increase in social conflicts over the new mining titles. The Santurbán páramo, where Vetás is located, would be the first delimited páramo that would serve as a pilot plan for the 36 remaining páramo complexes in Colombia, in which natural elements of the ecosystem and social and economic characteristics of the place would be taken into account.

In 2014, a delimitation of the páramo was delivered, indicating the páramo area, transformed areas that must begin a restoration process, and exploitation areas with the requirement that the activities carried out do not interrupt the flow of the ecosystem systems provided by the páramo. After talks with the communities, the companies were allowed to continue working until the expiration of their licenses. However, in 2016 the Constitutional Court annulled this document, since “it violated the rights to participation and access to information, due to that the community of the metropolitan area of Bucaramanga was not properly summoned, nor were their opinions and inputs taken into account.”

After 12 years, the Santurbán páramo continues without delimitation.



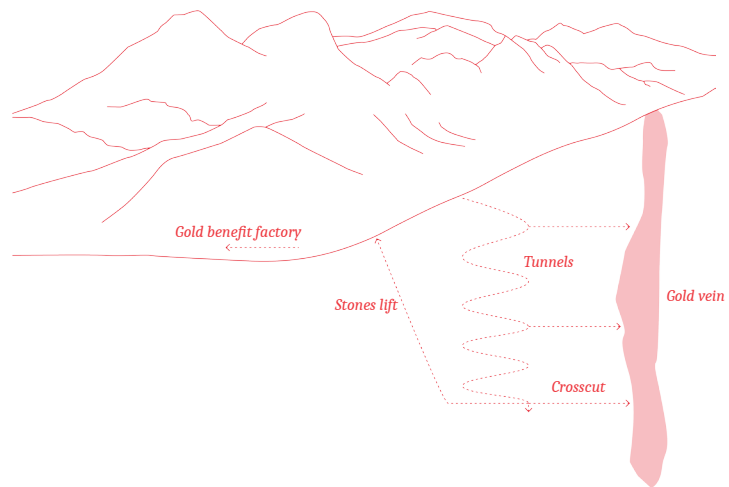
Classification of main mining activities in Colombia: Craft mining, *galafardeo*, multinational mining companies.

Craft mining: Mining with little technology (use of ram mills and concentration tables), with low gold production compared to multinational companies. It works as a group of partners who hire workers directly linked to the company.

