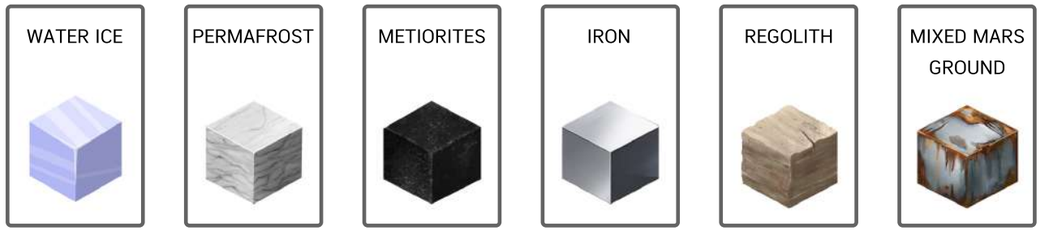
MARS RESOURCE EXTRACTION UNIT (MREU)

Mars, the next living potential planet. To imagine a human colony on Mars was such a sci-fi concepts but since NASA and other organization have been researching on the red planet they found a possibilities for humans to live on the planet but we better understand the resources that are available on the planet. In the reality, to bring all of the Earth materials needed to Mars is impossible becourse spaceships will be overloaded with Earth materials, as it won't be feasible to transport through space with all the materials that we'll need to live, subsist and remain safe on Mars over the long-term. Instead, we can turn Mars' Indigenous resources to satisfy our needs.

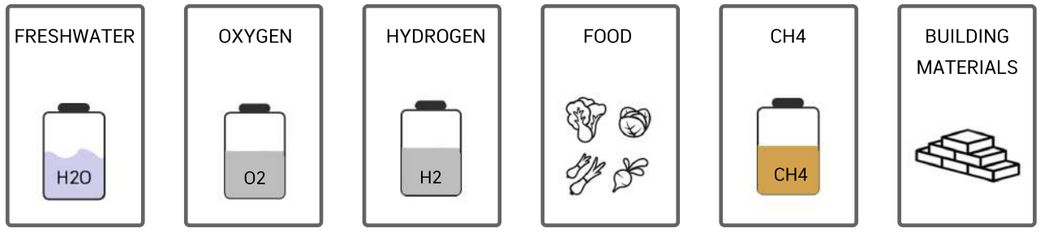
Fortunately, the red planet's natural resources, and their possibility to foster human life, are central to why notions of populating Mars have moved from fantasy to scientific plausibility. For one thing, Mars has carbon that can be extracted from the atmosphere and used to make plastics, rocket fuel or heating fuel. Nitrogen, hydrogen and oxygen are all biologically accessible in forms like carbon dioxide gas, nitrogen gas, and water ice and permafrost. There are also plentiful mineral resources including iron, titanium, nickel, aluminum, sulfur, chlorine and calcium. Silicon dioxide is the most common material on Mars, according to measurements taken by the Viking space probes, and is also a basic ingredient of glass. It is likely that glass products, including fiberglass, and structures could be constructed on Mars in much the same way as they are on Earth. Regolith is another readily available Martian construction material. The pulverized, dusty rock – that's mostly silicon dioxide and ferric oxide, with a fair amount of aluminum oxide, calcium oxide and sulfur oxide – has been deposited over Mars by asteroid collisions over billions of years. Researchers think that regolith could be a viable alternative for concrete. Beside all of that, we also can produce water from the water ice that has been found in the underground of the planet which it will be the main resource for the living.

The MREU project is our proposal for the first station that will build on Mars to be a laboratories and factory dedicated to investigating self-sufficiency and producing in energy, food, building materials and water for life on Mars. The station can produce basic building materrials such as glass, fiberglass, rammed brick, ceramics, steel and solar panel. it also can produce essential needs for living like water and oxygen.

