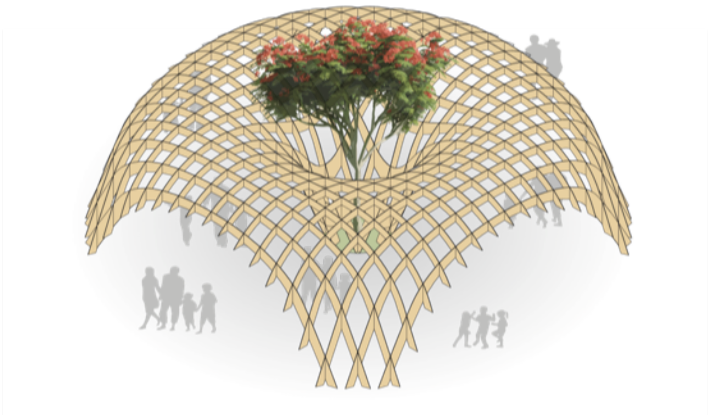
a34unm

comfortable urban vegetated structure



Elmer Gutierrez // Mentor: Michelle Hur

A tree for you and me, a comfortable urban vegetated structure.

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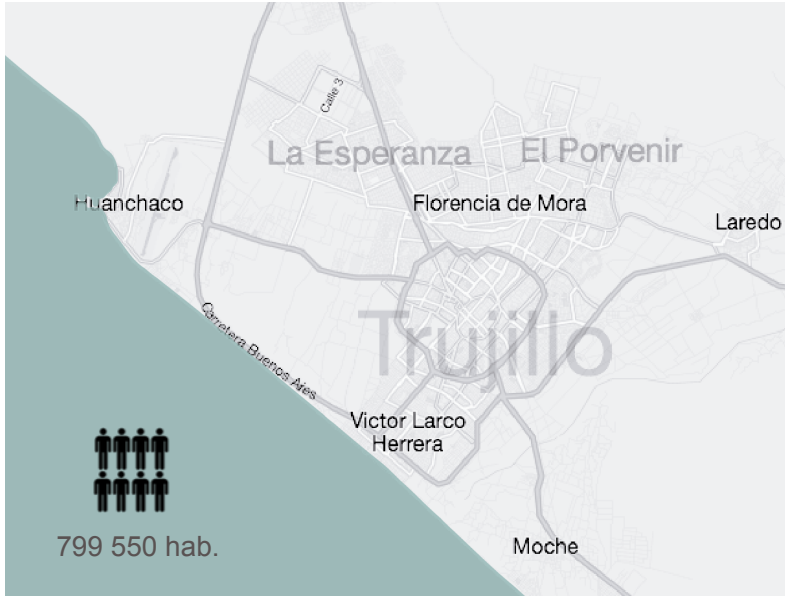
Trujillo



Trujillo is coastal city located in the north of Perú, close to the equator.

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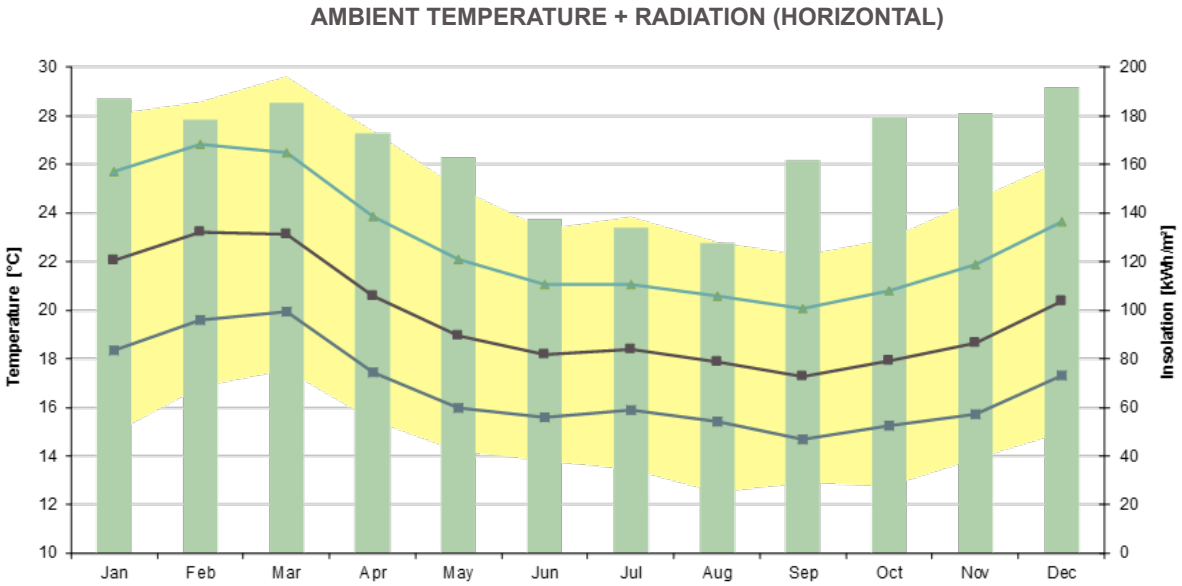
Trujillo



