



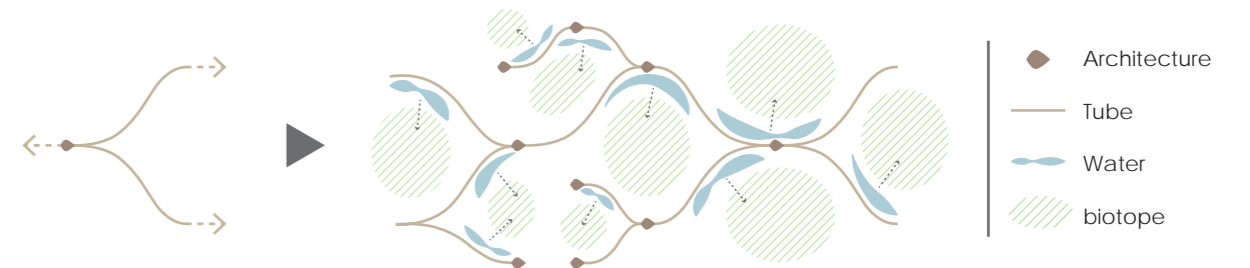
Terraforming Ray

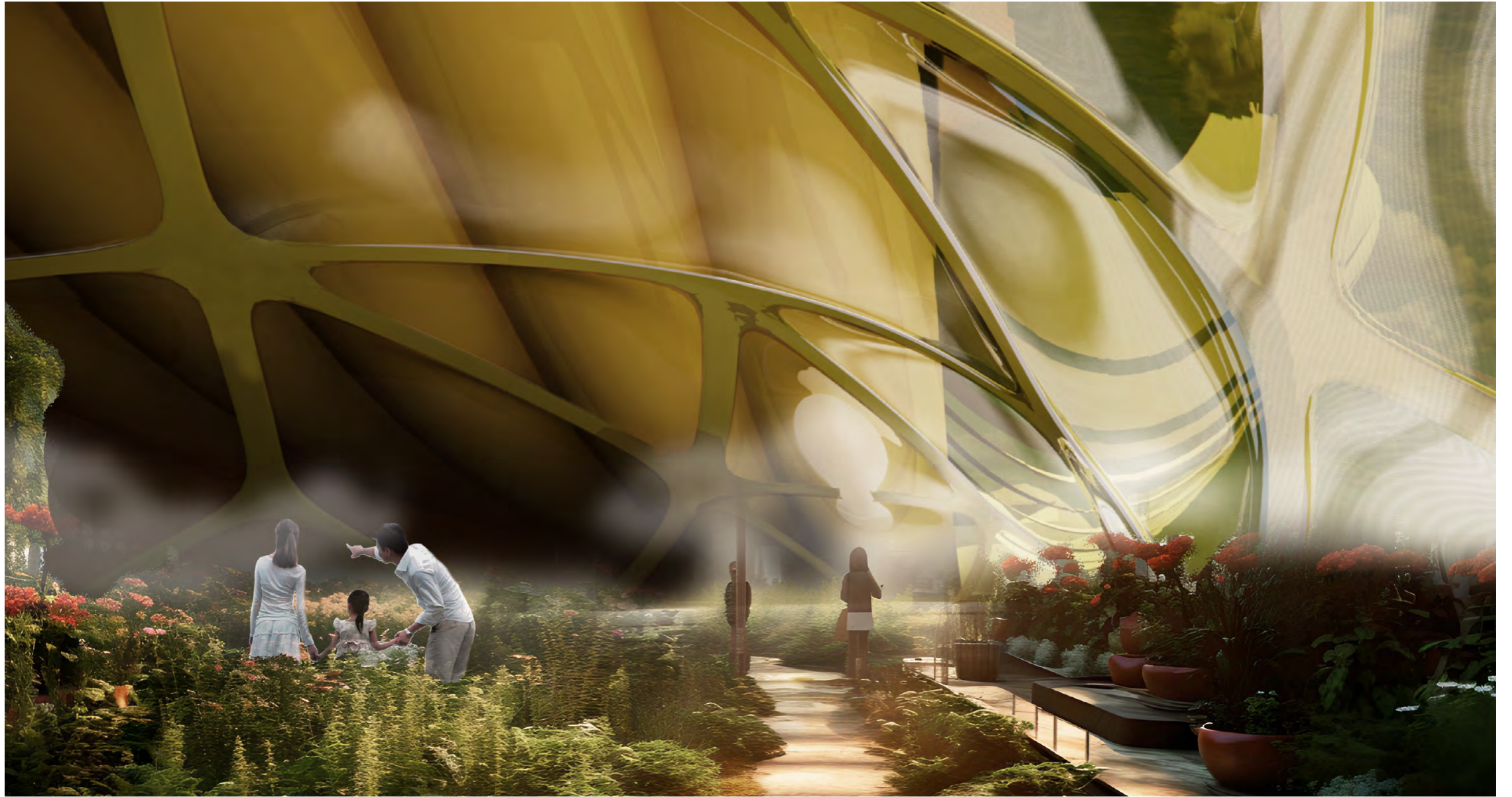
Mars is an inhospitable environment due to its strong winds and barren soil. The planet lacks surface water, and it experiences hurricanes called 'Dust Devil' that reshape its terrain. Additionally, the sandy soil on Mars contains toxic peroxides. The 'Terraforming Ray' is a device designed for terraforming, which harnesses energy from Martian winds and purifies the toxic soil, transforming it into fertile ground. Its name derives from the hydrodynamic shape of its rays. By expanding in a coordinated manner, it creates a new landscape with revitalized water and plant life.