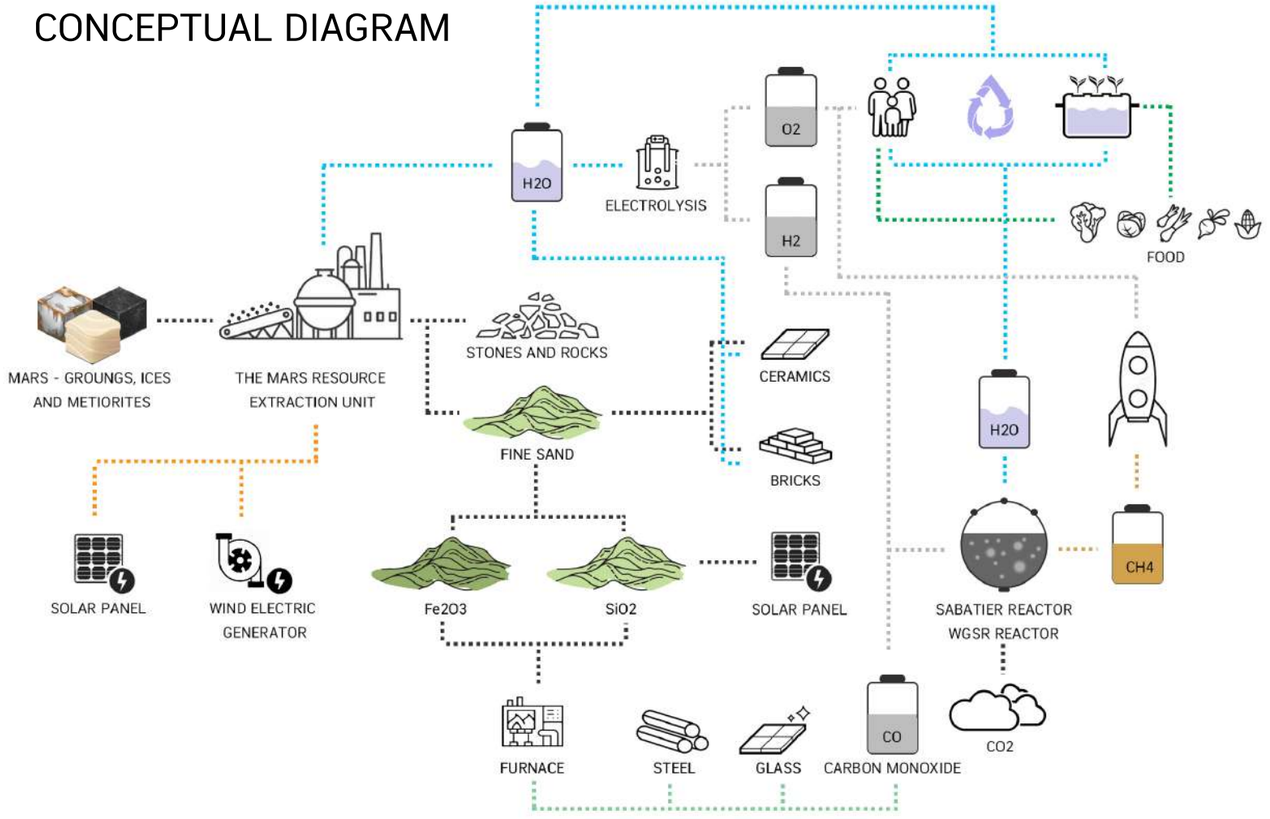
MATERIAL RESOURCES



OUT COME PRODUCT



CONCEPTUAL DIAGRAM



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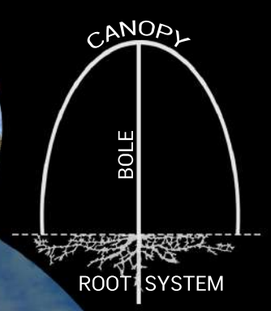
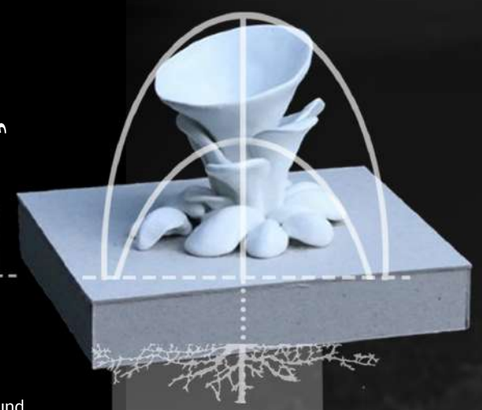
Mars Resource Extraction Unit

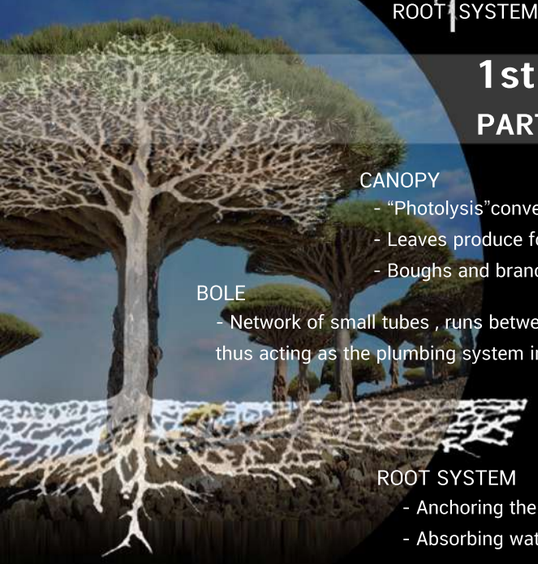
Design inspiration

Model development





1st develop: PARTs OF TREE



CANOPY
- "Photolysis"converts the light to chemical energy
- Leaves produce food for the plant
- Boughs and branches store food materials

BOLE
- Network of small tubes , runs between the roots and the leaves, thus acting as the plumbing system in the plant.

ROOT SYSTEM
- Anchoring the tree to the soil
- Absorbing water and minerals from the soil

- Inspired by each part of the tree functions to plot architecture zoning and form. following the needs- to digging underground ice rock, extract out the H2O, H2, O2, and building- materials then storing and finally- shipping out for human usage.

