

Design Studio • Rapidly Deployable Shelter • WS2022 • USTUTT

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ADDitively Manufactured OPTimized Structures by means of Machine Learning
Institute for Lightweight Structures and Conceptual Design (ILEK) | University of Stuttgart



Acknowledgments

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Bahay Cono

Rapidly Deployable Shelter
WS22/23

Eman Pagala
Weifeng He
Keiya Nakazato

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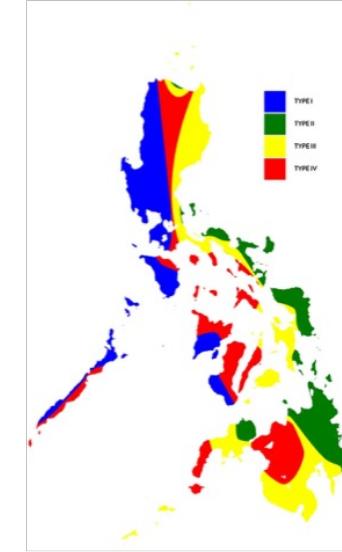
- 1. Site Analysis**
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Site analysis

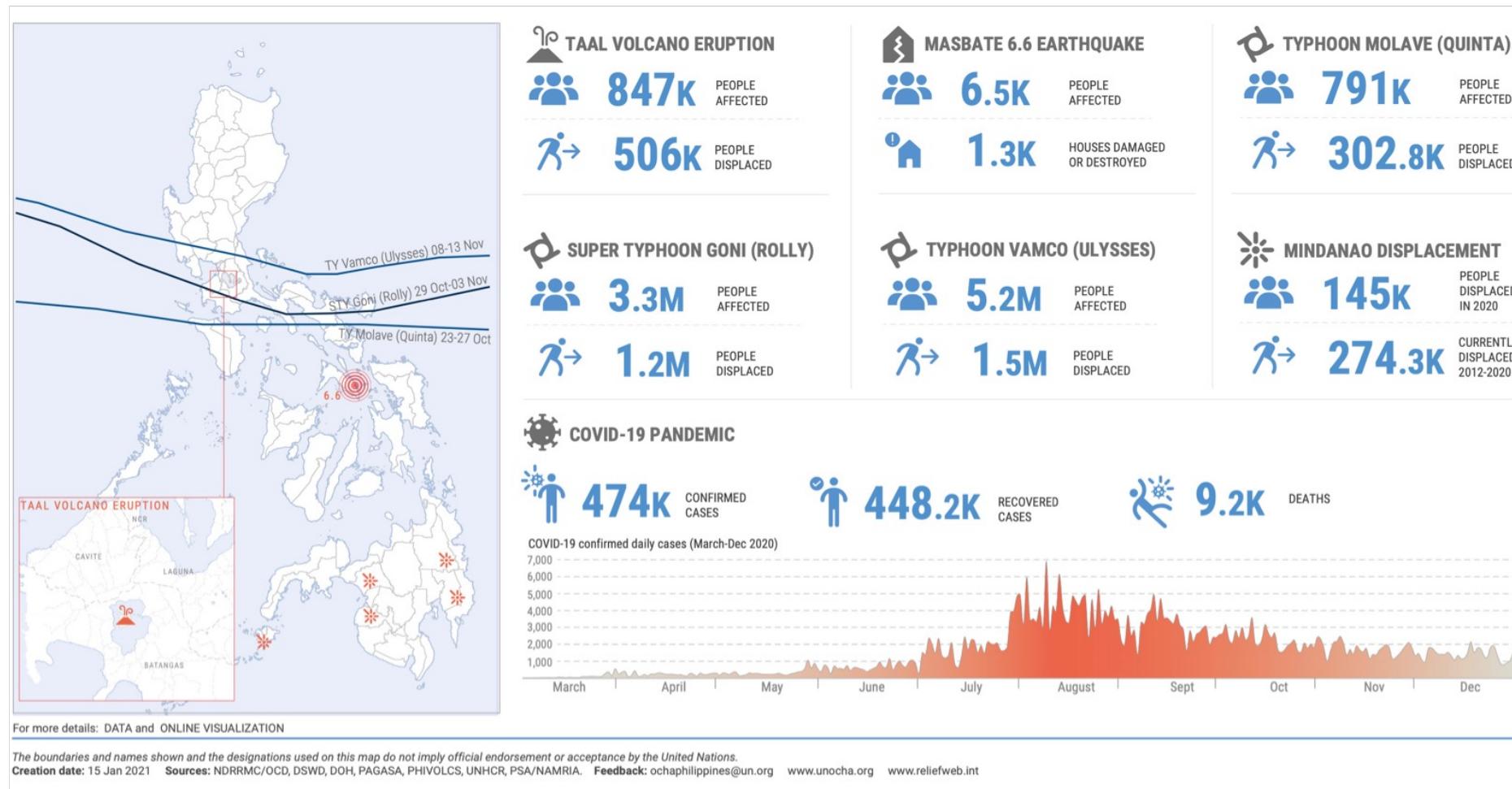
Location



Type	Dry Season	Wet Season
I	November - April	Rest of the year
II	No dry season	Maximum rain period from December to February; Minimum rainfall during the period from March to May
III	Short dry season either during the period from December to February or from March to May	No very pronounced maximum rain period
IV	No dry season	Rainfall evenly distributed throughout the year



<https://www.discoverthephilippines.com/climate-of-the-philippines/>



<https://reliefweb.int/report/phillippines/phillippines-2020-significant-events-snapshot-14-january-2021>



<https://www.bbc.com/news/world-asia-27601951>



<https://news.un.org/en/story/2014/02/461962>



<https://www.todayonline.com/world/phillipine-refugee-tent-fire-kills-mother-5-kids>



<https://www.rappler.com/moveph/44364-emergency-shelter-kits-yolanda-survivors/>

Less flexible



Soft soil. Weak after heavy rain



Not suitable for life in the Philippines



Concept



Storm

Phase 1

The DEC's members – 14 leading UK aid charities began to deliver vital supplies such as **food, water, emergency shelter and medical care to the survivors of the typhoon.**

(November 2013 to April 2014)

0-6 months



Phase 2

More than a million homes were flattened by the typhoon, and thousands of people were forced to take shelter under tarpaulins or in government bunkhouses.

DEC members repaired or rebuilt more than 40,000 homes in the second phase of the response.

(May 2014 to October 2016)

after 6 months after



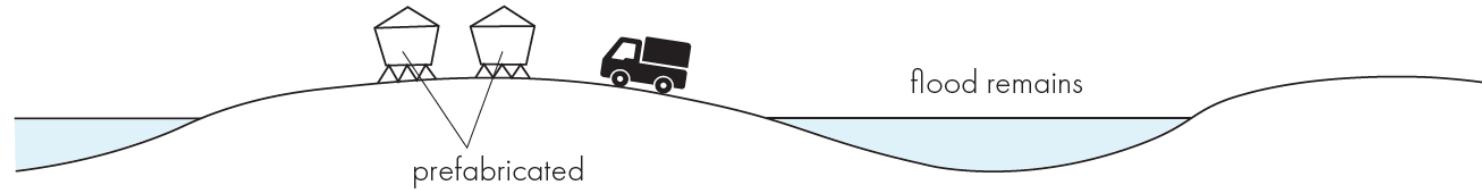
<https://www.dec.org.uk/article/philippines-typhoon-facts-and-figures>

What happens after a typhoon.

Phase 1

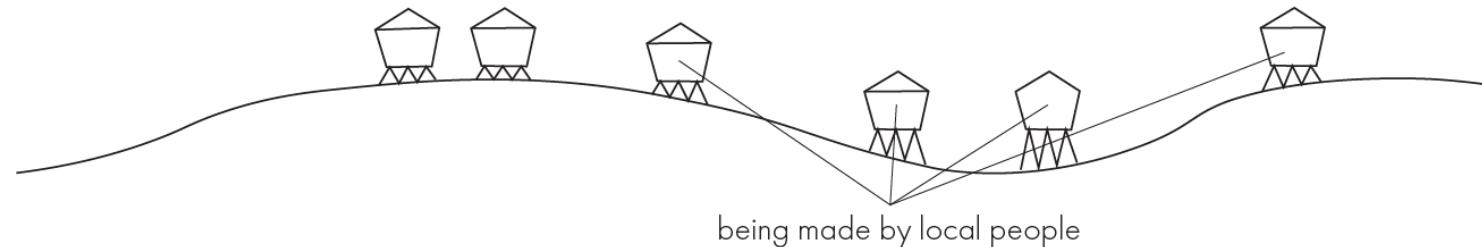
After 2-3 days

we make prefabricated shelters for essential needs on the hill



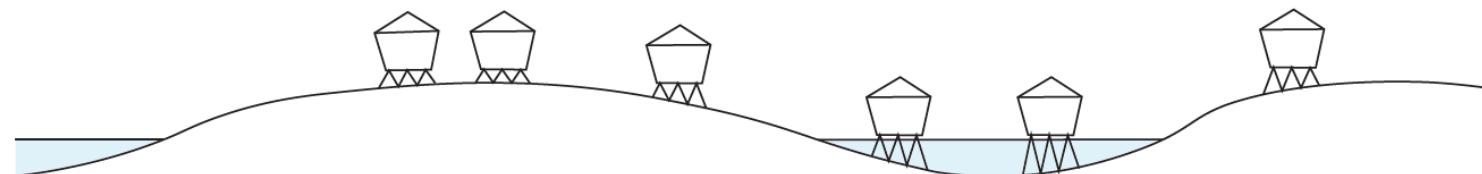
After 10 - 15 days

People make their own house by their hands and increase the number of shelters.



