

# THE POROUS LANDSCAPE

A man-made landscape with porous qualities that create multi-purpose spaces to contribute to relieving the storm flood in Santa Marta, Colombia

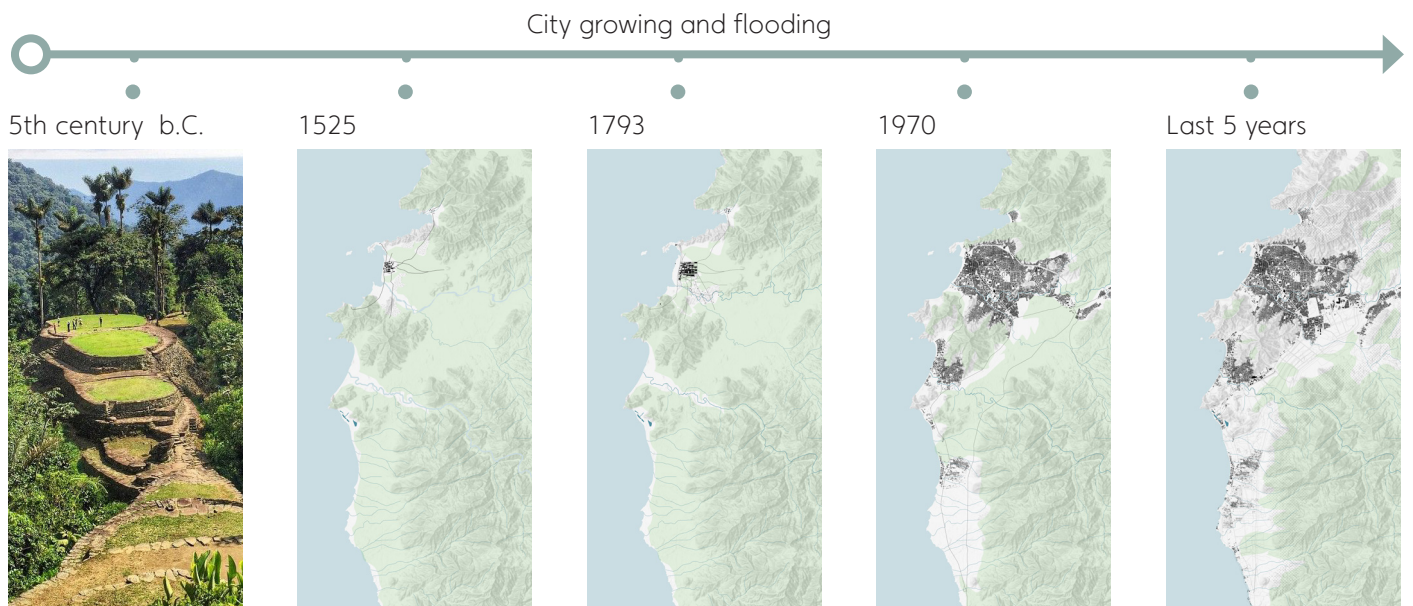
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## Abstract

The project is located in Santa Marta, Colombia by the foothills of Sierra Nevada of Santa Marta, the highest coastal mountain in the world, goes from 0 m to 5.000 m above sea level, and is the source of 36 rivers.



As the city was growing and developing, the space for water got reduced, reclaiming land and modifying the natural course of the river. In the pre-Columbian time, native communities developed cities high up in the mountain, their landscape interventions were based on terracing created with stone and cover by porous surfaces. As the city was growing on the floodplain, the course of the river was modified, the space of water got reduced, spaces occupied before by water, vegetation, and other species are now the location of constructed elements with non-porous materials. The city has a disconnection between the green and blue structures.