Final model develop : " MREU "

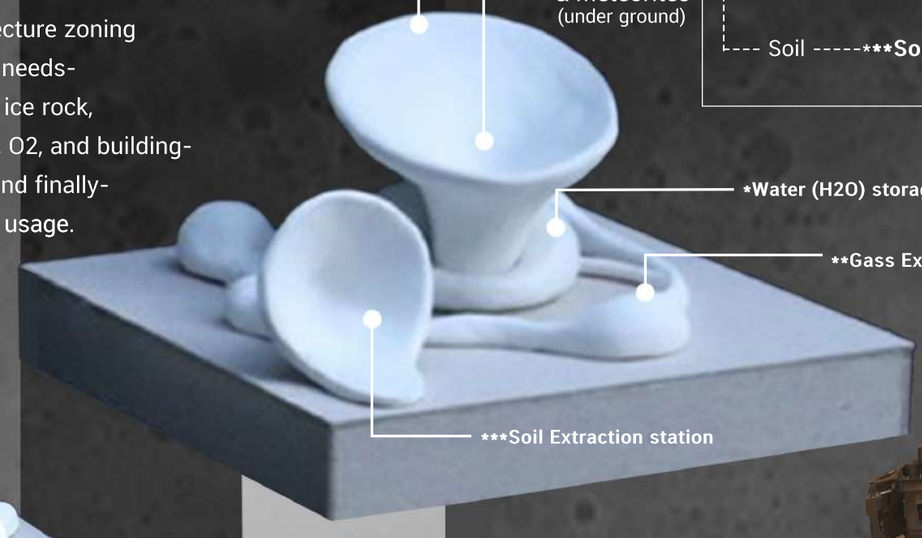
Solar Panel roof & Wind Electric Generator system

Minning Zone

grounds,,ice & meteorites (under ground)

- Water(H20)
  - ***Water Storage** — O2
  - ****Gass extraction** — H2
- Soil
  - *****Soil Extraction**
    - Sand&Rock
    - Fine Sand

(surface)



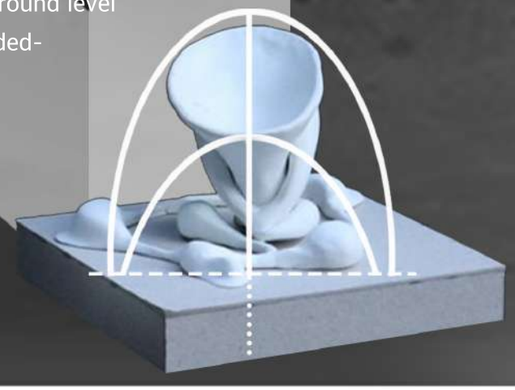
3rd: ON-SITE ANALYSIS

- "Minning Zone" located at an underground level to digging grounds, ice & meteorites under mars' surface.
Begin to separate those raw substances into H2O and Soil along the delivery process.
- Delivering H2O and Soil to upper ground level "Extraction station" for the more categorically resource extraction process.

Leaving half of the extraction station underground aim to use higher temperature near Mars surface to help storing liquid water and keep the indoor temperature warm.

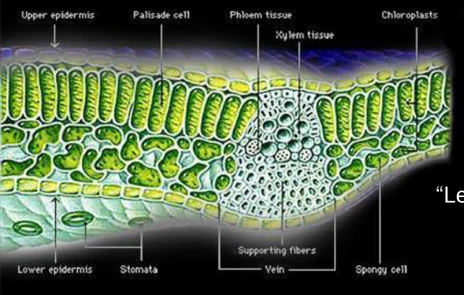
Another upper half on the surface level as- an entrance & exit serving transportation on ground for rovers & astronauts.

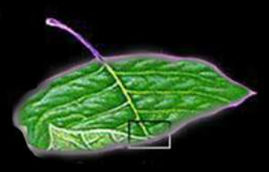
- Thicken some of the "Extraction station" for water storage.
- Lower "Extraction station" down to the ground level for less supporting structure in the expanded- form & weight to create water flow and - water storage.



2nd : THICKENED PART OF SUCCULENT PLANTS

drought resistant plants in which the leaves, stem, or roots have- become more than usually fleshy to retain water in arid climates or soil conditions.