After 30 days if it is raining

Both of prefabricated shelter and handmade shelter are resistant to light rain

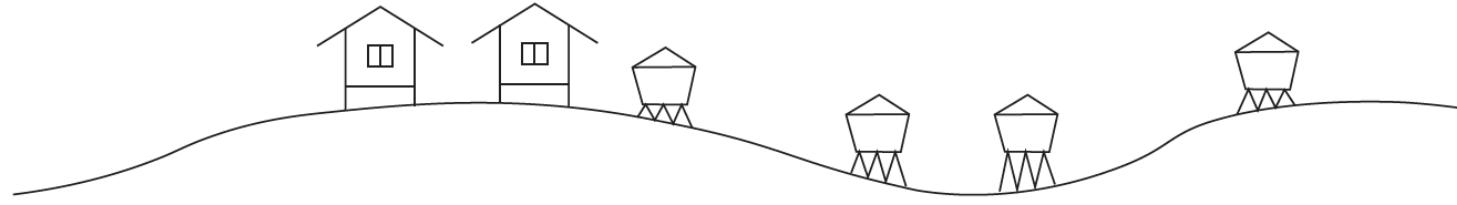


What happens after a typhoon.

Phase 2

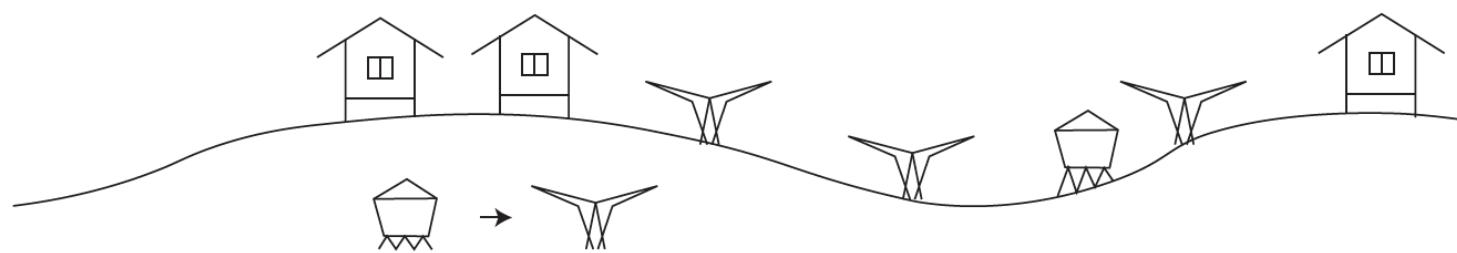
After 90 days

the season changed local people rebuild their house



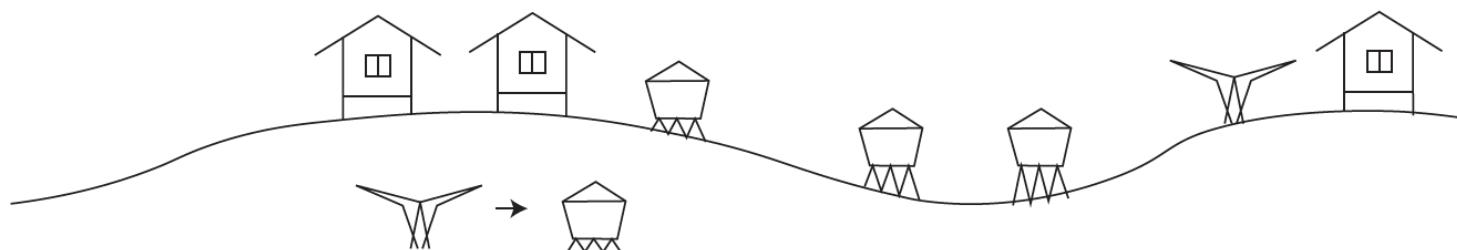
After 100 days

As the transformation concept, we can use the shelter as diffrent faunction.

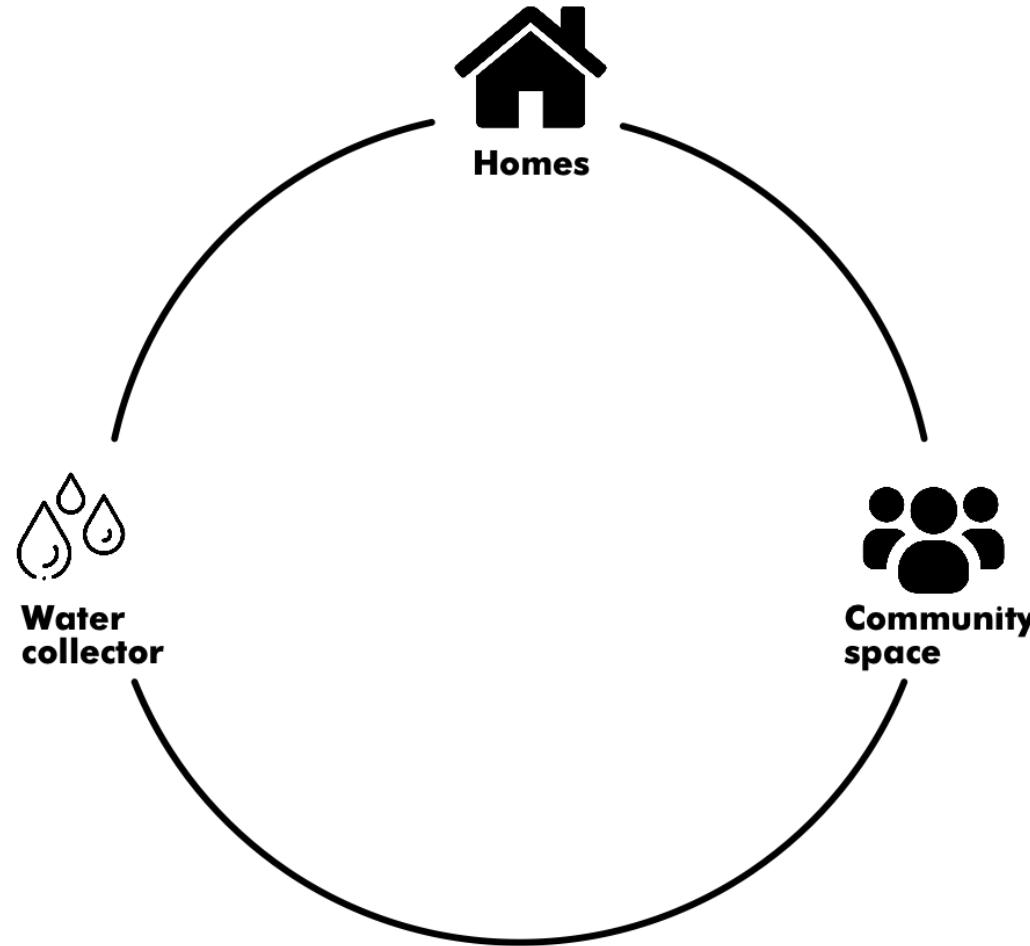


After 1 year

We can prepare for the next typhoon disaster.