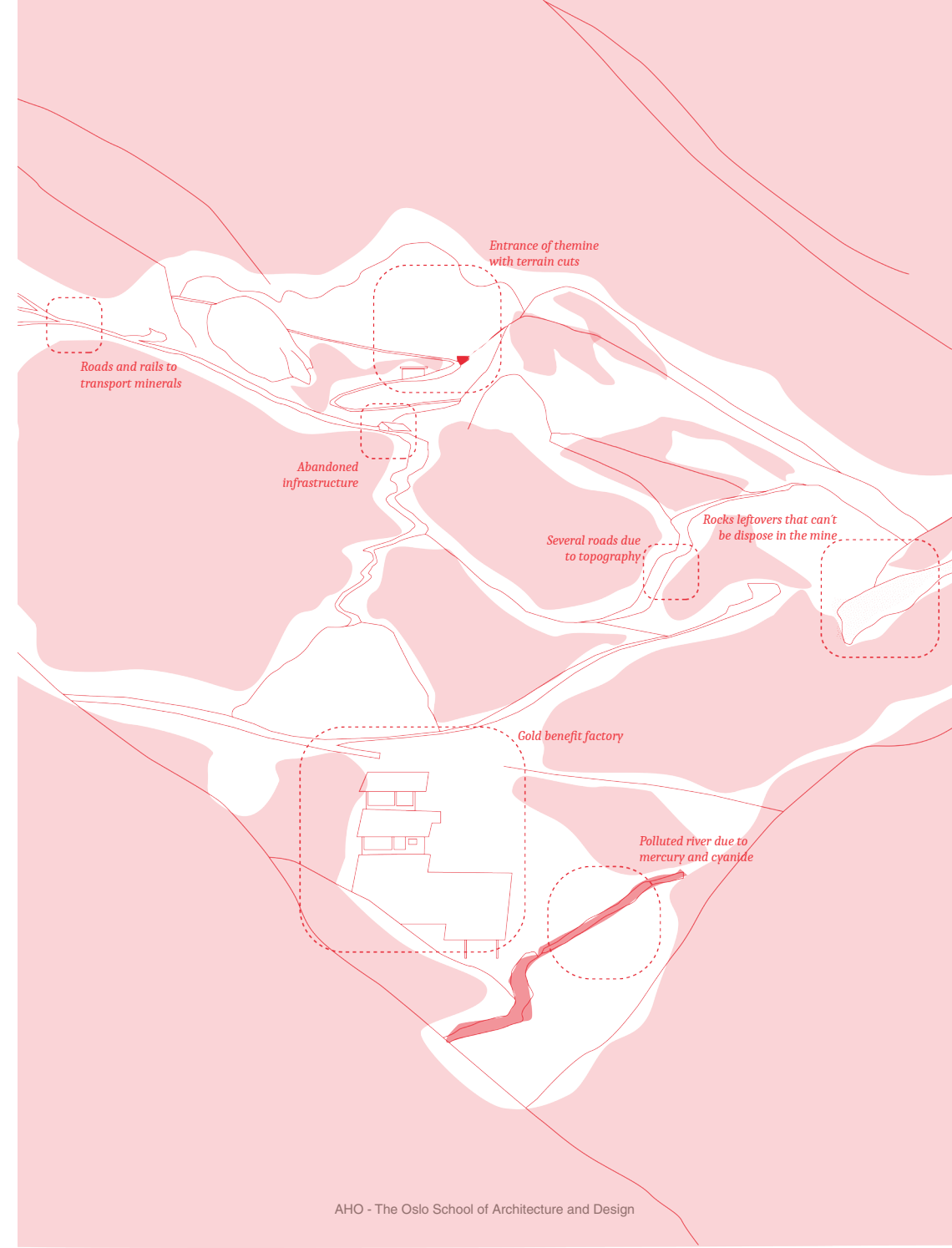
Galafardeo: Illegal extraction in mine tunnels; stones with sparks of gold are extracted to later grind them in the houses. It is done in two ways: 1) clandestinely entering the tunnel at night; and 2) opening holes from the outside to the tunnels.

Multinational mining companies: Foreign companies with a high level of technology, budget and high production that carry out exploration studies, mineral extraction and recovery of the environment.

Operation of a underground mine.



Operation of a underground mine (outside).





Why Norway?

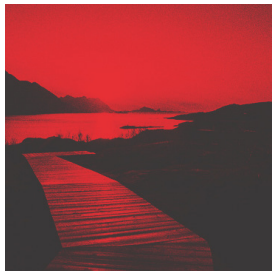
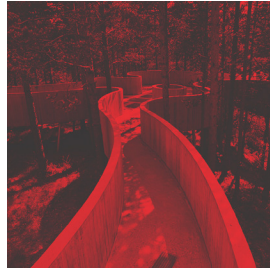
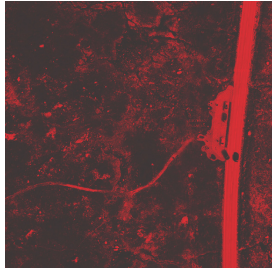
Colombia is rediscovering its landscapes that for many years the war has taken away the opportunity to experience. Beyond that, until now the conditions and ecosystems that they have and what they provide us are being studied, therefore, there is a general lack of knowledge of the cultural values of the landscape.

Norway, on the other hand, has had a rich understanding of its landscape for hundreds of years. From painters who have explored its emblematic landscapes, as well as royal roads that have been built through the most scenic routes in the territory.



Winter at the Sognefjord.
Painting by Johan Christian Dahl, 1827.