"Leaves" produce food for the plant

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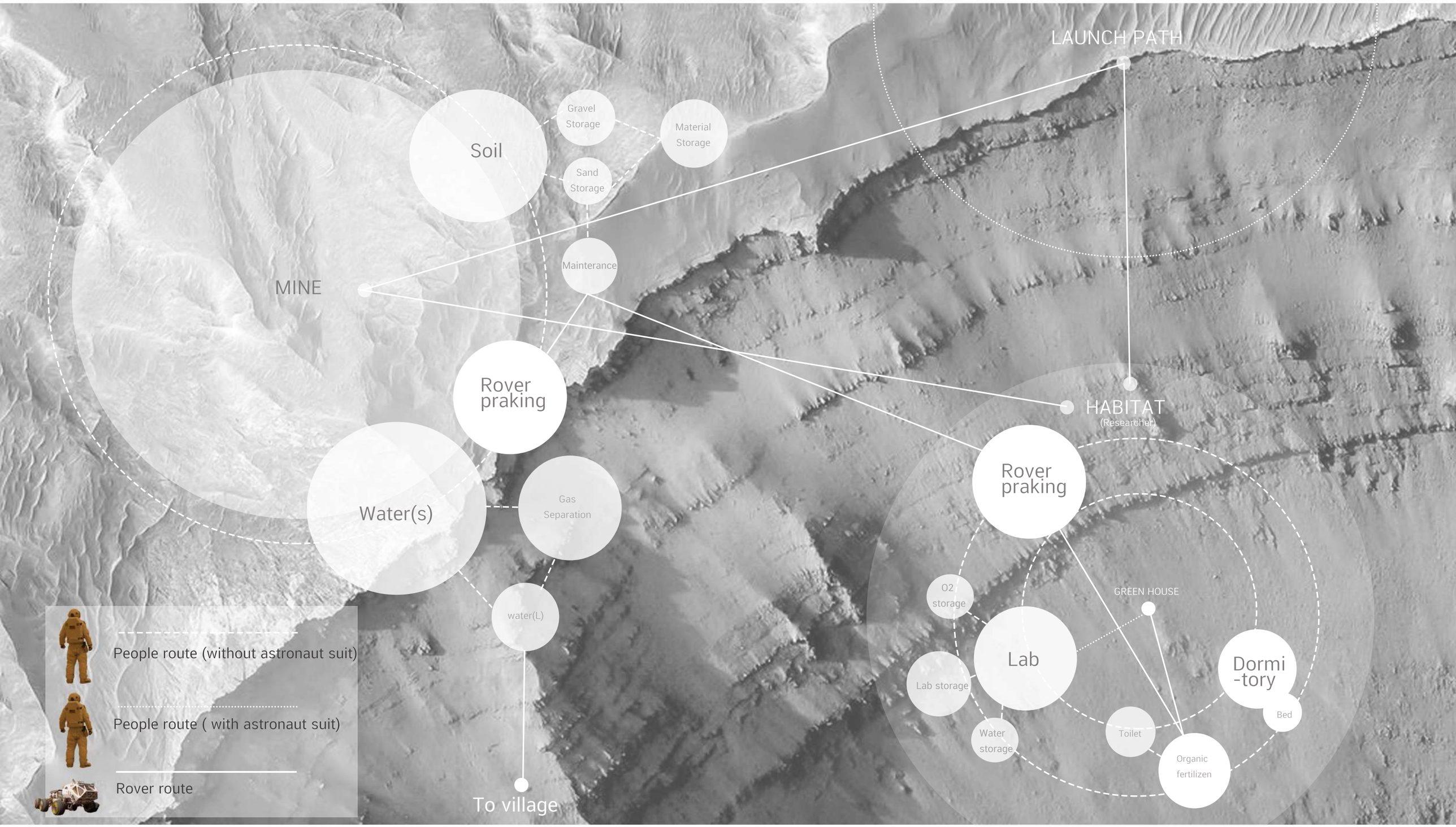

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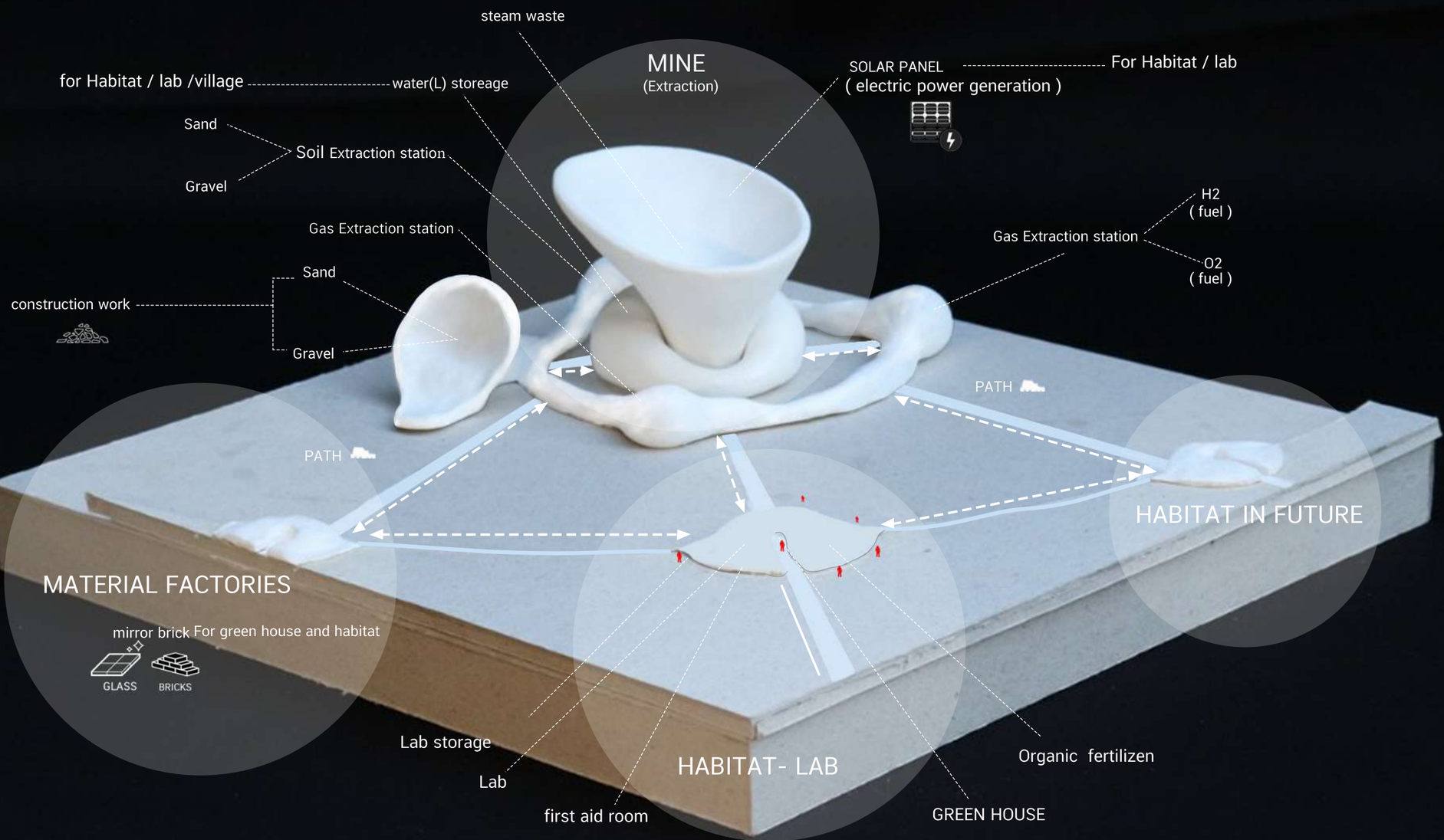
Isometric function and zoning