New Landscape

The group-formed "Terraforming Ray" will create a new landscape where resources are networked and shared, terraforming is completed and water and planting are restored.





Residence / Laboratory

Residence space in "Terraforming Ray" . Experimenting with vegetation before terraforming Mars.

2023 JACQUES ROUGERIE FOUNDATION AWARDS

Award's category : Space

Project's Name

Terraforming Ray

Description

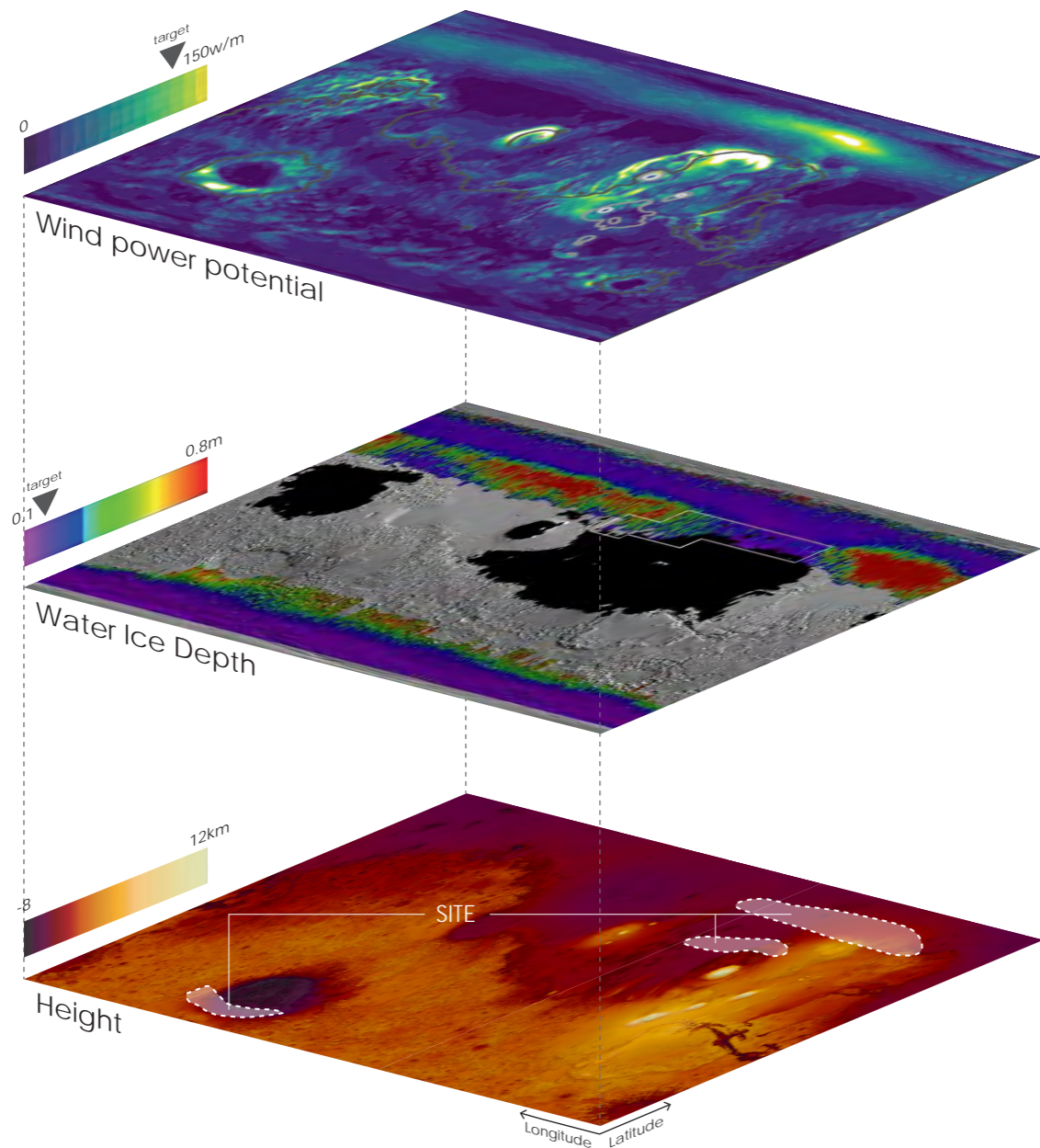
Architecture to terraform Mars by wind



Terraformed world

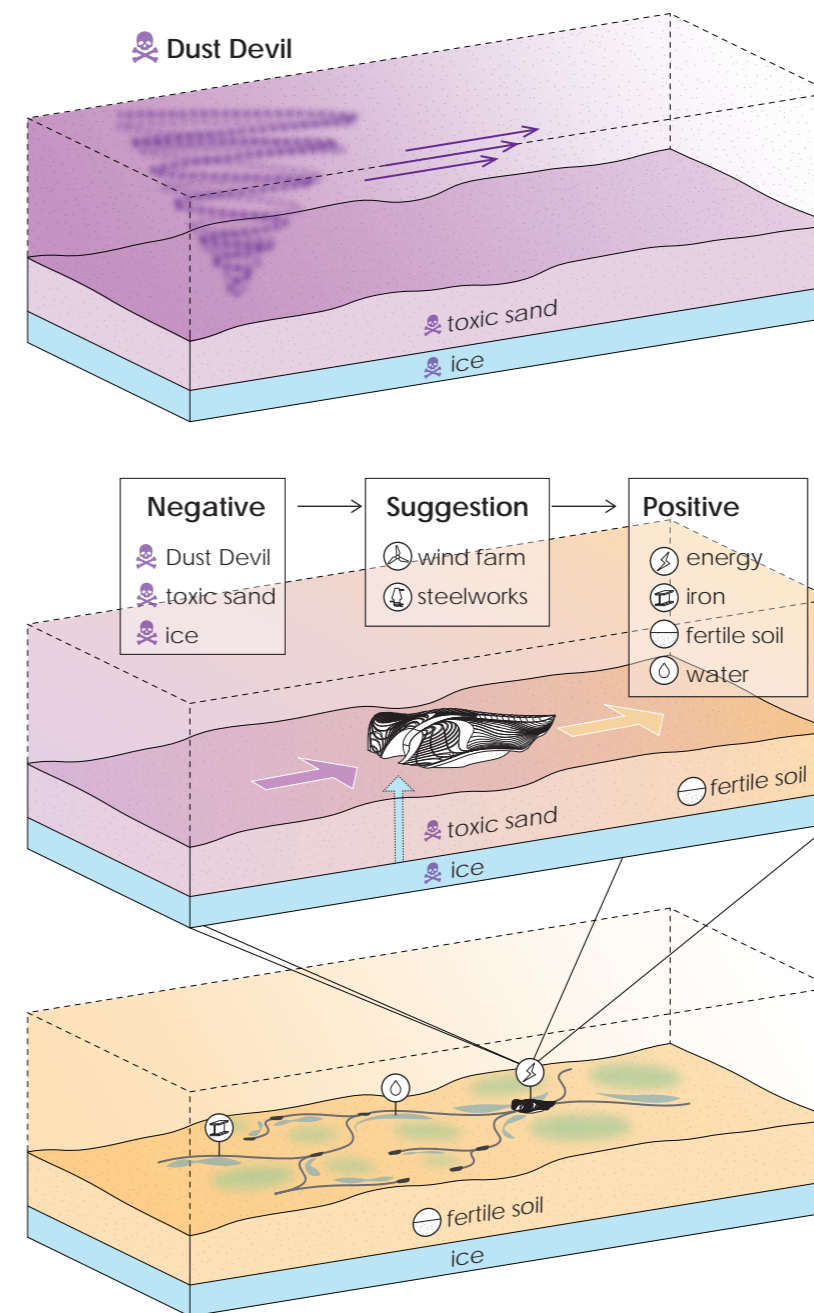
From sand planet to green planet

The air produced by "Terraforming Ray" allows people to breathe without a mask in the outside world.