(10)



Norwegian Scenic Routes

Norway's national tourist routes are world-renowned for highlighting the variety of its landscape through works of architecture and art connected by vehicular roads. However, as well as praise, it has also received criticism because its mark on the landscape is causing the opposite of its initial purpose. Projects that instead of highlighting the landscape, are taking your attention away from it due to its large occupation footprint, in addition to massive tourism.

Of the dozens of projects built on these routes, specific samples that somehow highlight the cultural values of the landscape with minimum infrastructure were chosen, this being one of the main objectives of this pre-diploma.

(11)

Gildeskål

Jan Håfström

At Oterstranda along Sørfjorden, you can park your car and walk up the little gravel road below the cliff and climb up at the back in order to reach the highest point. From this top you have a great view over the “The forgotten town”, which is reminiscent of a theatre stage.

Inspired by ancient Greece and Indian culture, the artist proposes in one of the highest points of the mountain an intervention of an old theater stage, the reconstruction of what people left behind and what was of the place.

In the páramos of Colombia there are often small buildings that were previously inhabited but are now abandoned in very poor condition. It is interesting to rehabilitate these buildings for different uses that help to enhance the landscape and that the history of what has happened is not rejected, but on the contrary, it is revived.



Traelvikosen Snøhetta

The project was conceived as an experience for visitors in which they are invited to slow down, contemplate, and reflect on time itself and the processes that take place in an ecosystem.

Through stepstones that connect the mainland with a small island, a path is proposed that is completely exposed at low tide, allowing a detail of the small traces of nature under water, and that, at high tide, remains fully covered, giving attention to the general landscape.

It is interesting how the same conditions and changes in the site were used in favor of the project, in addition to raising awareness of the different scales found in the landscape. Also, as with the time factor in the project, it invites visitors to stay and reflect, not to only go to take a picture.



(14)



(15)

Second life of mines

Kilometers of tunnels found in the mines will always come to an end: when the ore runs out, when the license to extract comes to an end and in the case of the mines in the páramo zone, due to its prohibition.

However, there is an opportunity to take advantage of all the energy spent in the excavation of the mines by giving it a second use that, in addition to highlighting the cultural landscape of the site, will provide an alternative income to the former miners.

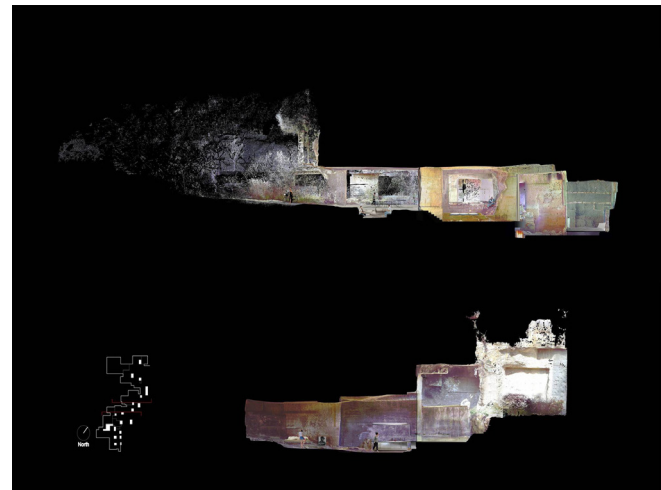
Ca'n Terra

Ensamble Studio

The place that was initially a quarry and that later served as an ammunition depot during the Spanish civil war, was abandoned for many years, until a new history totally different from the previous ones was found to be written in it, once again.

Its materiality and its sharp cuts are reinterpreted as industrial elements, just as it was surely full of tools when it functioned as a quarry, now these elements are changed for industrial furniture located taking advantage of the topography as part of the furniture as well. In addition, the spaces that should be created for its new use are evaluated, as well as the quarry roof opening spaces that allow natural lighting and ventilation connected through internal courtyards and obtaining a beautiful range of sand colors from the sun reflected on the rock.

The different scales, the result of the normal operations of a quarry, provide richness to the different spaces that at times generate a sense of protection and at others of monumentality.



