Coastal fog-harvesting tower, Huasco, Chile

Project data
Type of project: Landscape design
Estimated start of construction: Not applicable

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Comment of the Holcim Awards Jury Latin America

The Huasco region in northern Chile is an agricultural region that depends on water for irrigation from the Huasco River. Water availability has decreased over the last decade, and new solutions have to be found to obtain water on the coast of this desert region. This project intends to use the "Camanchaca", a coastal fog originating from the anticyclone of the Pacific and condensing behind the coastline. The striking idea consists of towers with a height of 200m catching the water particles and conducting them to the base of the tower, where the liquid will be filtered through a reverse osmosis process to eliminate salt.

The tower is constructed as a spiral structure with a wooden base, copper mesh providing conduits and a plastic skin. The water catching system only uses wind energy and gravity in its principal working process. The jury was delighted by this innovative, simple and elegant solution that will provide water to an otherwise declining agricultural area.

Project description by author

Huasco is a port city in the north of Chile. The city has a significant agricultural industry irrigated by the Huasco River, but in the last decade the river's water levels have decreased making irrigation from the river impossible in the mid-term. It is therefore necessary to develop a new strategy to source water for the coastal area west of the Tacama Desert.

A climatic phenomenon of the area called Camanchaca, a type of very dense coastal fog that has dynamic characteristics, is a condensation that is displaced towards coastal zones by the wind. The condensation originates in the anti-cyclone of the Pacific that produces a cloud layer stratospheric, which persistently covers the coastal strip from Peru to northern Chile. The clouds form around 400m above sea level (with a variation of 200m) although humidity is also present below the cloud height. This second (lower) layer of fog extends from the sea, but in lower concentration than seawater. Water obtained from the fog therefore requires less filtration than water obtained directly from sea water.

The tower is 200m high and catches every water particle in the air that comes from the coast to the valley of the Huasco River. The water yield is projected to be 2 to 5 m³ per surface of vertical surface. Each tower has a vertical surface of 0.5 m², producing a minimum of 10,000 m³/day, and an impressive peak output of 50,000 m³/day. This quantity of water renders viable the agricultural industry of this and coastal area.

The tower is composed of four components:
1. Four sides of high-density plastic filter mesh that are the main collector system in the tower. The water is collected with this passive system.
2. Four sides of low density copper mesh that link the spiral arms and yield water at the first condensation process in the fog. These sides form a structural condensation between the four spiral arms. The four facades contain different mesh designs because this helps to produce different kinds of filters.
3. Four spiral arms that make the structural possible and transport the collected water to the main collector. The four spirals are the same size and made of compressed wood with a copper conduit inside each spiral from the top to the base.
4. A main collector in the base is divided in three components: the water tank in the perimeter, a multi-composite filter membrane in the middle, and a central tank for the freshwater. Purified water is distributed in four horizontal filter membranes in the middle, and a central tank for the freshwater.

The original desert landscape is modified by placing the tower on the land. The impact of the tower expands the area on which agriculture without reliance on water from the Huasco River becomes viable.

Quantum change and transferability
The project uses simple low-cost technology to produce a large impact in the viability of agriculture in coastal areas.

Ecological quality and energy conservation
The construction system was researched and designed with materials sourced from natural controlled sources: wood from the south pine forest (plantation forest), the copper use is restricted to the thinnest diameter capable of channeling water, and the plastic skin is sourced from recycled elements. Compared to a conventional system of fog capture, the surface is optimized in the height of the tower (the conventional system utilizes big horizontal surfaces, the coastal mountains). The water collection system uses only wind energy and gravity is the principal working process. In the main collector, the filter works using only the pressure differential between saltwater and freshwater.

Economic performance and compatibility
In the beginning, the project utilizes economical resources related to the research and technology development. In a second implementation stage the project requires a cooperative system of funds (government aid) to promote development in the geographical area of the study. In a third stage the people will fund further implementation based on greater economic prosperity from the new agricultural activities.

Contextual and aesthetic impact
The towers are landmarks in this new territory. A great transformation from the original arid landscape (green transformation) can be produced. The contextual impact of the towers extends beyond the agricultural application, and represents a new horizon to utilize lands previously considered of low value on the coast of Chile. The project can create a new form of communitarian expansion using sustainable resources (communitarian societies).