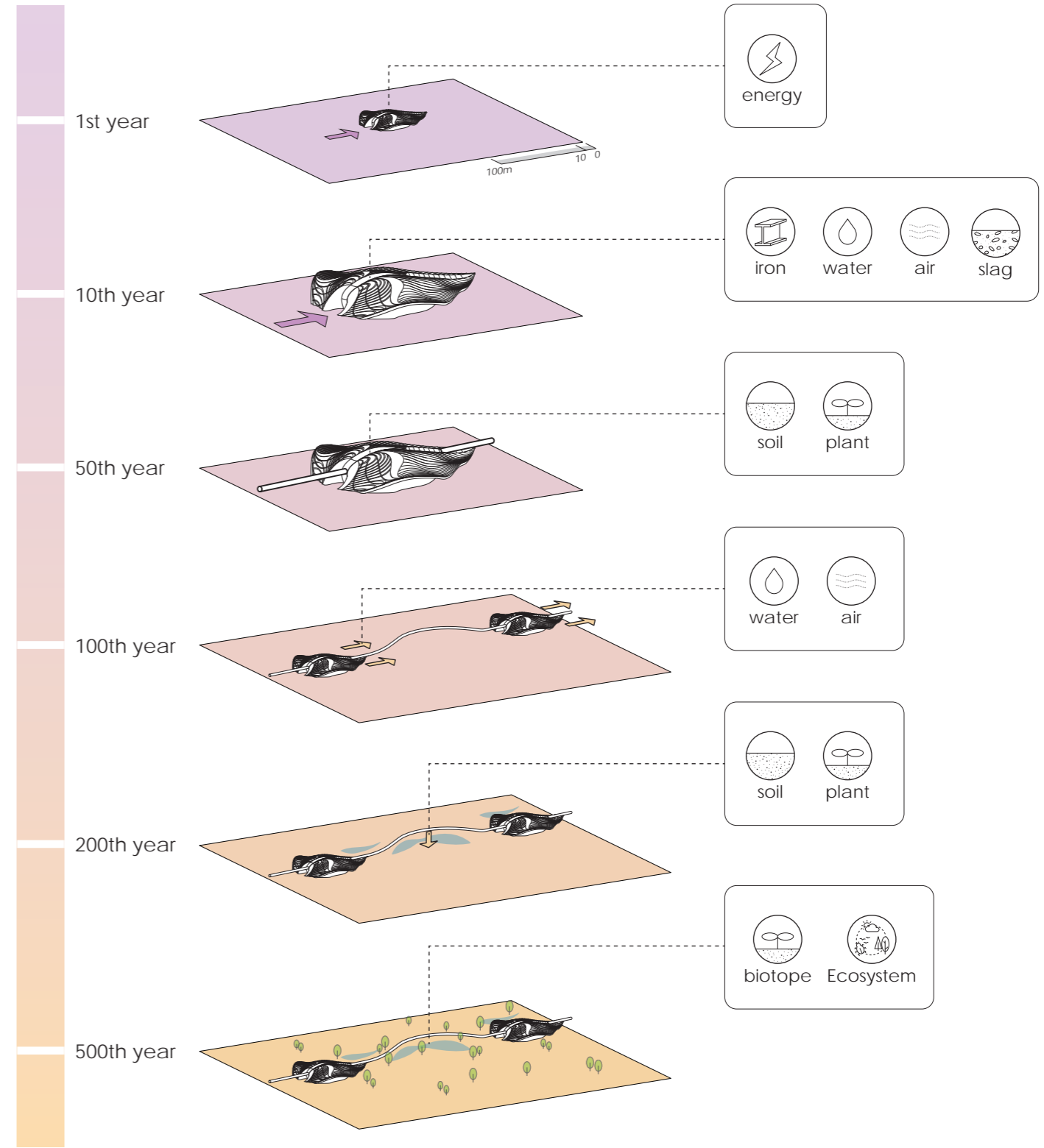