→ Total radiation on the horizontal yearly = 1999 kWh/m²/a
→ Predominant winds from SE, average 3.8 m/s

Temperatures are very pleasant around the year, but radiation is quite high, with almost 2000 kWh/m2 annualy.
Due to its closeness to the equator, the sun angle does not vary much and remains high in the sky.
Predominant wings are coming from SE at 3,8 m/s. 66% of the year RH is above 12 g/kg.

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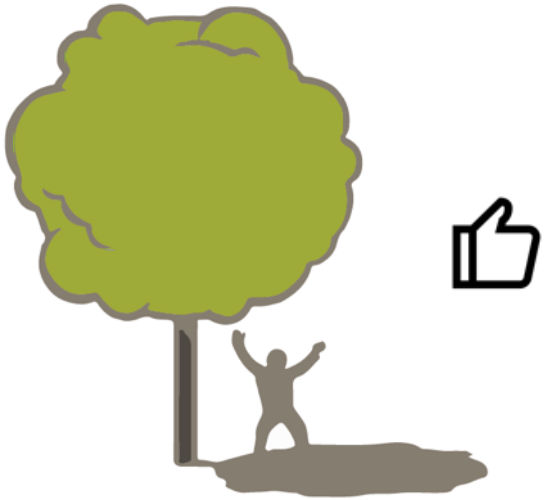

Undoubtedly due to climate change, the registered Tamb and PT have increased. The lack of comfortable public space providing shade is notorius, and the best and simplest solution for this seems to be planting trees to get natural protection...

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World Health Organization

1 hab. = 9 m^2

Trujillo

1 hab. = 2.1 m^2

... and when we talk about Trujillo and green areas there is a big gap we have to fill according to the WHO, so why not trees?
Unfortunately, reality shows that green areas and young urban trees hardly consolidate and end up dying or poorly growing.