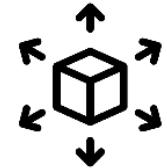
Proposal aim



Proposal aim



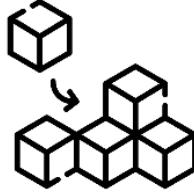
Simple construction



deployable



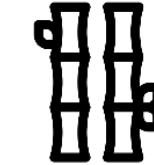
durable



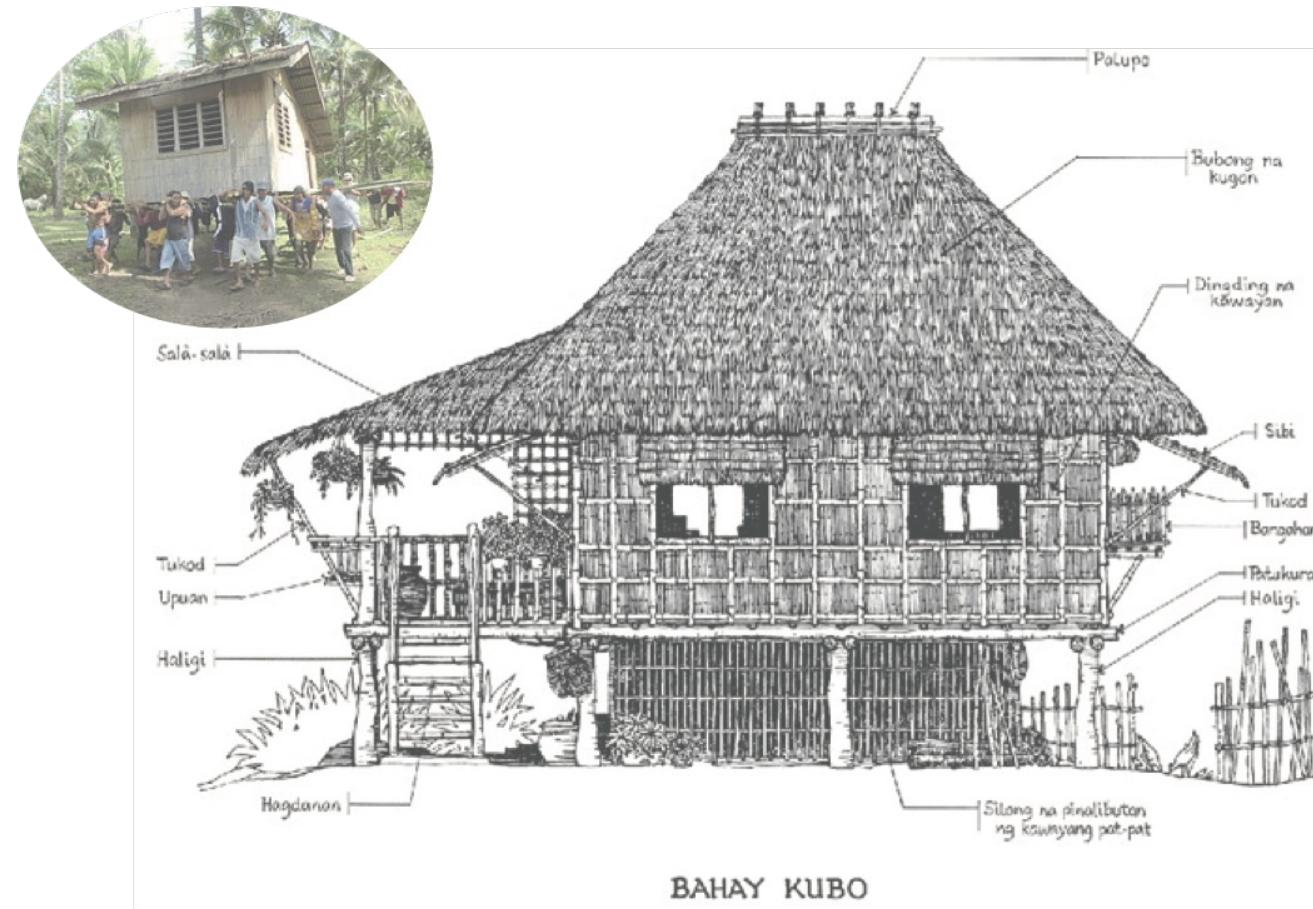
modular



lightweight



local material

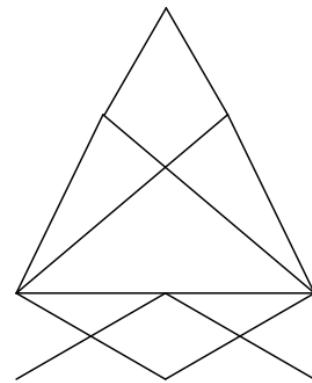


https://en.wikipedia.org/wiki/Bahay_kubo

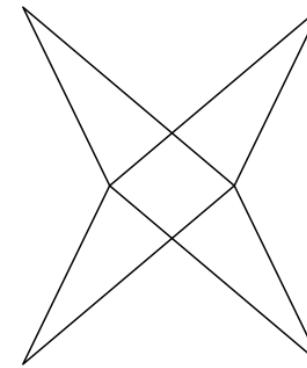
<https://www.realliving.com.ph/lifestyle/arts-culture/5-ways-to-achieve-filipino-style-a00043-20170224>