(16)

Tindaya

Eduardo Chillida

The mountain where the project is located was a quarry from which the rock it is made was extracted, until it was closed due to the mountain being declared as a cultural heritage because it was a sacred mountain by ancient inhabitants of the island, therefore, different symbols can be found carved in the stone and for which the project has not been carried out.

The artist's intention was to communicate human with the sun, the moon and the sea. Therefore, his project is comprised of a large central space which communicates with three tunnels, one of access where from the interior you can see the sea; and two zenithal tunnels that let in the light of the sun and the moon. The scale of the central box awakens the senses of smallness, solitude and reflection of man.

It is interesting how the space was explored through the relationship with the direct landscape framing it or how the different entrances of light to the space were explored with only the excavation of the space, without adding strange elements highlighting the rock.



(17)



(18)



(19)

Outro

There are some other projects outside of Norway that explore the fragility and subtlety of nature that are of interest to the project and act as inspiration, even if they are not in a landscape similar to the one is being studied.

The following chapter will study two projects that represent a reflective state of the longevity of nature and the relationship the human has with it.

Tiny Taxonomy

Rosetta Sarah Elkin

With the global perspective, the small detail has been lost. The same happens with large scales in nature, since the perspective of small objects and ecosystems of the landscape has been lost in projects.

In this project Rosetta wants to exalt exactly those little things that have always been in front of us but that we do not see. The vegetation cover of a forest, this time is highlighted by placing it at eye level, where plants, moss, rocks and insects are now visible.

Just by placing the plants at eye level, an intrinsic relationship is created between the subject and the object in which the individual beauty of each species can be appreciated, as well as its fragility.

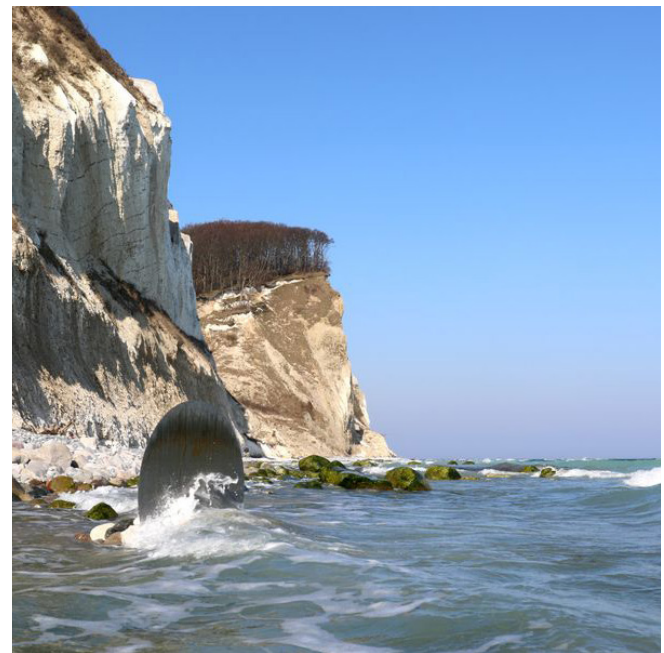
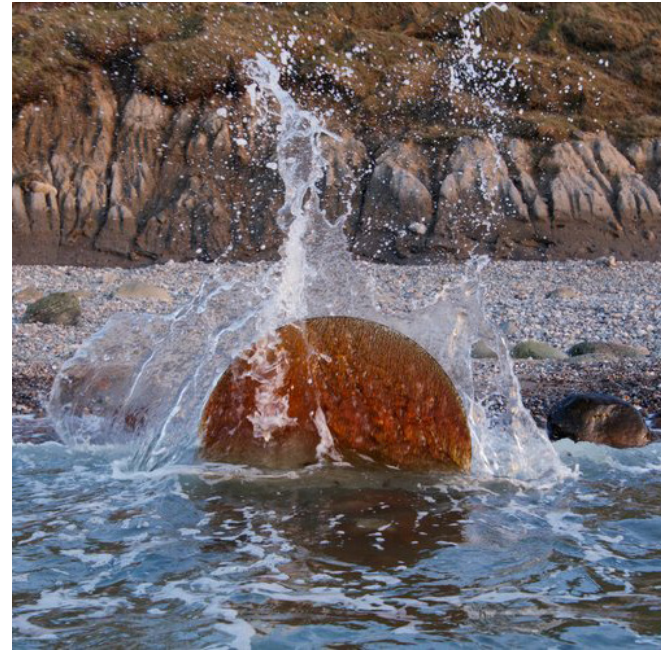