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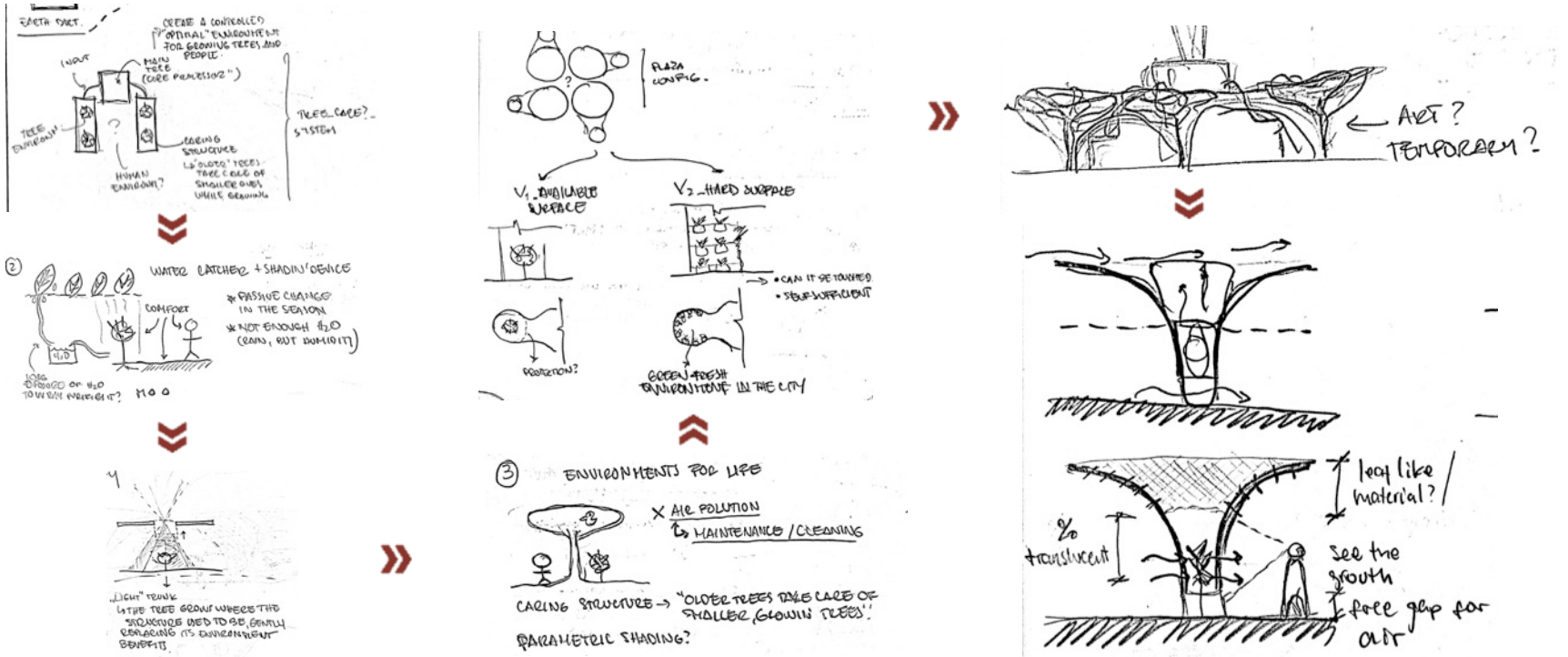
What to do?



After thinking on many ways of approaching this two problems some base needs were met considered.

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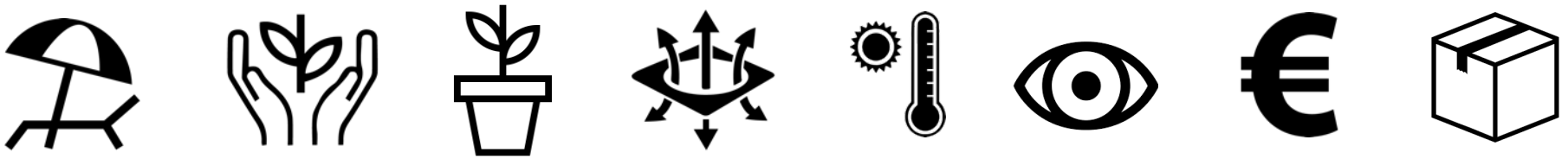

Provide instant comfort to create awareness on
the importance of trees on the urban environment

The structure should provide shade, thermal comfort, affordability, easy transport, visual connection with the inner tree while this growns which will also allow free air flow.

In other words, Provide instant comfort to create awareness on the importance of trees on the urban environment.