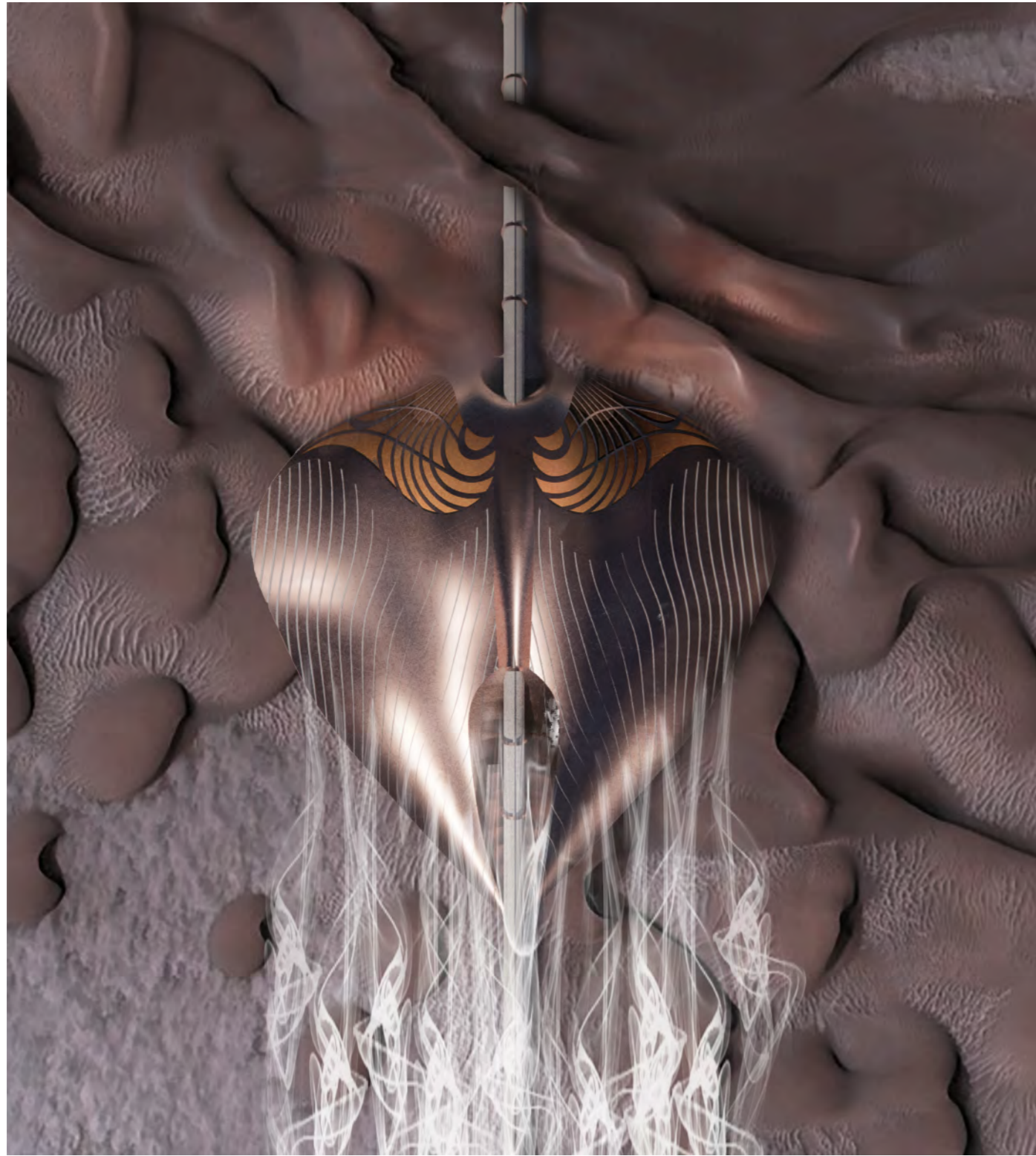
Mars environment