Bahay Kubo reference





Prefabricated shelter



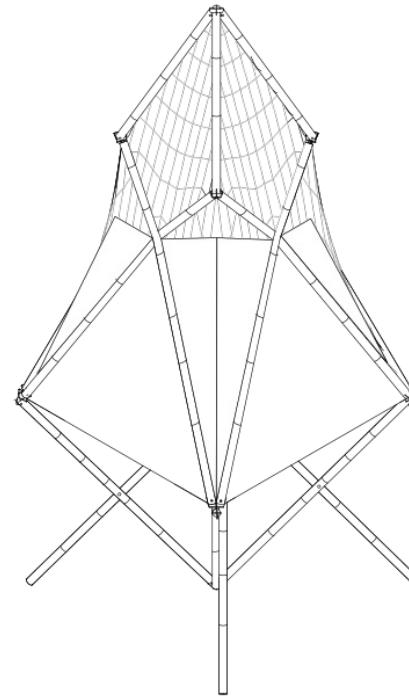
Water collector

Phase 1

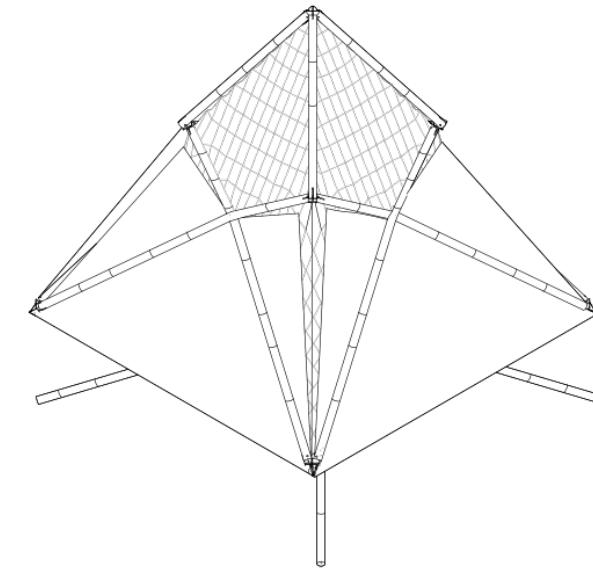
Shelter structure



delivery shape

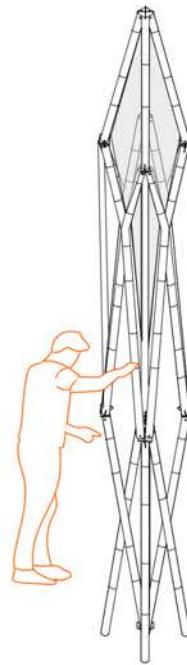


rainy shape

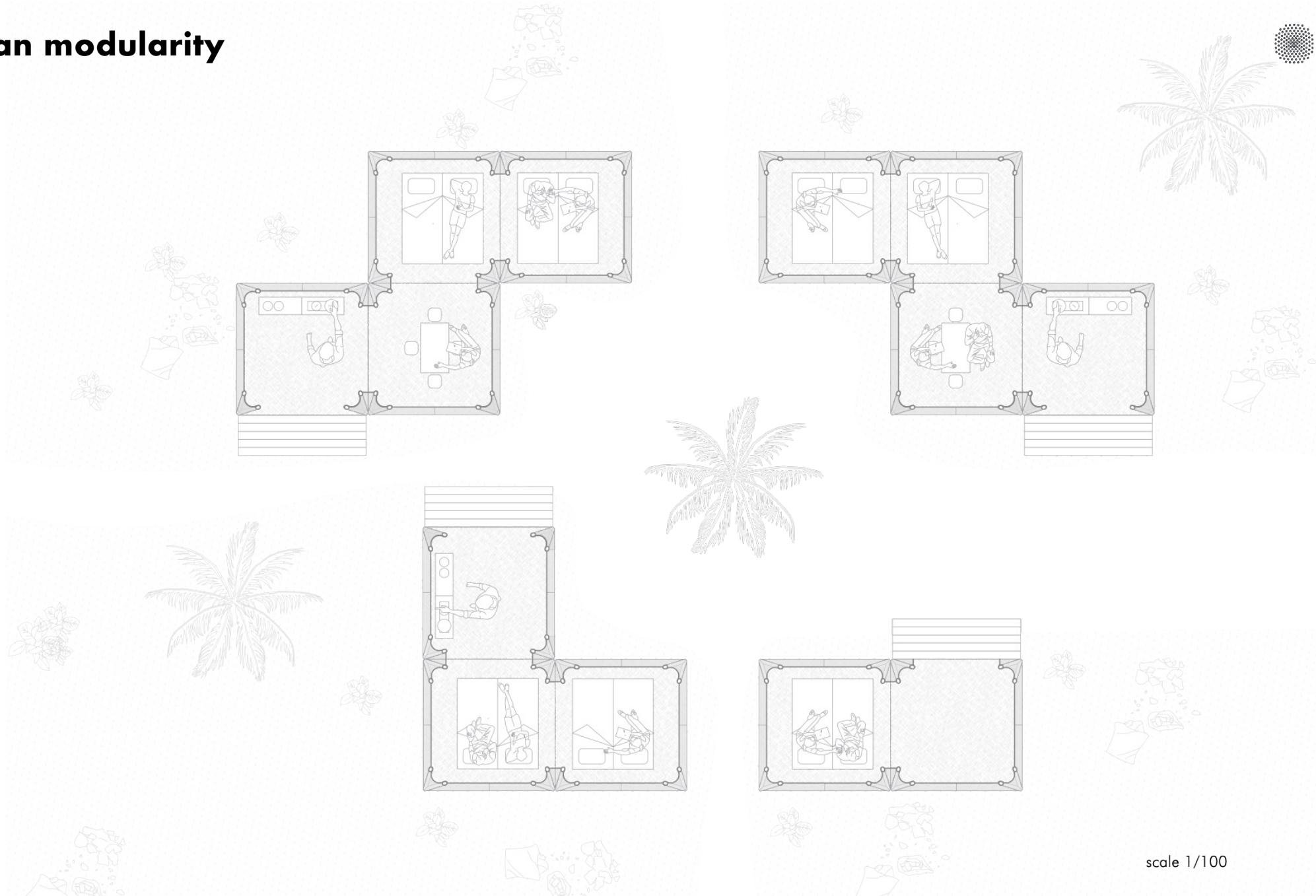