USER

- total 8 people
- x3 mock up building material
- x2mechanical engineer
- x2 doctor
- x1 botanist

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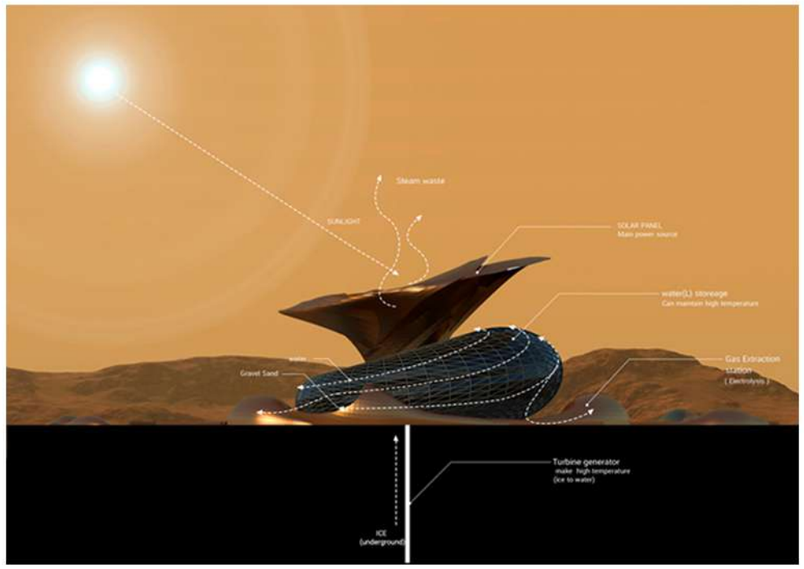
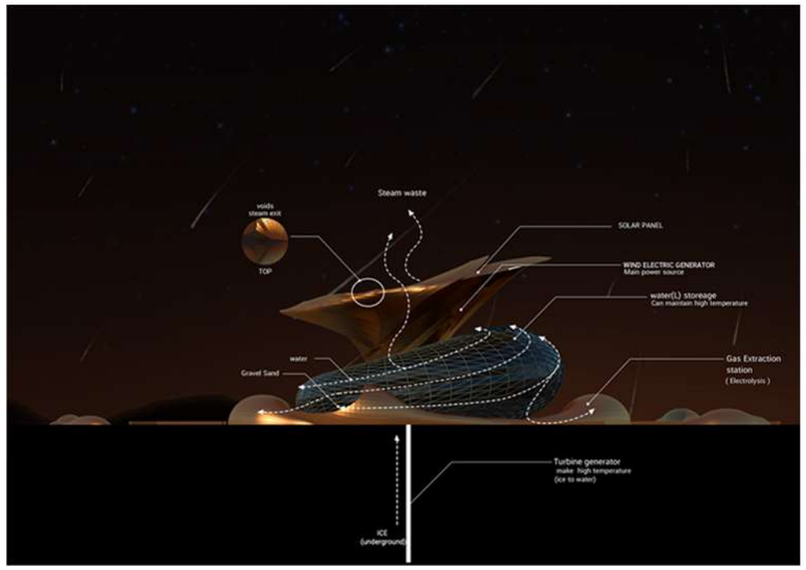
MREU working in different climates.