(20)

Tide Studio ThinkingHand

The Project is located on three different coasts of Denmark: Kattegat, Baltic Sea and the Northern Sea where the continuous encounters between industrial materials with the oceans, winds, salt, rocks and algae are documented, where nature and the intervention of human come together as one, with human as the canvas and nature as the painter.

The exploration between the human-nature relationship is necessary to be studied because with the continuous expansion of the human footprint, fragile landscapes will be touched by man. Once studied the sensitivity of the balance between both, there must be tools so that the human is touched internally by nature, in such a way that its intervention will be respectful.



(21)



(22) *Hypericum laricifolium* / Velillo, guarda roca, pino de páramo.



Diplostephium floribundum / Romero de páramo. (23)



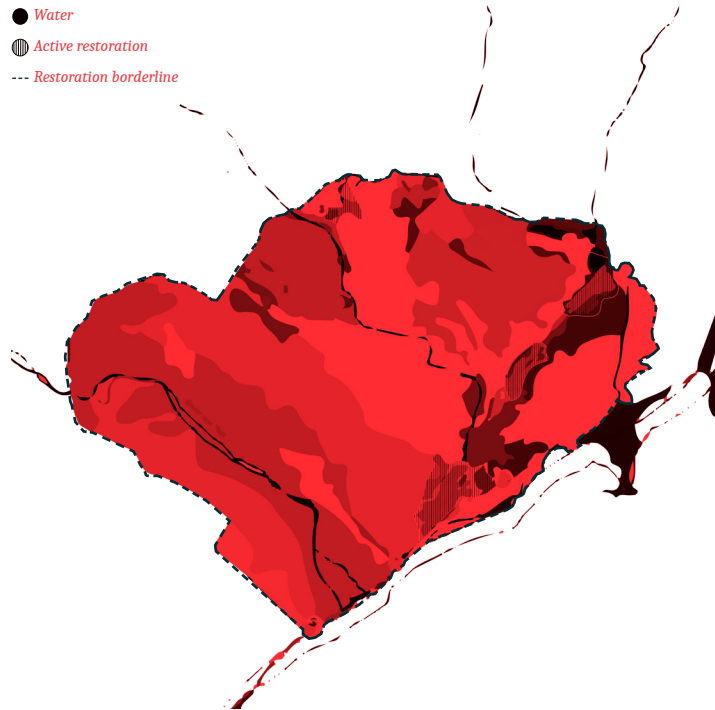
Páramo Los Nevados

In Los Nevados National Natural Park, there is a conflict between the uses of the protected area and extensive cattle ranching by peasants who live in the park.

An intervention of 100 ha of degraded areas was proposed in order to reduce the effects of cattle, establishment of native species and reduce the area of invasive species or native species with invasive behavior.

1. Restoration area: assessed management

A tour is made in areas where cattle is still predominant and sites related to water such as rivers, lagoons, wetlands and peat bogs are prioritized, sites where there have previously been fires and finally where there are invasive species are also chosen.



2. Areas to intervene: Passive and active restoration

Passive restoration: Restoration without human intervention. The restoration is based on the resilience of the ecosystem. The only human intervention is the fence that isolates the area to be restored.