The site can be designated as a planning location for the "Terraforming Ray," allowing for the acquisition of abundant wind energy and the securement of ample ice resources.



Diagram

Terraforming Ray harnesses energy from Martian winds and purifies the toxic soil, transforming it into fertile ground. By expanding in a coordinated manner, it creates a new landscape with revitalized water and plant life.



construction phase

1st year : Small-scale and energy generation

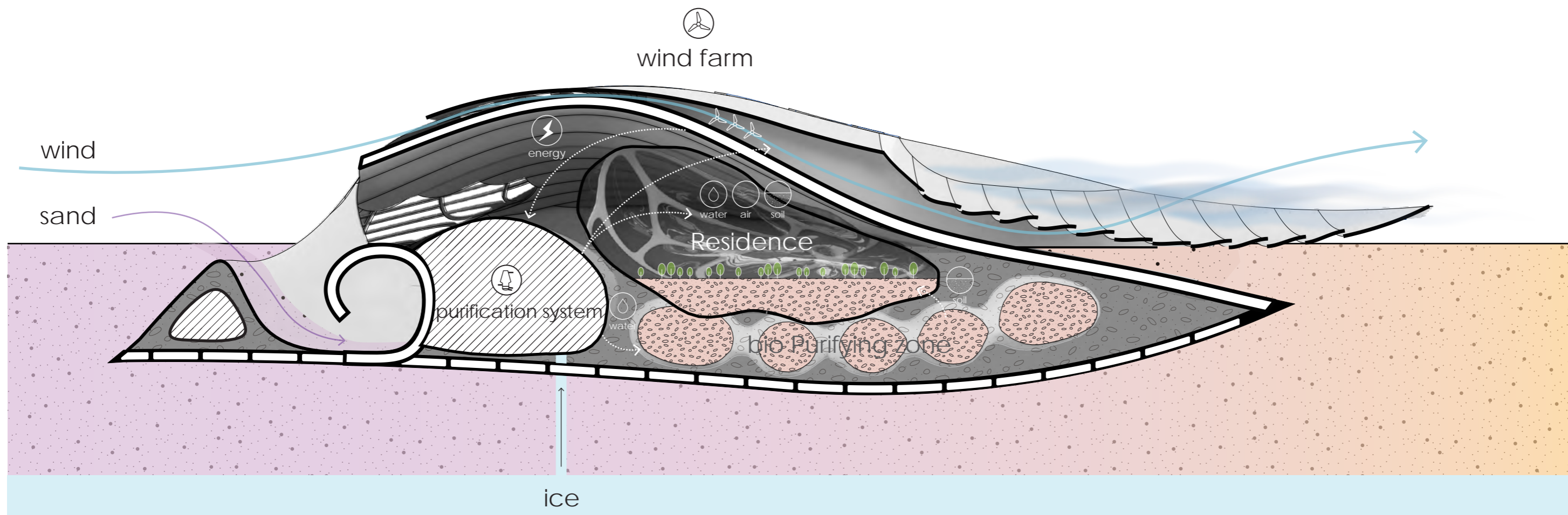
10st year : Wind energy is used for soil remediation and steel making.

50st year : The thermal energy generated inside is used to improve the soil using micro-organisms.

100st year : Purified water and wind are released outside.

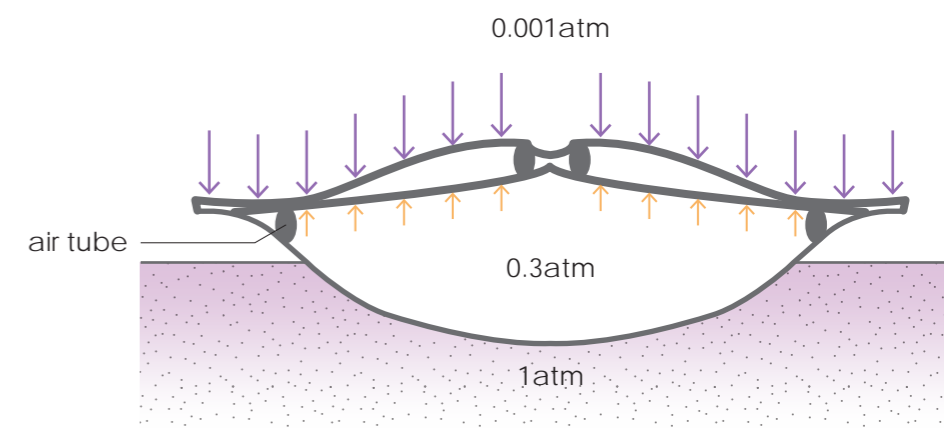
200st year : Fertile soils are shared by networks and distributed to the outside world

500st year : New landscapes and ecosystems are created through the revival of river and planting