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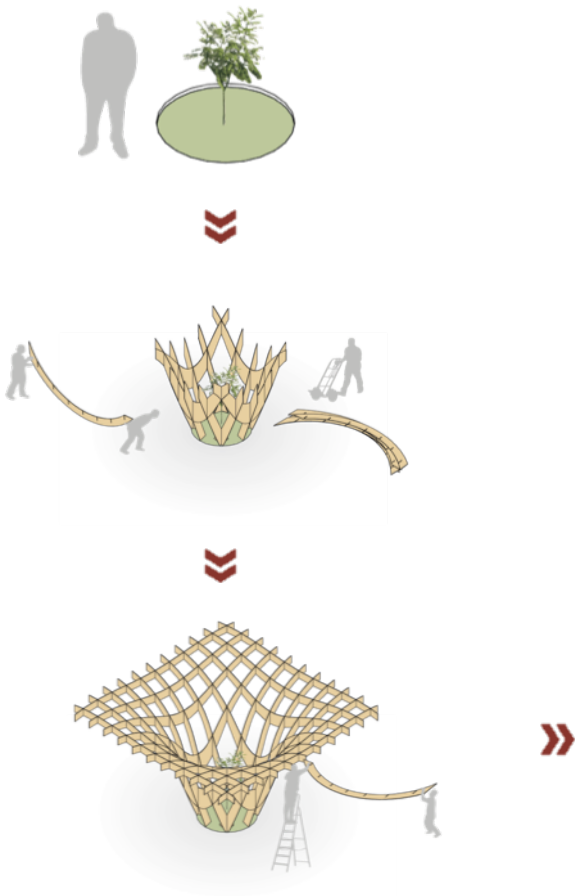
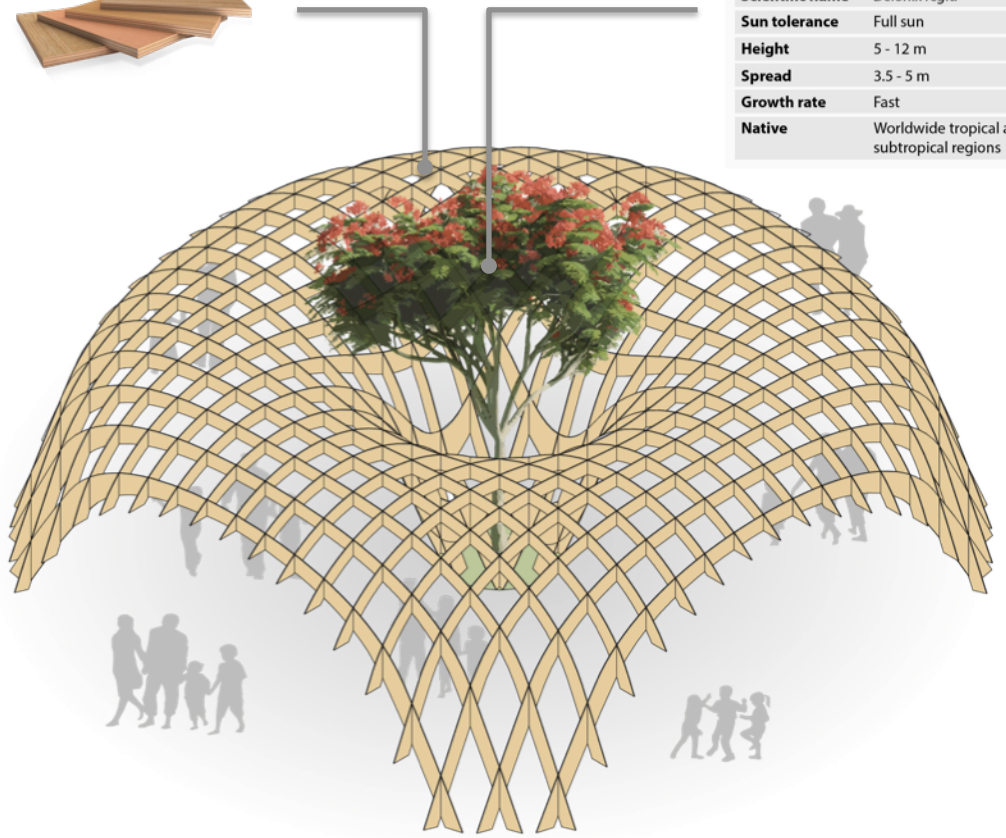


Plywood

Royal Poinciana, Gulmohar

General information	
Scientific name	*Delonix regia*
Sun tolerance	Full sun
Height	5 - 12 m
Spread	3.5 - 5 m
Growth rate	Fast
Native	Worldwide tropical and subtropical regions



Height → 3 m // Width → 10 m

So this is how it starts, the structure is built sorrounding a young tree to first provide protection.
When it is complete it will also provide the benefits of the grown tree from the first day of its assembly.
Structure's shape is extracted from the species fully grown dimensions.
The material for the structure is recycled framework.