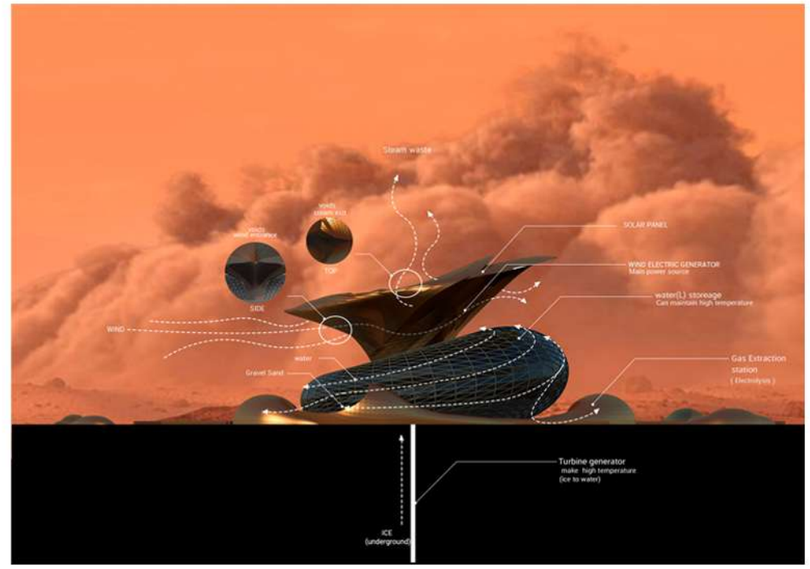
1. Daytime

MERU using solar panels & wind electric generator roofs as the energy source in the daytime. Generate backup electric energy from outside solar panel field and steam waste from the mine, storing it in an electric generator as reserve power.



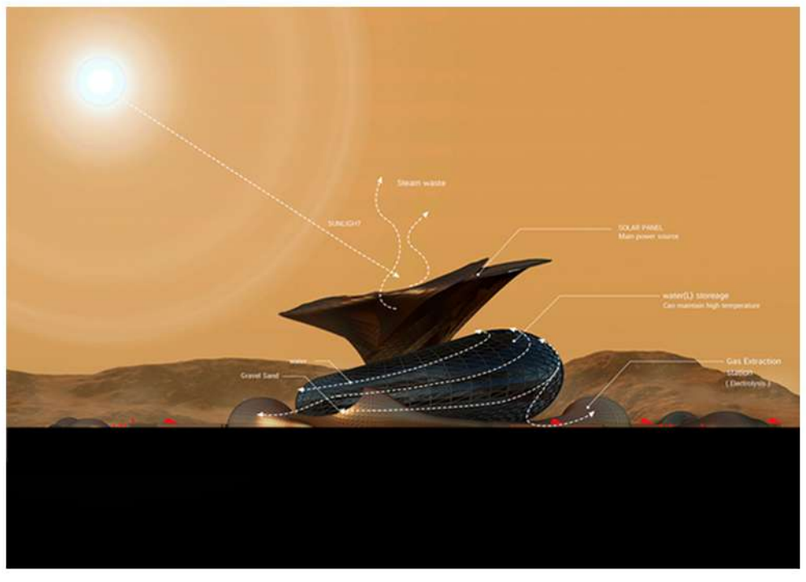
2. Night time

Generate electric energy from the steam waste together with using reserved energy from the electric generator to continue running building system at night time.