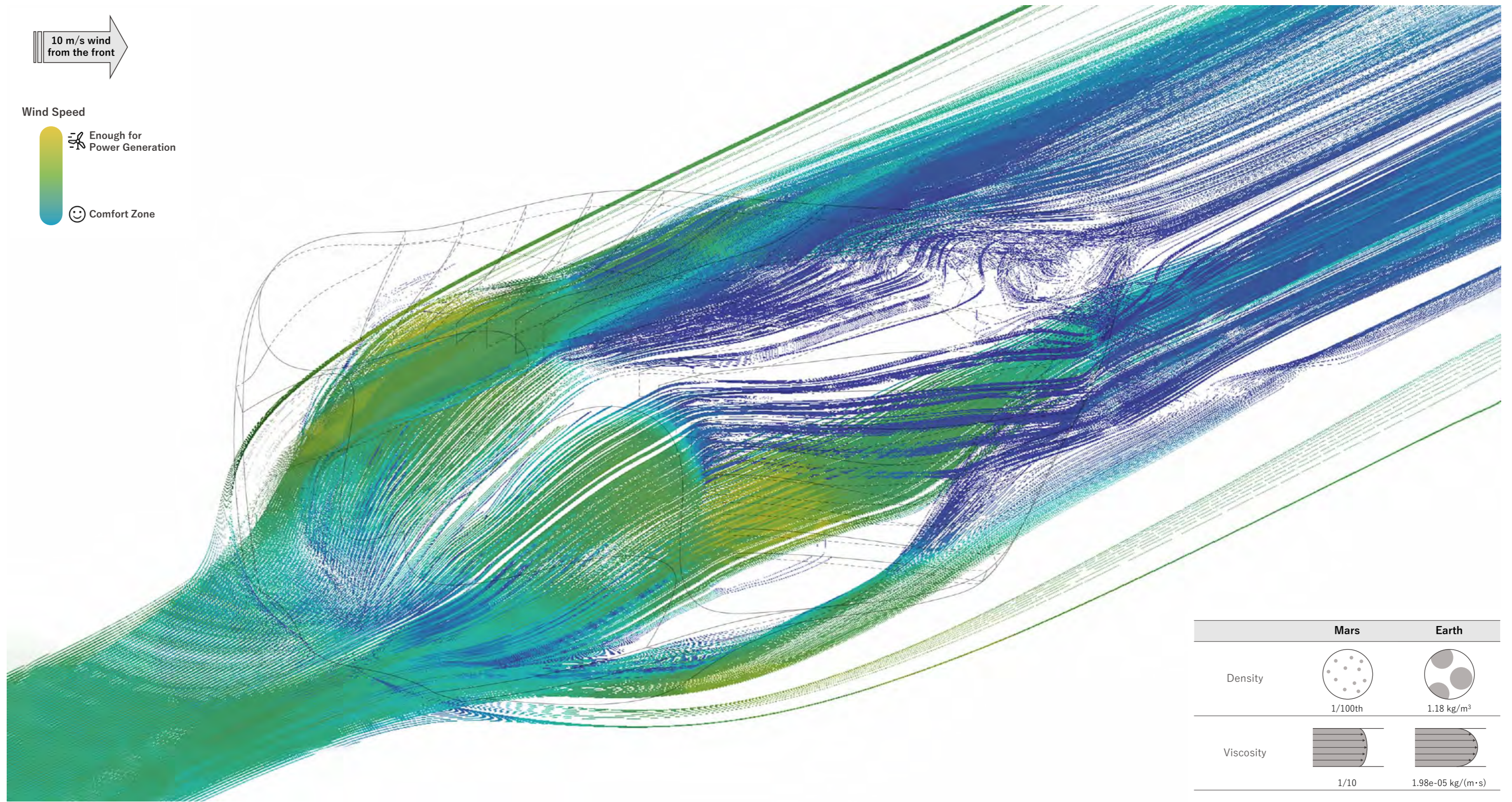
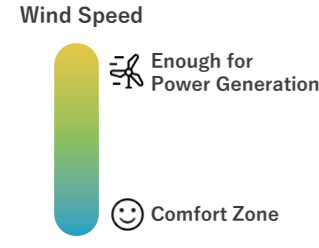


Section Structure

The space is constructed by means of a tube-membrane structure, which uses the thermal energy generated during the soil purification process. Mars has an extremely low atmospheric pressure on Earth, which makes large structures possible.