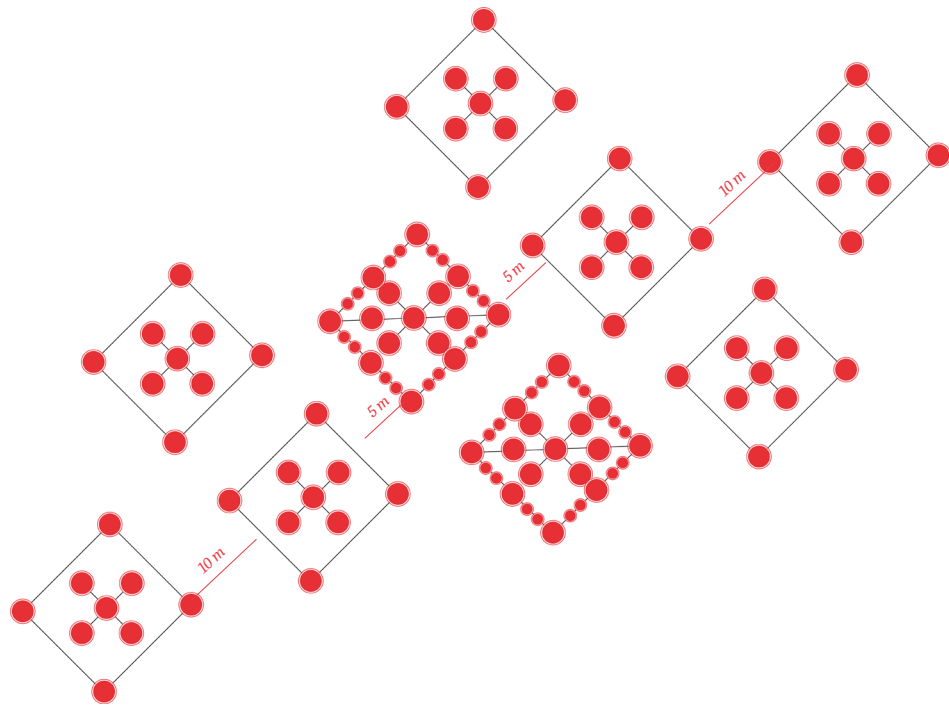


Active restoration: It is restored through direct human actions. For this intervention there are different techniques that vary according to the specific state of the area to be restored. (Soil loosening, planting, nucleation, etc.).



3. Active restoration strategy: Core design

The designs consist of 6 low-density cores and 2 high-density cores spaced 5m apart and 10m between cores. The high-density cores are placed where invasive plants were found, therefore the topsoil cover was removed.



(4d)