sunny shape

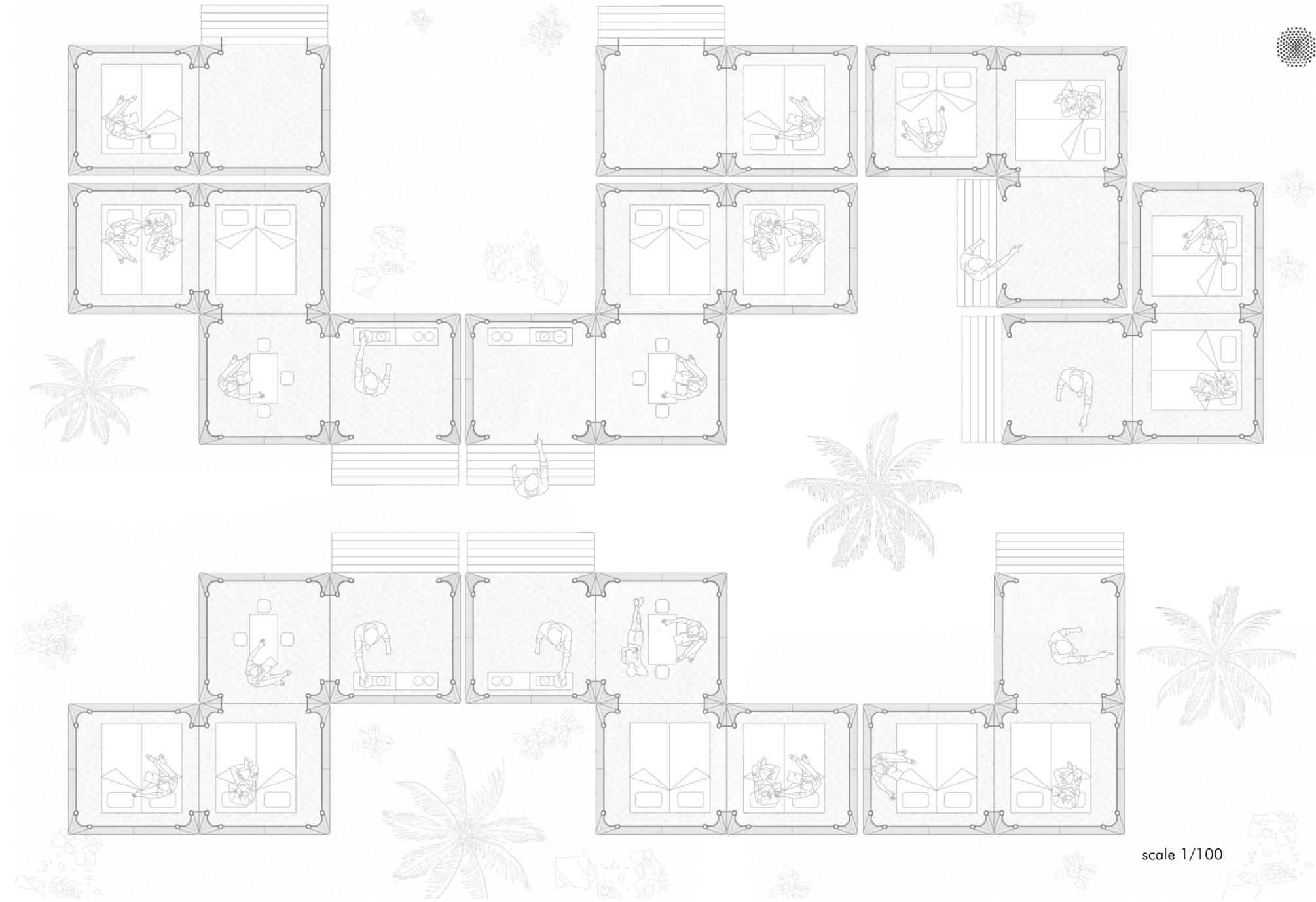
Assembly process



Floorplan modularity

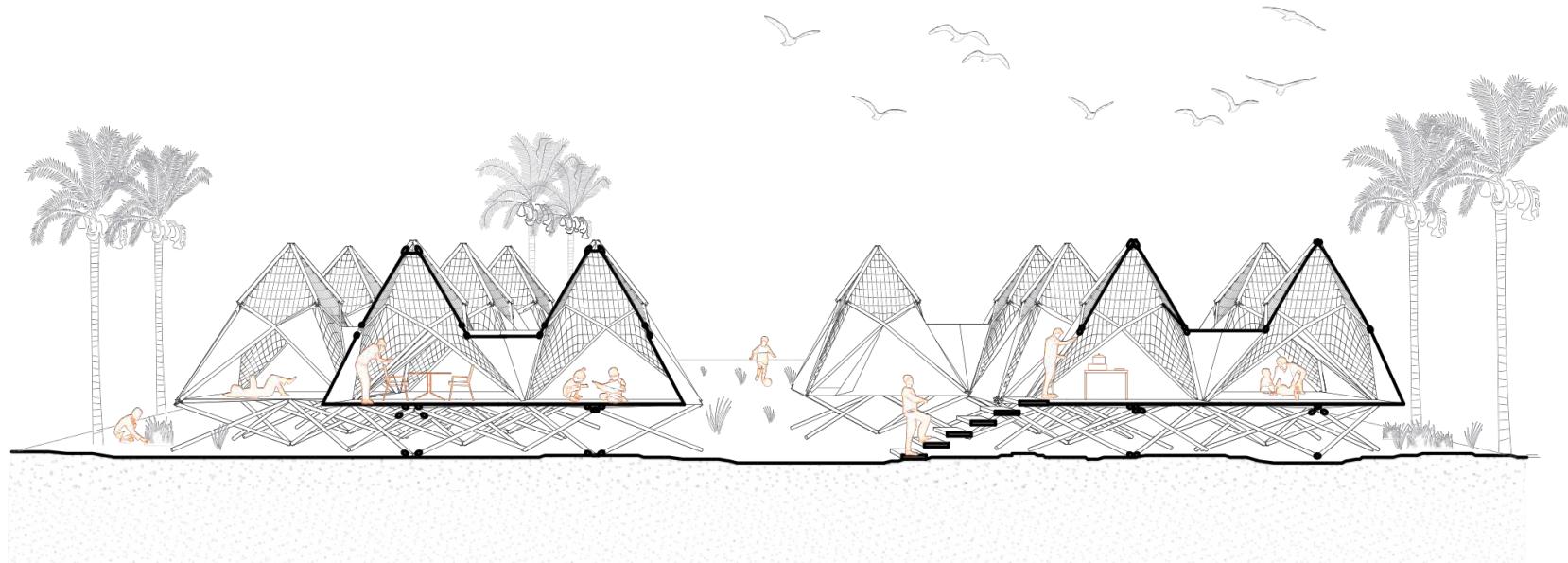


scale 1/100



scale 1/100

Perspective section

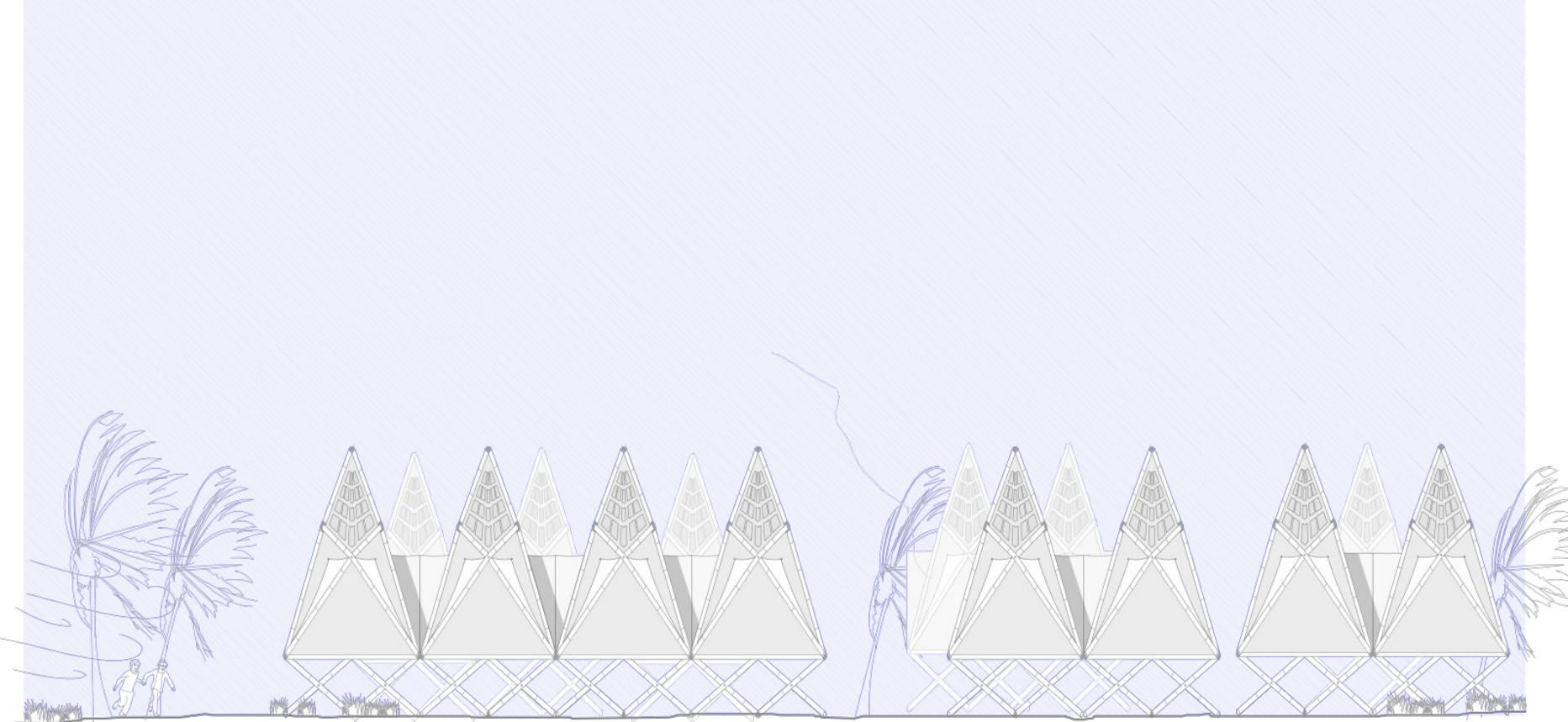


Adaptivity and transformation