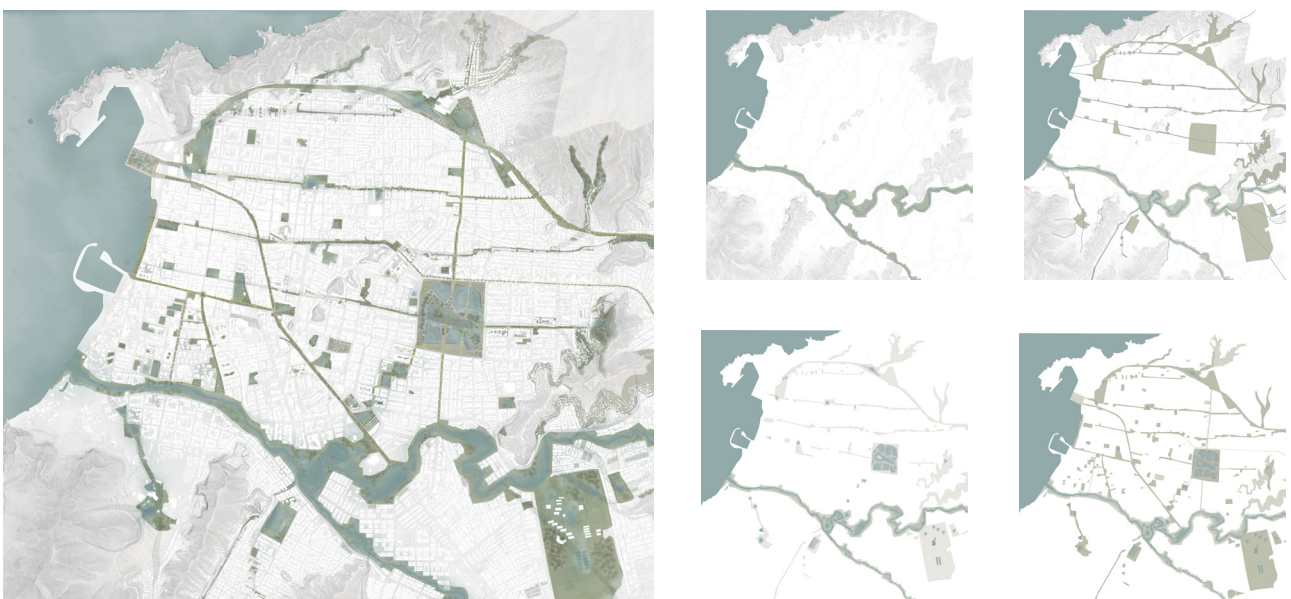
Santa Marta is a city of contrast characterized by a very dry weather during the first months of the year and a heavy monsoon season with the high peak on October when the city suffers of flooding events. Floods represent the 65 % of risk events every year.

The flood in SM is mainly on the city center, is shallow and extensive, with a low speed in comparison to other cities in the country.

Currently, the city manages stormwater by a pipe system, it is centralized, does not allow to increase its capacity. Centralized systems focus on getting rid of water as soon as possible.

How can landscape interventions could help to relieve the storm flood impact in the city?

The project objective is to connect the blue and green structures in the city to use stormwater as a creator of new dynamics. By transforming the city into a sponge, with a decentralized system. Stormwater is managed locally on-site, creating new recreational areas in an adaptive landscape that gives identity, and creates new ecosystems not only use for humans but also for other species.



City intervention steps:

1. Create a flooding buffer area, give space to the river to grow during monsoon season in a safe area.
2. Recover all the tributaries. Give space to the natural streams on the surface. Make visible the natural working of the water.
3. Insert wet basins to filter and storage stormwater and dry basins to increase system capacity at extreme flooding events.
4. Porous system based on runoff reduction elements incorporated on public spaces that work to relieve the flood in the city, creates identity, new ecosystems, and integrate communities.

A project by itself wont solve the flood problems in the city, but a porous city system will help to relieve the flood in the most critical areas.

The system needs different elements to work. A toolbox of runoff reduction elements is use to locate them across the city, catchment elements, connecting elements, and basins, these elements are interconnected and work together to allow control floods on public spaces in spread areas.

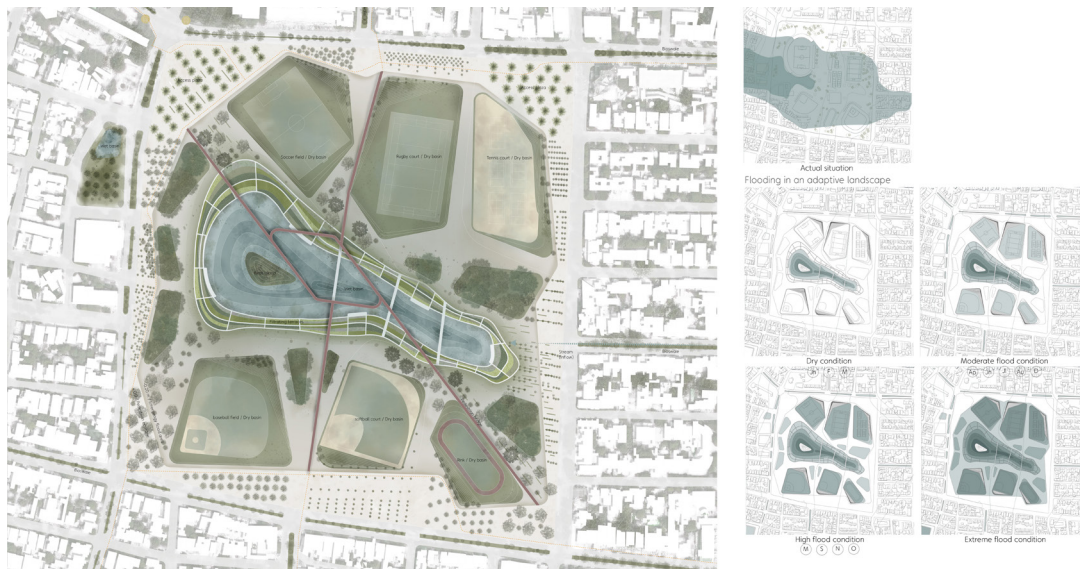
They work together to transform the city into a sponge, a permeable and porous city that works down the principle of a decentralized system.