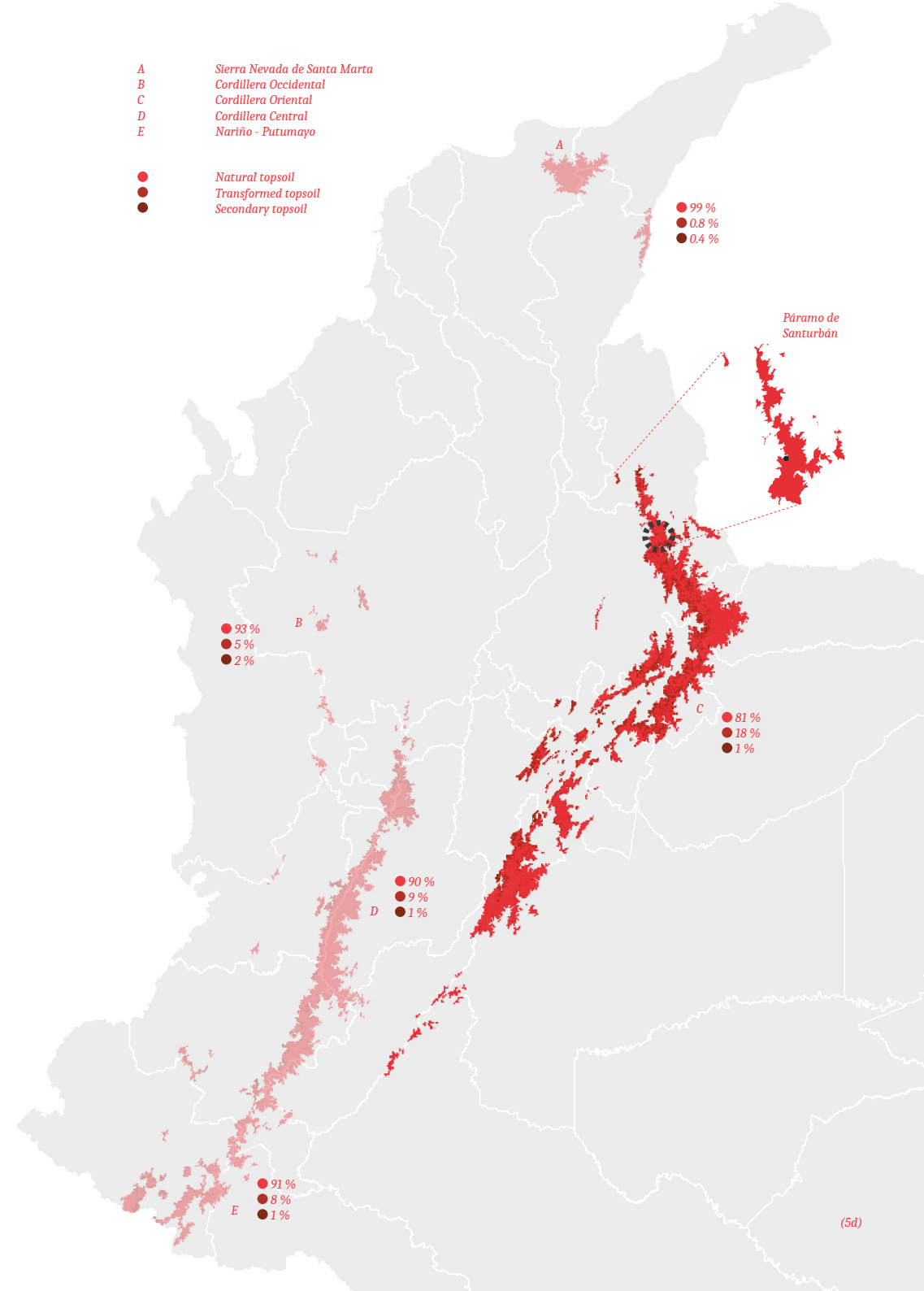


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Natural topsoil

Although, the paramos of Colombia are in good condition as indicated by their high rates of natural topsoil, over the years there has been an increase in transformed topsoil that corresponds to the decrease in natural topsoil. Secondary topsoil also increased steadily, which indicates that there are still pressures on these, such as livestock, grazing and mining, for which they must be protected from future negative effects.

The eastern mountain range, is the one with the highest rate of loss of natural topsoil and the greatest increase in transformed topsoil, with alarming levels that deserves a conservation, restoration and education strategy for the protection of its páramos, but also a sustainable strategy that manages to stop its deterioration in a consensual manner with the communities.



The site: Santurbán

The Santurban's Páramo is located between the departments of Santander and Norte de Santander with an extension of 142,000 hectares at an altitude between 2,800 and 4,290 meters above sea level with temperatures that can be between -13°C and 15°C.

It is a strategic páramo due to its capacity to recharge and regulate water, from which more than 2.3 million people are supplied, in addition, the waters that flow down from Santurbán are the most important waterflow that supplies Maracaibo's Lake in Venezuela.



Maracaibo's lake.

(25)