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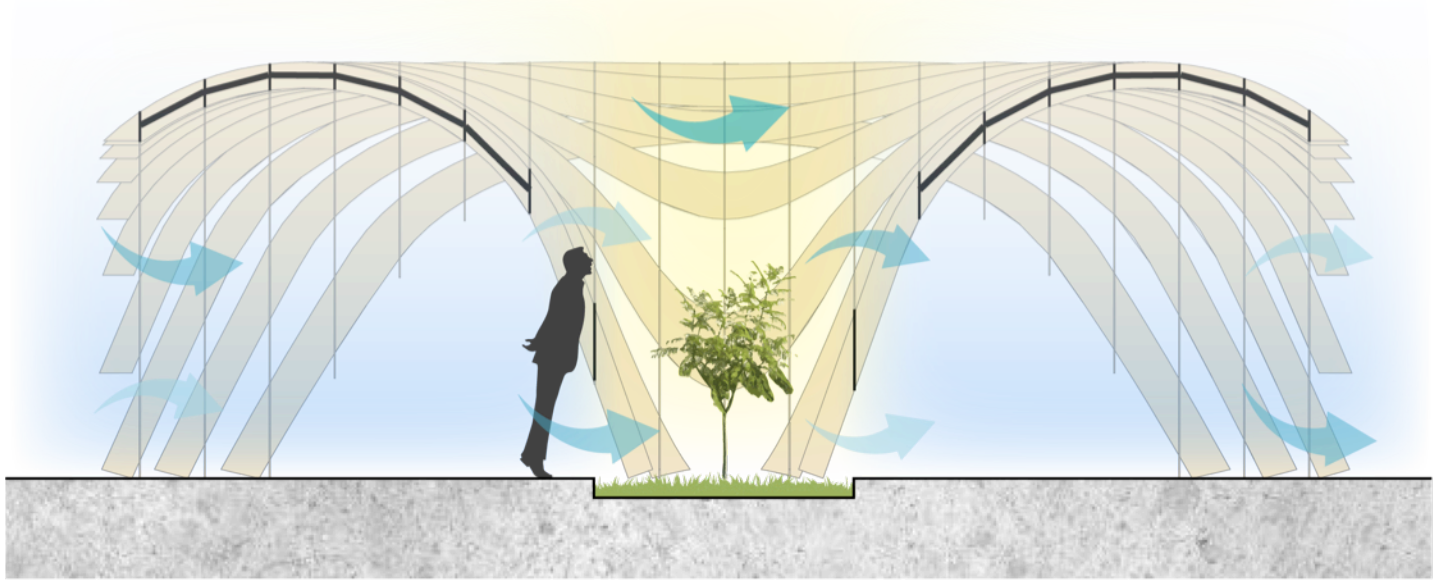
High radiation days



The waffle structure allows the air to freely flow around the tree, and at the same time a visual connection with the people being able to admire the growing process.
On high radiation days, specially summer, the structure offers shade, decresing the UTCI max. 5°C, providing comfort...

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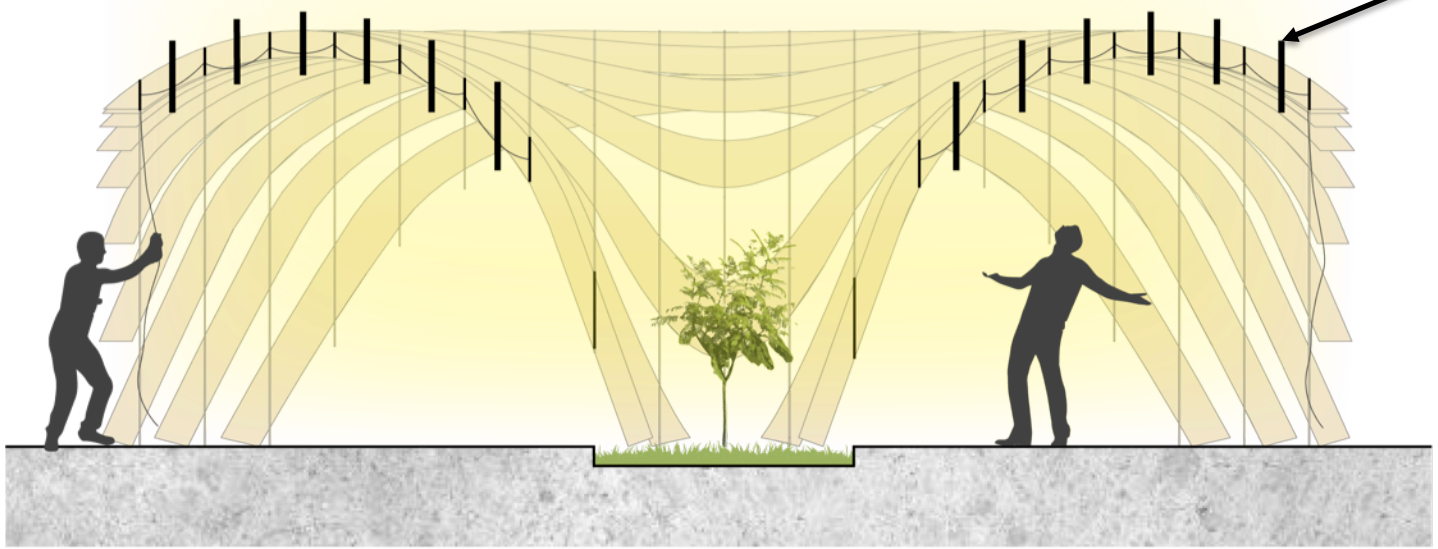
Low radiation days