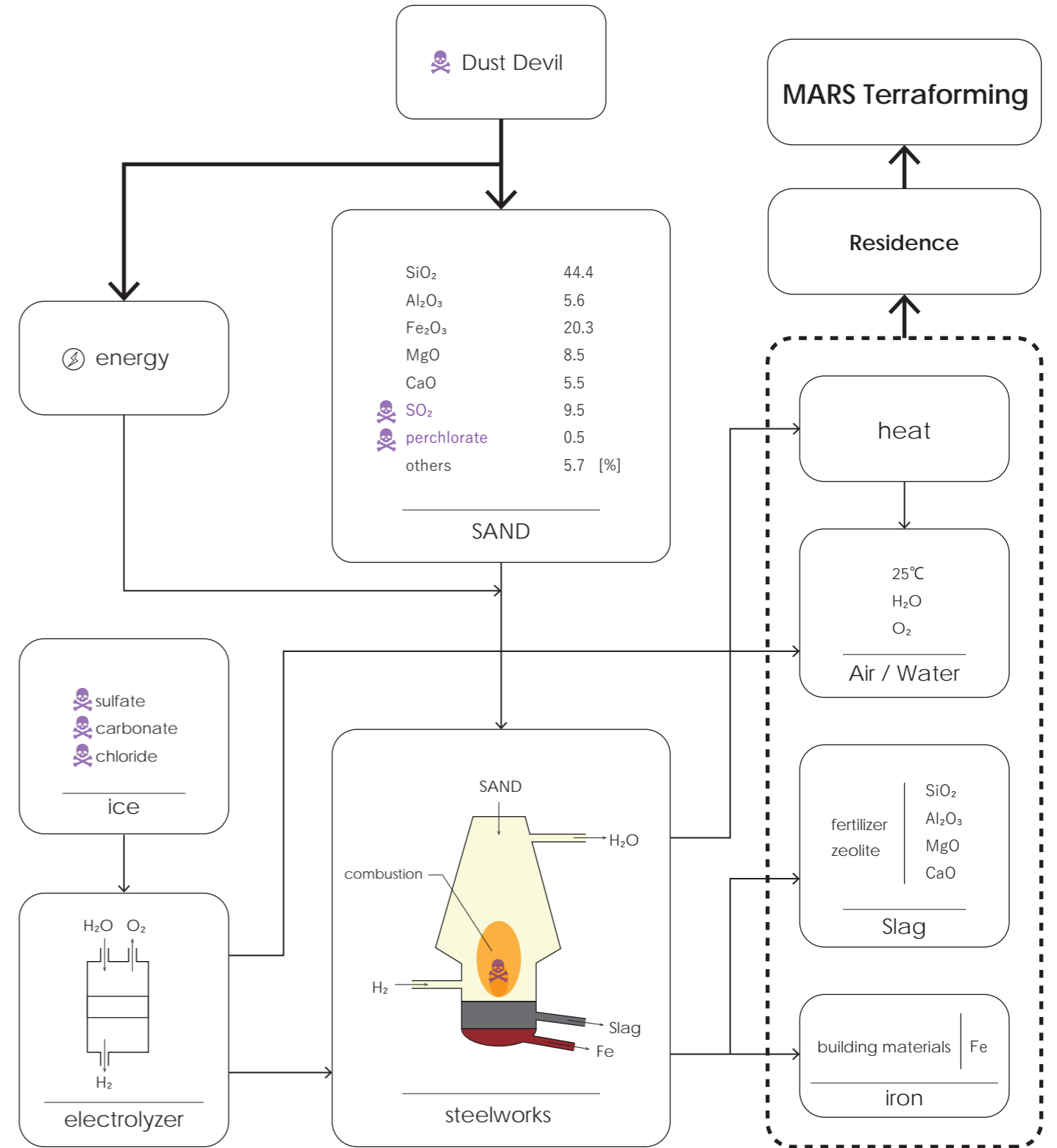
10 m/s wind from the front



Wind analysis

The shape, which resembles a stingray, disperses wind like a stingray scraping its way through sand. The dispersed wind flows into the pipe in a direction and at a speed suitable for wind power generation, providing a source of energy for the plant and for daily life. In addition, the process through the pipes also produces water by distilling ice, which is then purified, softened, and delivered to the users of the residence.

	Mars	Earth
Density	 1/100th	 1.18 kg/m ³
Viscosity	 1/10	 1.98e-05 kg/(m·s)
Gravity	↓ 1/3	↓ 9.8 m/s ²
Ground Roughness	 Comparatively High	 Depends on the locality



purification system make negative elements positive

The iron oxide present in Martian sand will be utilized for iron production. On Earth, coke serves as the reducing agent for iron extraction. However, on Mars, locally sourced hydrogen obtained through the melting and electrolysis of subterranean frozen soil will be used instead. The heating process yields three additional benefits:

1. Toxic perchlorate is incinerated and rendered non-toxic, eliminating the risk of combustion or explosion.
2. Through thermal distillation and electrolysis, any sulfates, carbonates, and chlorides present in the frozen soil are purified, producing fresh water.
3. As Mars maintains subfreezing temperatures, a valuable heat source will be generated to sustain an "optimal temperature" within the dome, ensuring a suitable environment for living organisms.

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