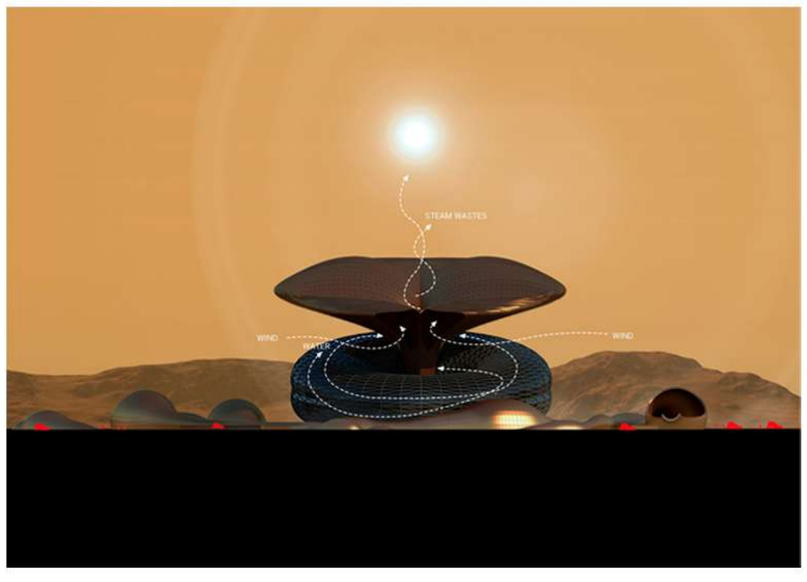


3. Dust storm situation

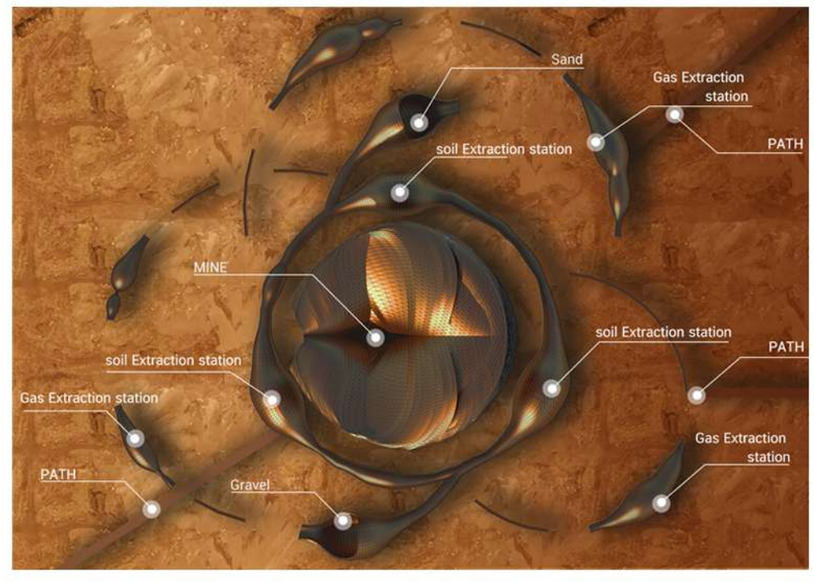
Take advantage of wind storm to generate electric energy through wind electric generator on the roof along with using reserved energy from the electric generator to continue running MERU building system during the dust storm climate.



SIDE



FRONT



TOP

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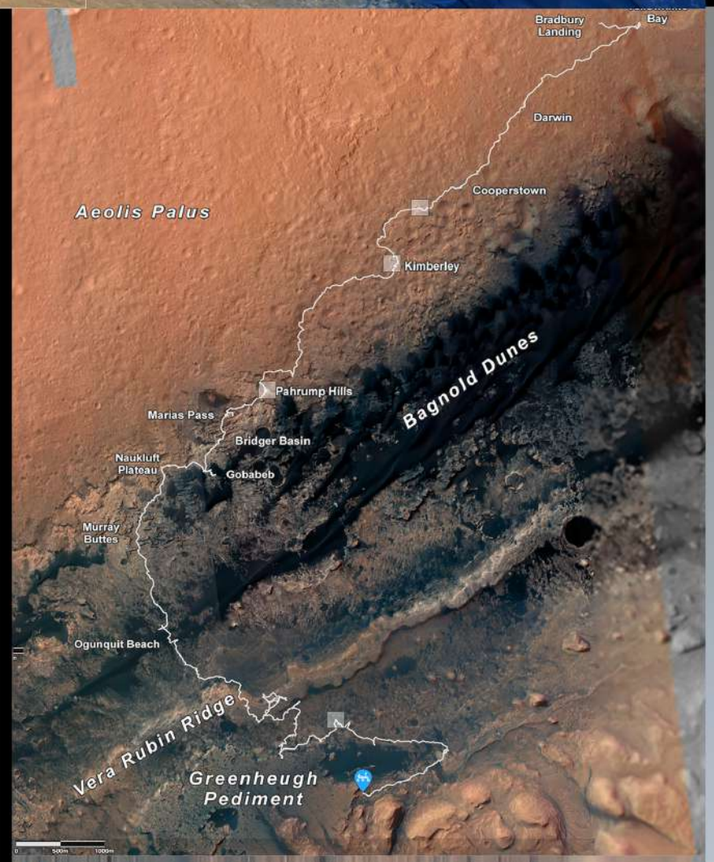
“MERU”
1st LOCATION ON MARS



Following Curiosity rover landing site & mission path.

Place the 1st unit of MERU at where Curiosity 1st landed on Mars, Quad 51 of Aeolis Palus in the crater Gale. Its landing site is near an alluvial fan which is hypothesized to be the result of a flow of underground water.
Then the further units following Curiosity mission path.

“Was Mars habitable in the distant past?” mission results will help prepare for human exploration.
Begin to install MERU along this explored route should be the most efficient way to use this in-hand info then continue collecting essential resources for living on-site.
Prepare to welcome the upcoming human on Mars mission.