Conductivity 0.276 kJ/hmK
Capacity 2 kJ/kgK
Density 80 kg/m3

Totora fields → 12 km

... and on low radiation days, specially winter, the totora flaps can be open to let radiation go through and warm up the ground. The flaps are manually operable, giving the user the possibility to adjuts it to the requirements. Totora is a local straw that, when knitted, becomes a panel used for many purposes.

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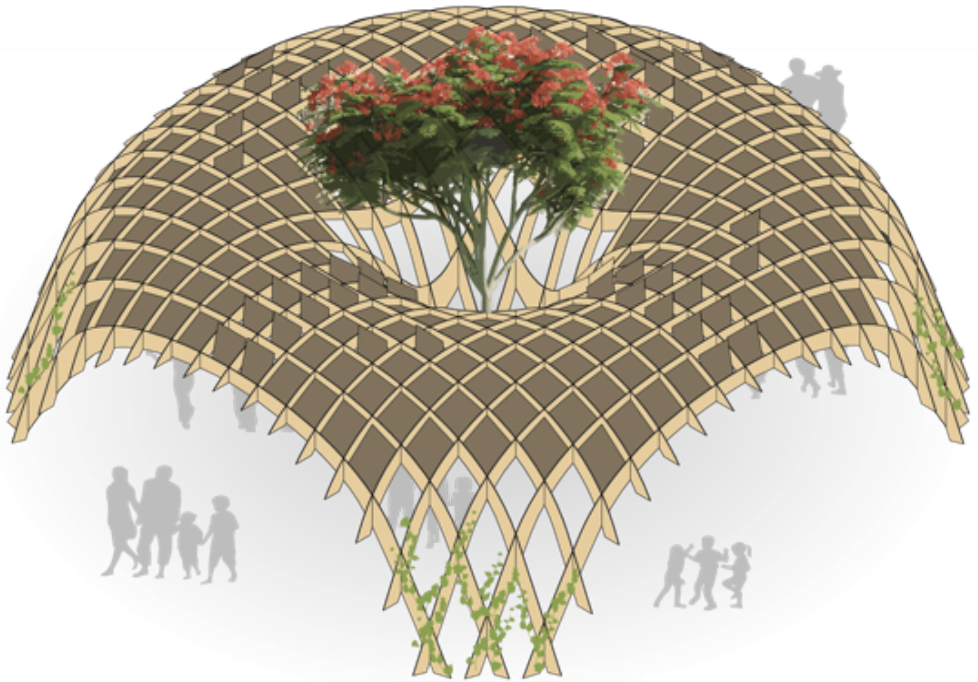

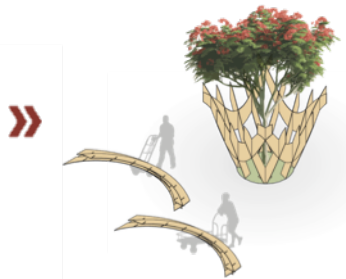

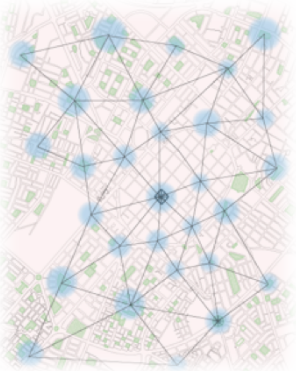

When the tree reaches considerable strenght, the structure is dimantled and taken to another part of the city where it can host another young tree.