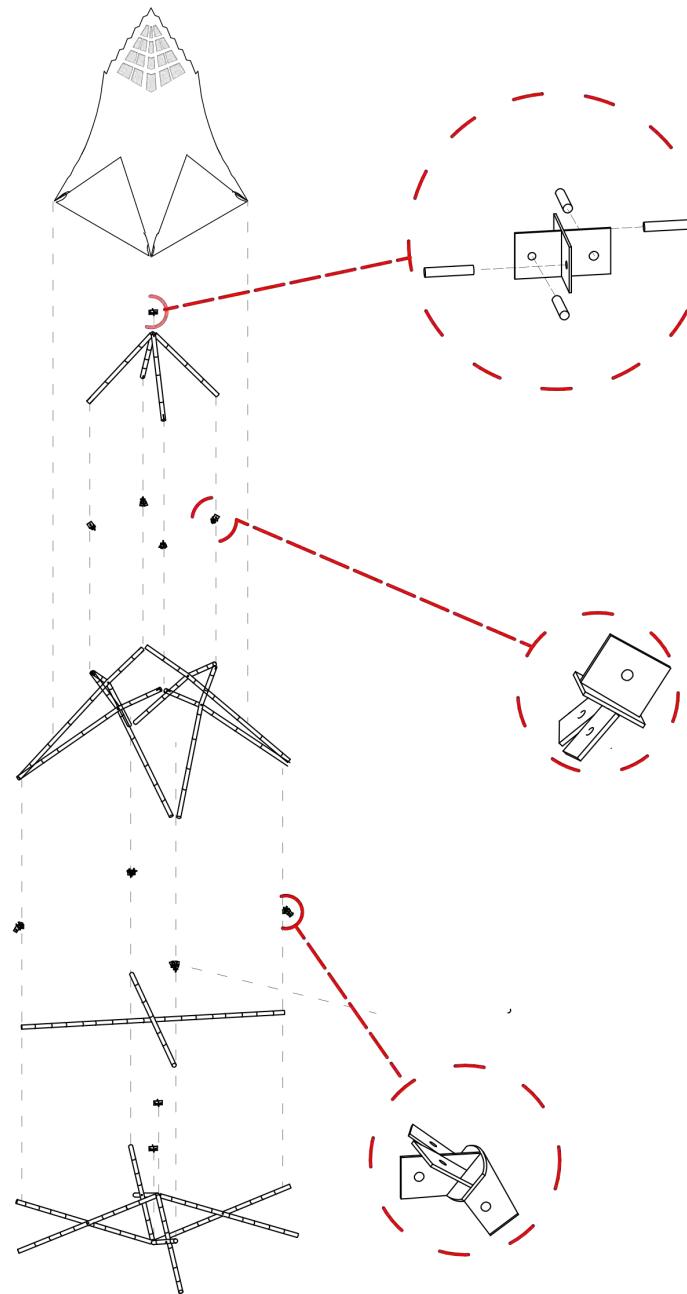
Elevation 1/100

Adaptivity and transformation

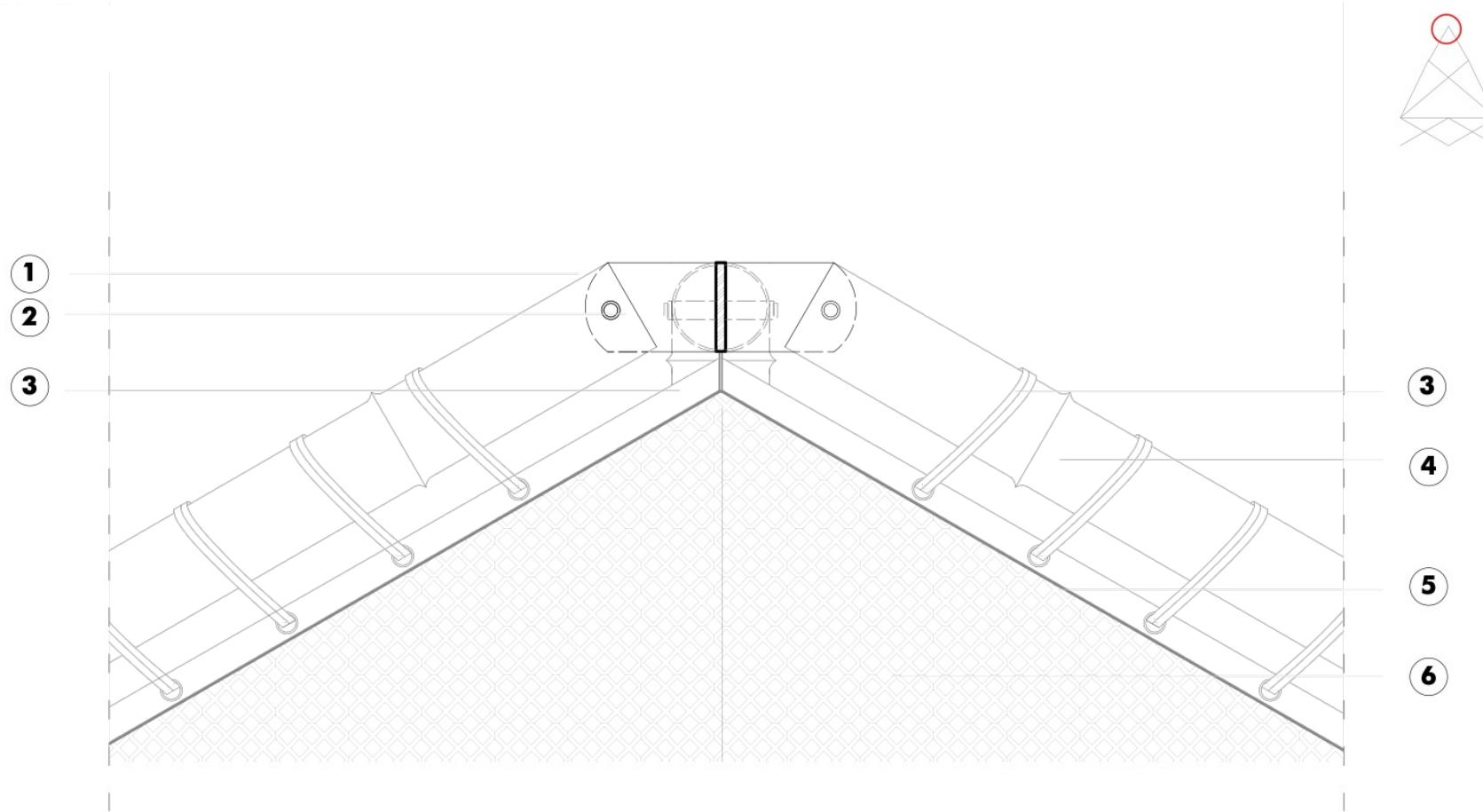


Elevation 1/100

Explosion

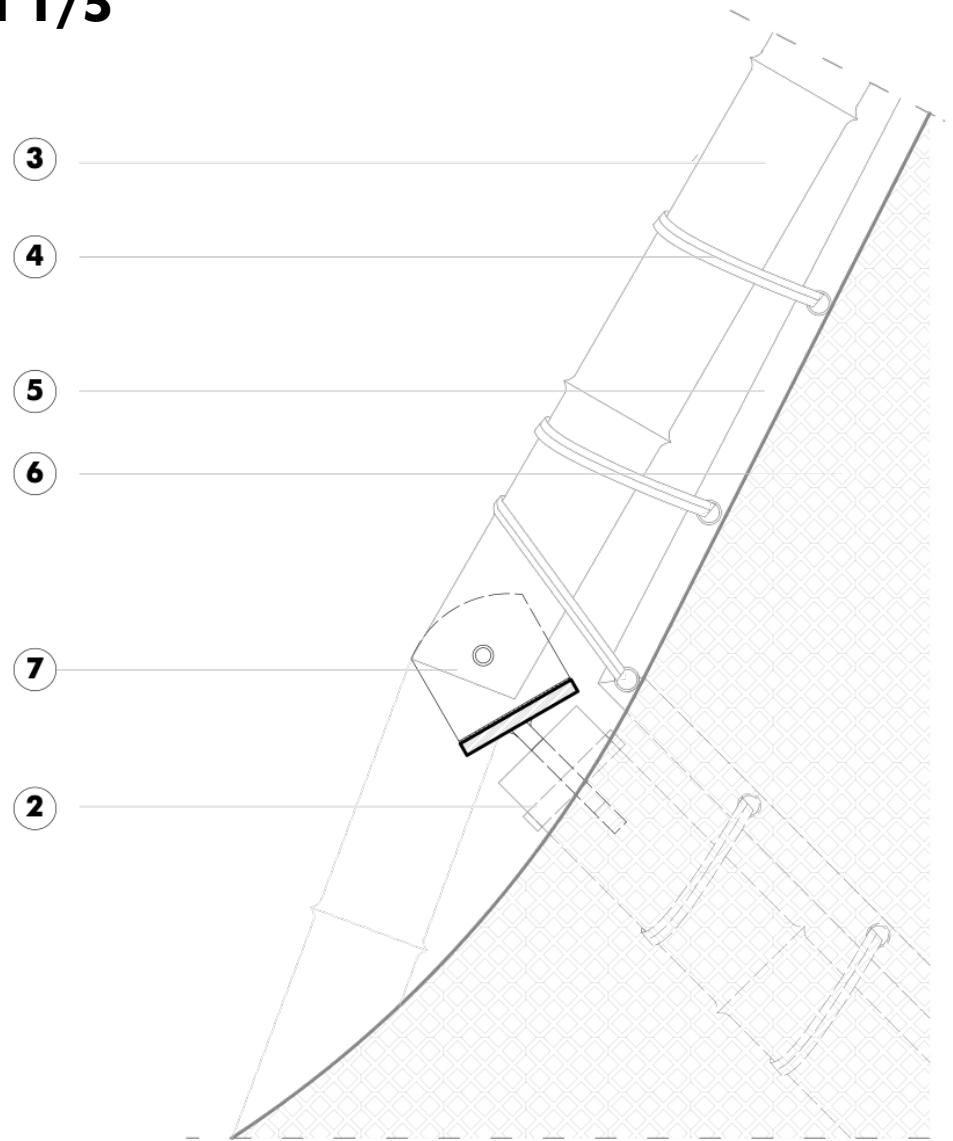


Roof joint detail 1/5



1. Roof joint
2. Bolt 1.5 cm
3. Bamboo Bar 8cm
4. Bamboo string