PLANNING THE INSTALLATION

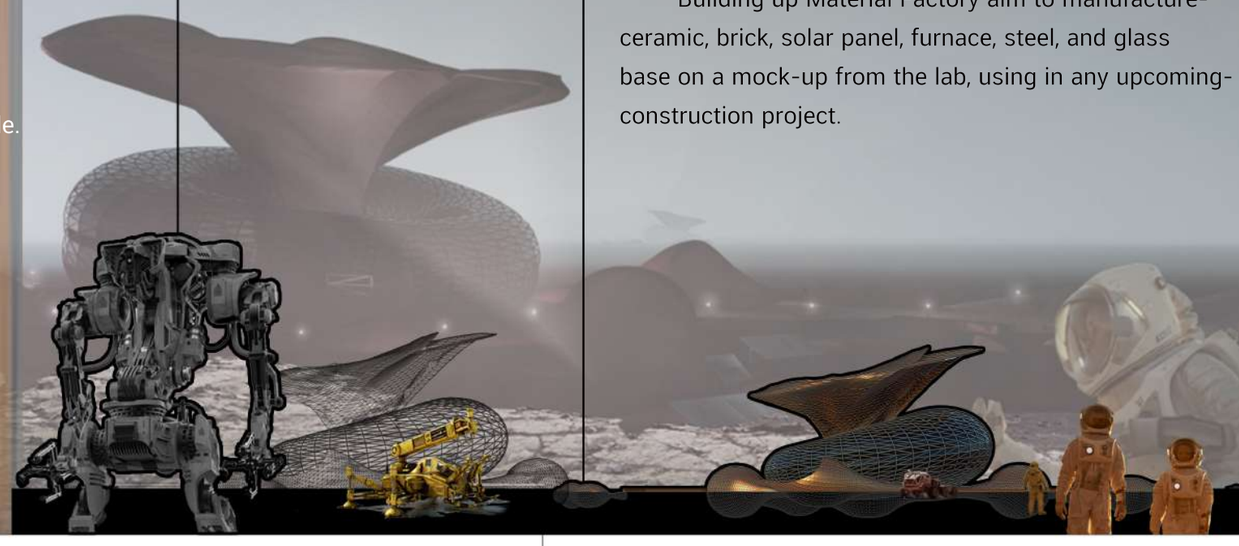
1st Phase: remote-control

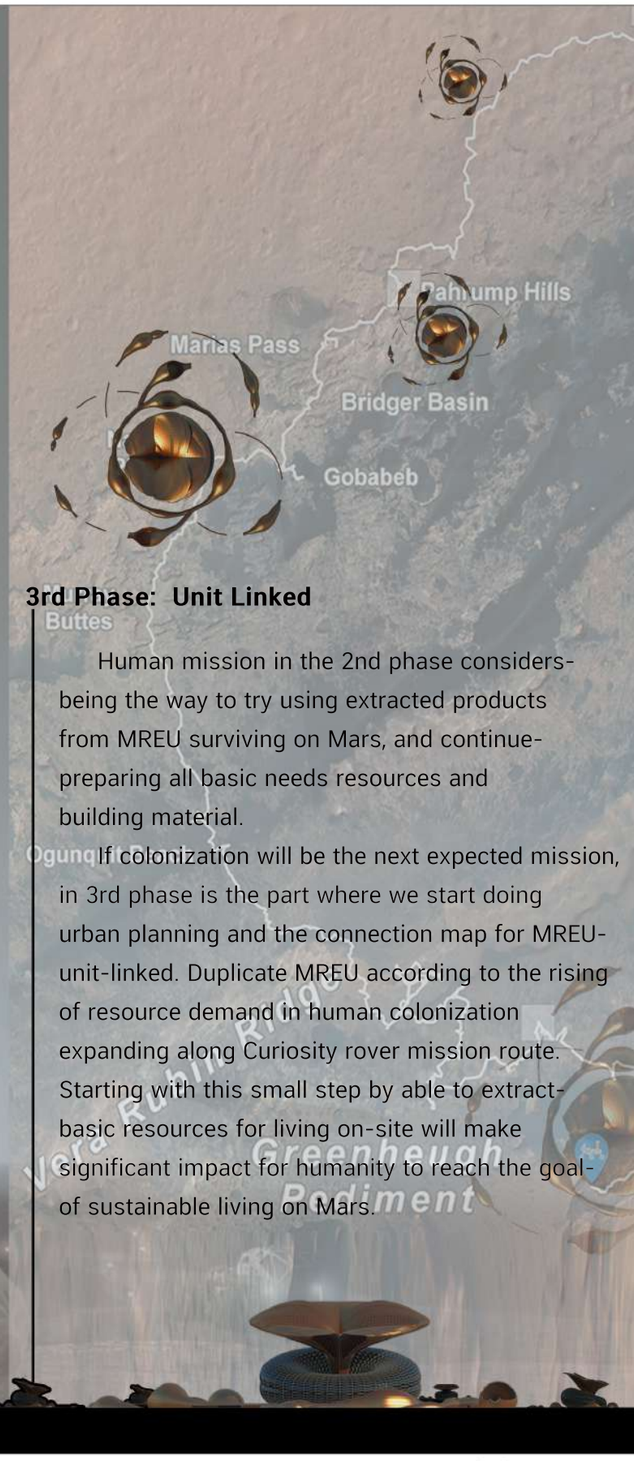
All construction jobs in this phase will be done by Construction Robots & Self-Driving Construction Vehicles remote-controlling from afar by the construction team on Earth.
Start site surveying/3D mapping, setting construction area include all land leveling work. Getting construction site ready to work with the next arrival prefabricated structure and material. Then finally, running the building system and begin the resource extracting cycle inside MERU.

2nd Phase: sustain living setting

Attempt the living on mars mission start with a small crew of astronauts. First, to recheck / maintenance the construction works. Later on, continue doing research/experiments to create a sustainable long-term living system on Mars. Using extracted products from MERU for daily life purposes in the habitat, producing a mock-up of building material along with necessary substance to survive and go around in a research lab also planning on food production.

Building up Material Factory aim to manufacture ceramic, brick, solar panel, furnace, steel, and glass base on a mock-up from the lab, using in any upcoming construction project.





3rd Phase: Unit Linked

Human mission in the 2nd phase considers being the way to try using extracted products from MREU surviving on Mars, and continue preparing all basic needs resources and building material.

If colonization will be the next expected mission, in 3rd phase is the part where we start doing urban planning and the connection map for MREU unit-linked. Duplicate MREU according to the rising of resource demand in human colonization expanding along Curiosity rover mission route. Starting with this small step by able to extract basic resources for living on-site will make significant impact for humanity to reach the goal of sustainable living on Mars.

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