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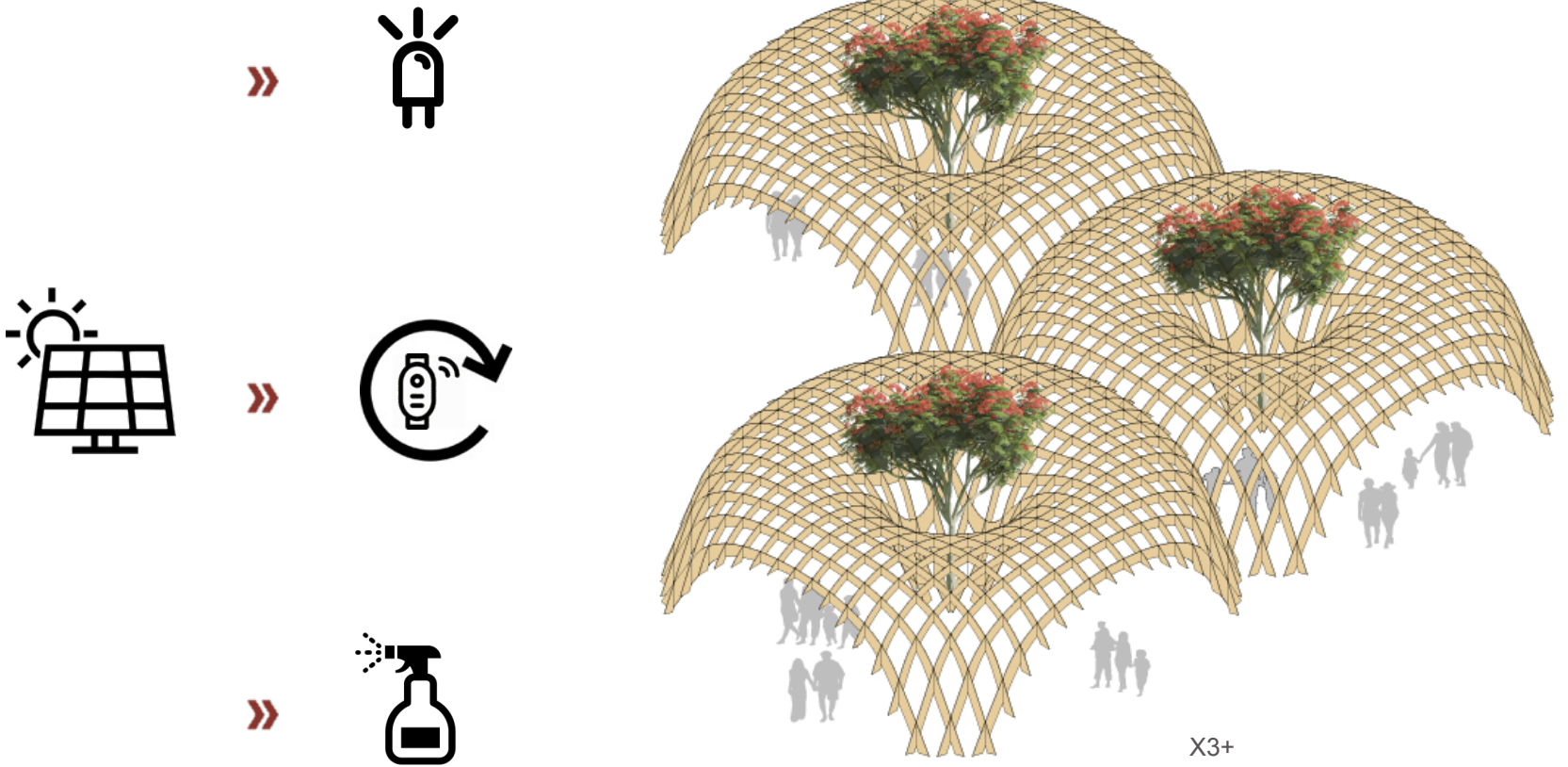

Since the first objective of the project was to create a passive structure, radiation potential suggests energy harvesting, which allows the integration of sensors that can rotate the flaps automatically, and the introduction of other systems that provide evaporative cooling.

Thanks!

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