5. Envelope flap
6. Envelope recycled PET

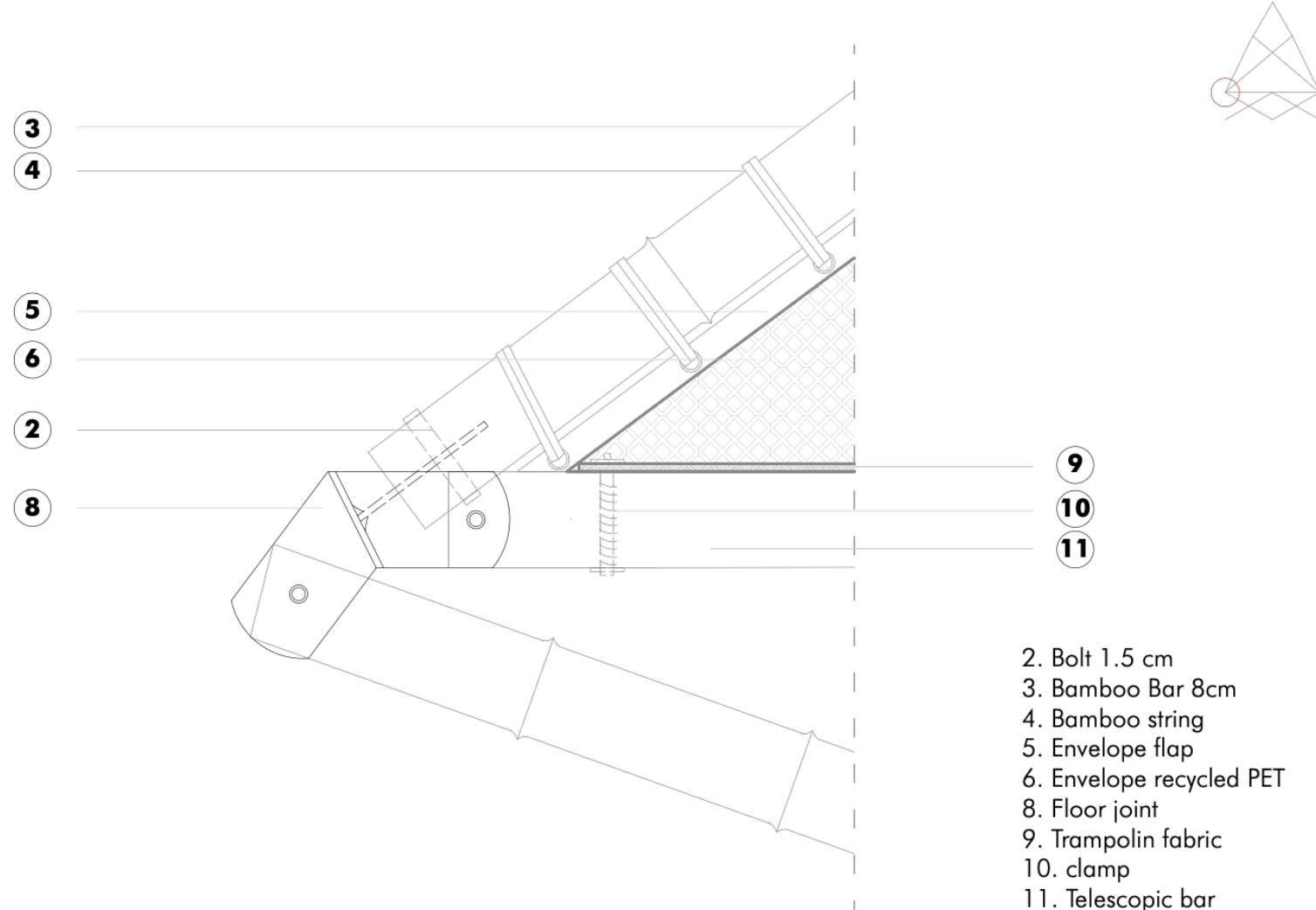
Connection joint detail 1/5



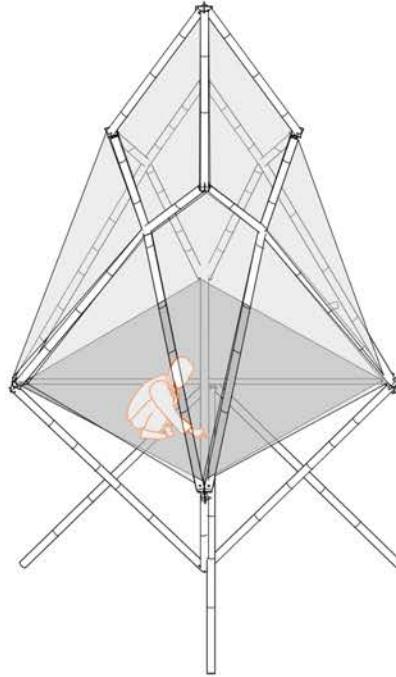
- 2. Bolt 1.5 cm
- 3. Bamboo Bar 8cm
- 4. Bamboo string
- 5. Envelope flap
- 6. Envelope recycled PET
- 7. Connection joint