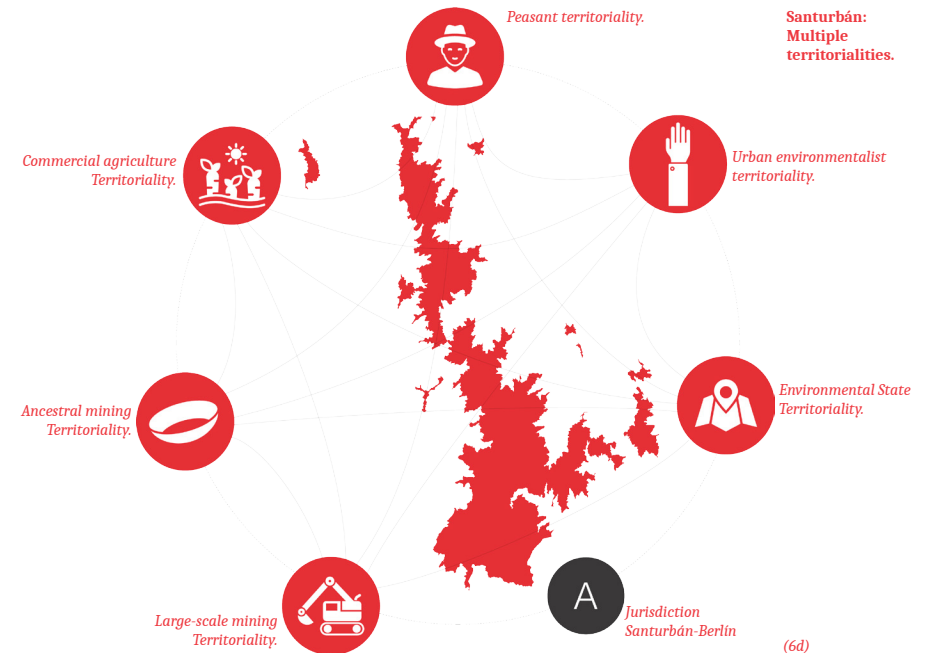


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Territorial pressures

Historically, different pressures from the different territorialities have been done on this páramo, mainly done by the environmental state territoriality with the delimitation of the páramo area. From this pressure, different conflicts have arisen related to the different communities that inhabit the páramo and others that benefit from the páramo:

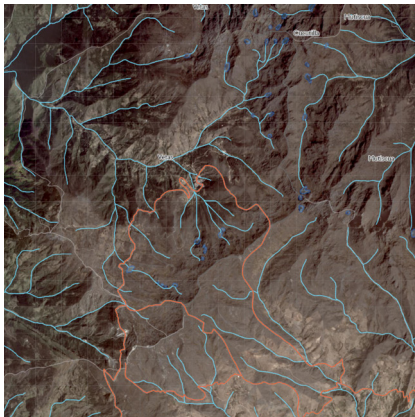
Peasant territoriality is due to small and medium-scale livestock practices and the burning that these activities entail. The territoriality of ancestral mining and large-scale mining, which are divided into the traditional practices that have been carried out in the area for gold extraction and those of multinational companies that have been buying land due to the geological potential of the subsoil. The territoriality of commercial agriculture due to the profitability of potato and onion producers. And finally, the urban environmentalist territoriality that puts some pressure through legal actions and public demonstrations in favor of the conservation of the ecosystem.



Vetas area

The chosen site has unique features that make it a place with many opportunities to develop. The site is located in the area surrounding Vetas, a town in Santander, which is within the limits of the Santurbán's Páramo and on which its economy and jobs are based on gold mines.

Moreover, it is in a strategic location for tourism, because it is in an area close to Bucaramanga, a dormitory city for extreme activities and hiking trails, as well as being one of the closest settlements within the limits of the páramo for lodging places for visits to the páramo. The number of mines in páramo area that are going to be closed soon as well as the number of lagoons found in the sector makes it one of the areas with the most potential to be visited, intervened and protected.



River network.

(27)



(28)





Mines



Lagoons



Lagoons









The mines that cease activities due to its prohibition will now become **tourist scenarios**, passages and rooms will be found in them, **new passages** will be opened between tunnels showing the purity of the **rock and the minerals** found in it with exploration of natural and artificial light. The **rock leftovers** from the gold extraction of the mine will be **integrated into the landscape** along the **roads** that will provide access to the tourist sites.

Recovery of the **surroundings of the mines**, all the degraded soil will be replaced to give life to the nature that should occupy the space, as well as to recover the space lost due to the **displacement of the vegetation** to higher areas. New vegetation that will recover streams and **riparian areas** in high and low areas of the creeks from the use of mercury and cyanide for years.

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