The project is developed through different scales, zoom into a local scale, the design of a sport park integrates into the porous city network, its objective is to be a multipurpose space, to create recreational spaces, and at the same time to regulate water. Reduces the flood in the historical center by managing the water on site.

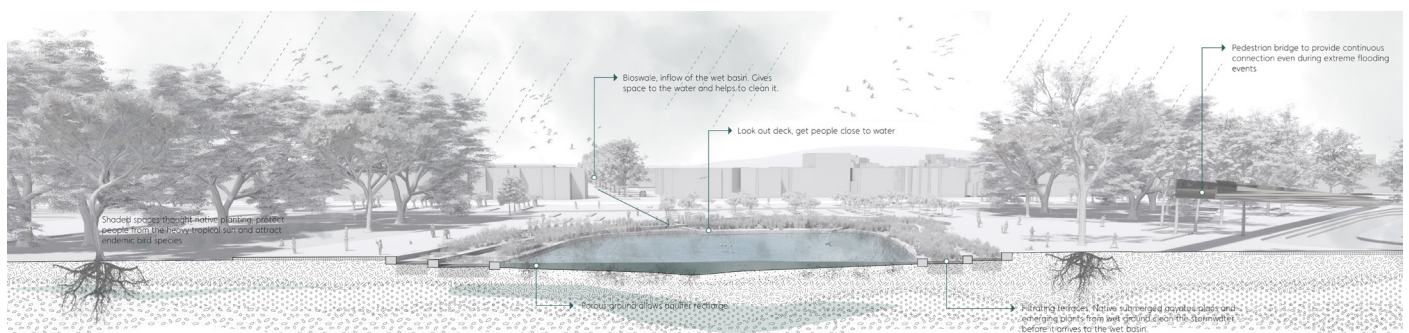
The inflow comes from the stream running from the hill at the east, the water flows through terraces with native submerged aquatics and emerging plants from the wet ground that clean the water before it arrives at the wet basin.

In moments of high floods, the system increases its flooding capacity with a combination of dry and wet basins. Dry basins work as sports fields in dry conditions, in addition, 80% of the park is located 0.20 m lower than the pedestrian ecotone, which allows flooding the whole area in an extreme flood event.

A pedestrian bridge connects the ecotone and allows the normal flow of people, even when the whole park is under an extreme flood condition.



The project uses the technique of cut and fill to create shallow space for water and to create a microtopography that is multifunctional, First, it protects the sport facilities from the strong winds coming from the north east, second helps to directions the water to the filtrating terraces and then to the wet basin, and third works as lookout points and amphitheaters to the sports facilities.



As Naoto Fukusawa says "Great design is a multi-layered relationship between human life and its environment." The project recognizes the need of creating spaces not only for humans but also for animals, spaces that understand and highlight the natural working of the world.

The porous park is designed as a connector element, part of a bigger network that integrates different users in the same place. Gives space for water that fertilizes the soil and allows the growing of vegetation. Frutal trees and water are an attractor for different bird species, the project work as a stepping stone for them, a space to eat, to rest, and to be between the Sierra Nevada de Santa Marta and the sea.

Shadow trees and topography that protect from the strong wind create a comfortable space for people to practice sports or to enjoy a man-made nature in the middle of the city.



The location of the planting is defined by a series of grids, that look for a geometrical connection, relation, and tension with the urban fabric, the natural flow of the people, and the natural flow of the water.

The planting strategy is divided into 3 different zones:

1. Dry zone: Pedestrian ecotone, access plazas

The ecotone planting is characterized by 3 layers of vegetation. Tall trees, medium-sized trees, and low vegetation. The access plazas are a combination of palm trees that highlight the desertic zobiome that surrounds the area, give a clear path to follow, and are combined with fruit trees that attract different bird species.

2. Shadow zone: Spaces in-between

The average temperature in Santa Marta is 31 c with a max register of 41 c.

It is necessary to introduce native trees with high shadow production to provide climatic comfort for people and promote the all-day function of the park.

3. Wet zone: Filtrating terraces and aquatics

A series of plants between emerging, submerged and flooring has been selected on a color range of green with purple flowering. These plants are located along with the permanent water bodies and have been chosen for their ability to clean the water of heavy minerals, they filter the water before it arrives at the basin and performs well even when the stormwater has been mixed with the sewage water.

Climate change is affecting strongly Santa Marta, every year the floods are stronger as well as the extended dry seasons are harder, we as landscape architects have the responsibility to create projects that understand these changes, create interventions that are transformative, that highlight the identity of the site and shows the natural workings of the world. We need to create projects that welcome different species, recognizing that we are not the only ones in this world and that we need to live in balance with our surroundings. The porous landscape looks for achieving balance with nature, adapting to a changing world, and to give space to everyone in the city.