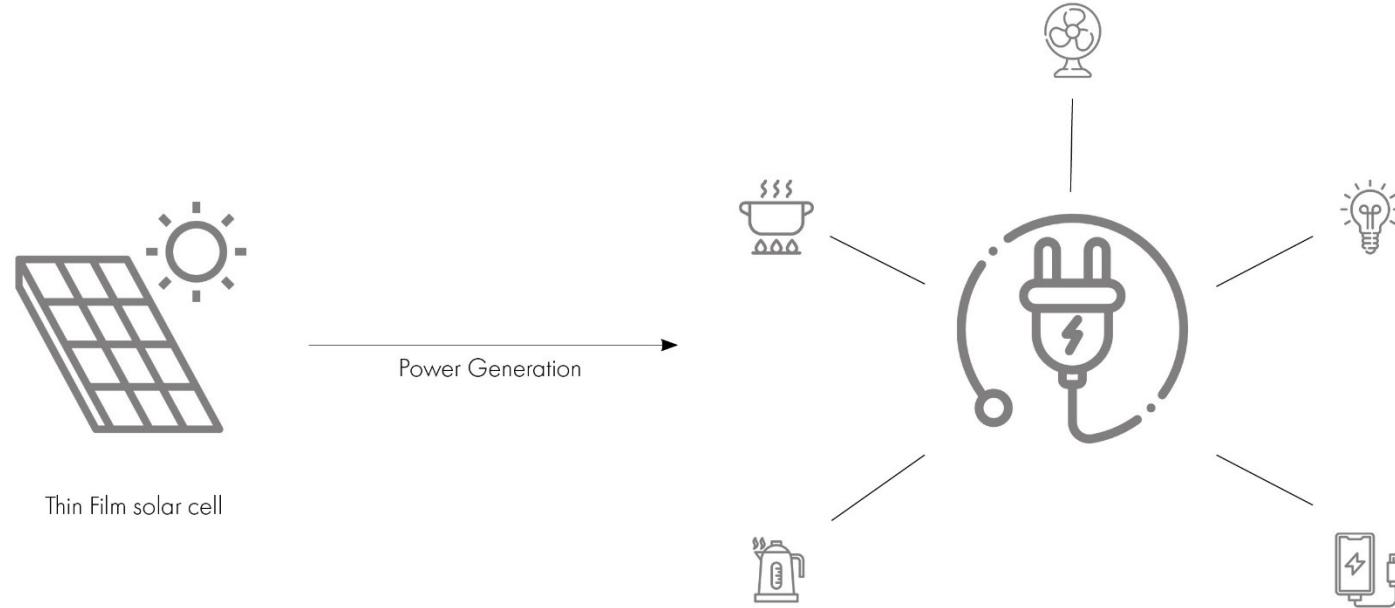
Floor joint detail 1/5



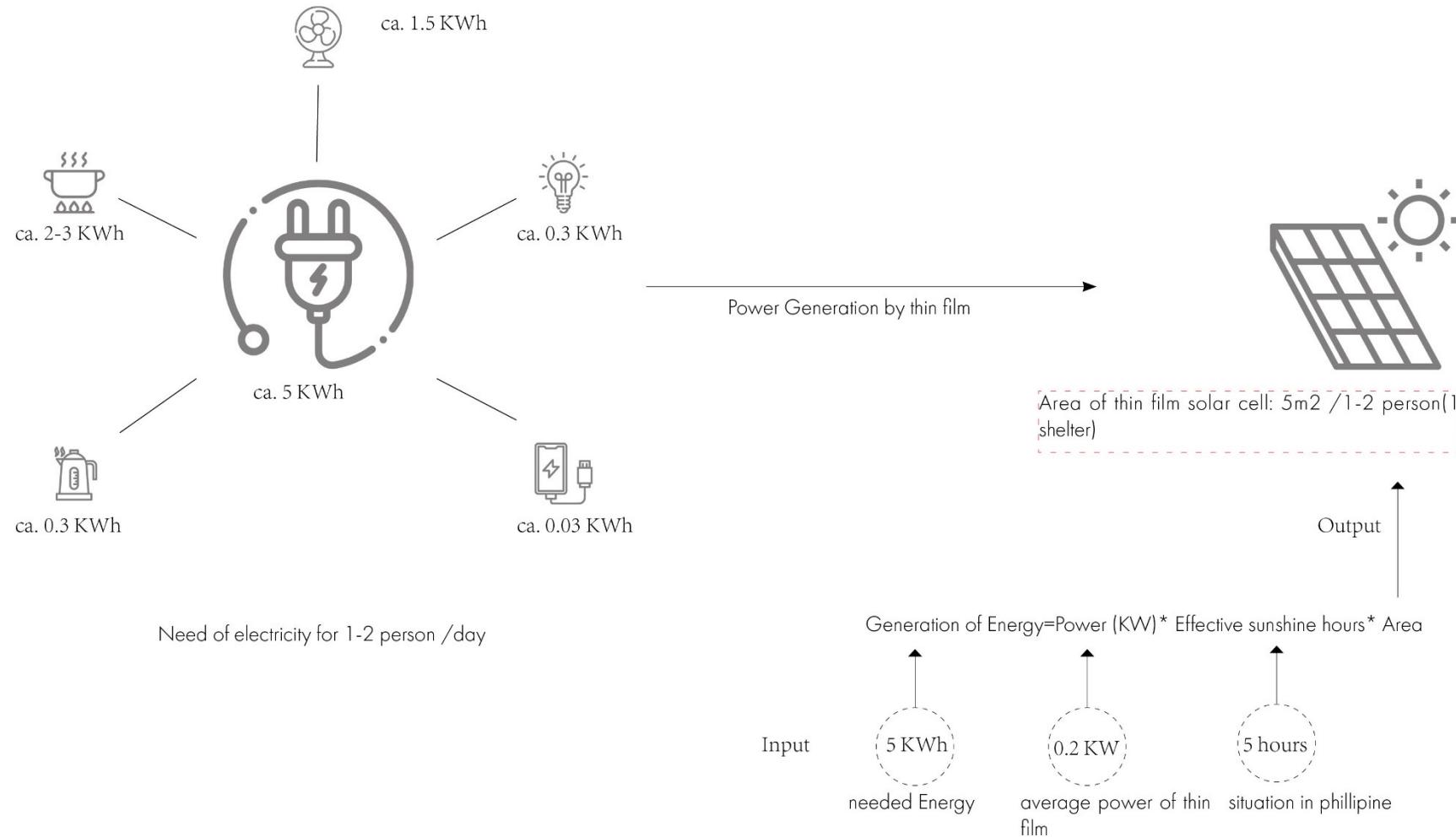
Disassembly process



Solar energy concept



Solar energy concept



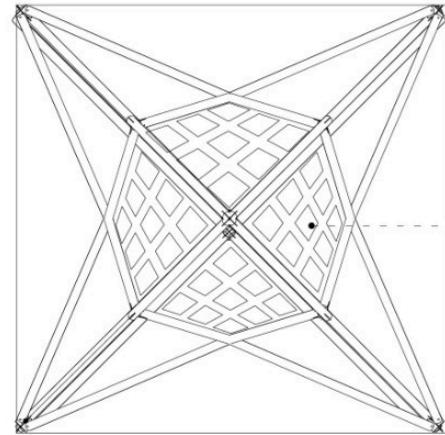
Solar energy concept reference



<https://materialdistrict.com/article/tensile-solar-panel/>

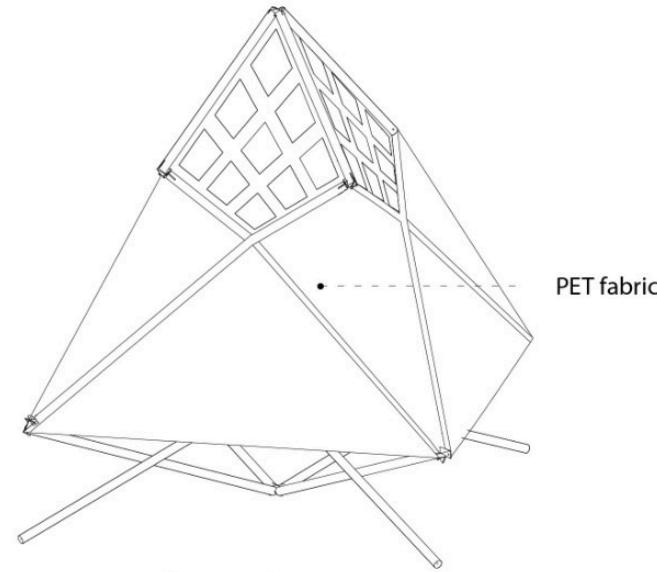
<https://www.core77.com/posts/19379/smit-tensile-solar-lightweight-modular-solar-power-19379>

Solar energy concept



Top view

Thin film solar cell



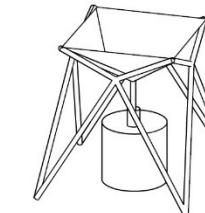
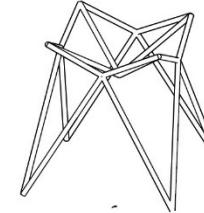
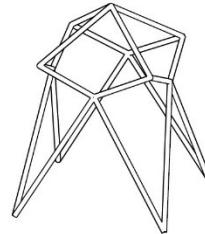
Axonometry

PET fabric

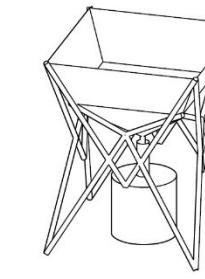
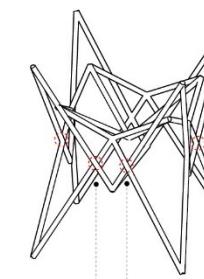
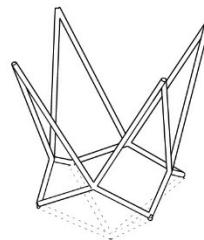
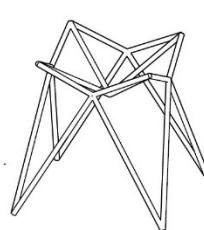
Phase 2

Transformation | Water collector

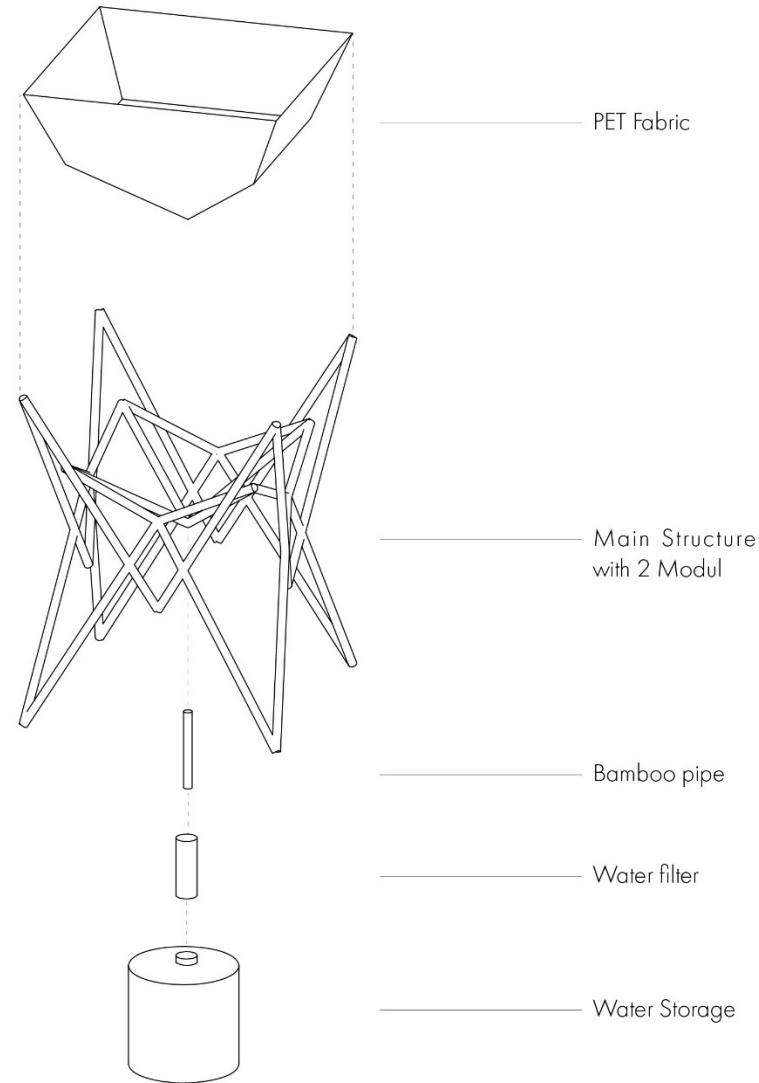
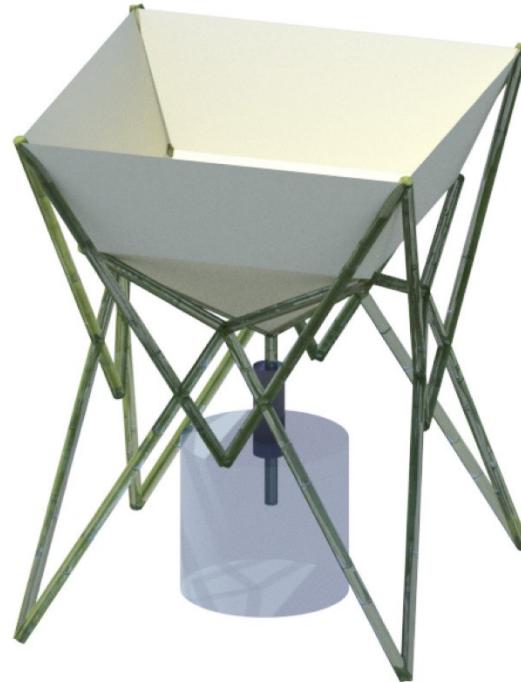
One modul



Two modul



Transformation | Water collector



Rendering



