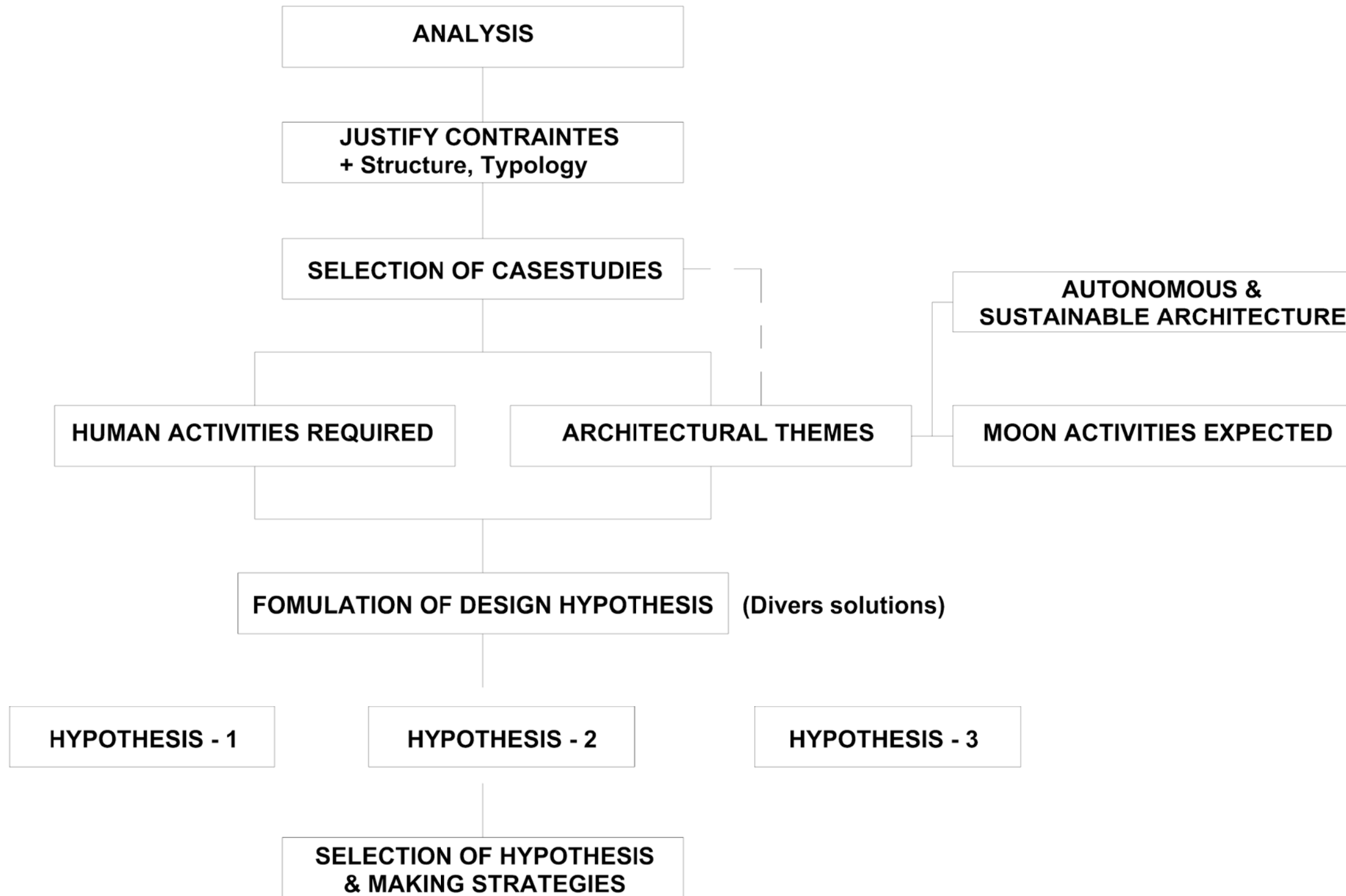


# METHODOLOGY AND STRUCTURE FOR LUNAR-HABITAT (EXO-COHAB)





## HUMAN ACTIVITIES REQUIRED

### PRIVATE

Sleep, relaxation,  
rest, storage

### PUBLIC

#### HYGIENE

Shower, Changing cloths,  
Toilet, Housekeeping, Storage

#### FOOD

Sotre, Prepare, Grow,  
Consume, Storage

#### WORK

Operations, Worktasks,  
Experiments, Communication,  
Education, Training, Storage

#### LEISURE

Free-time activities,  
Exercise, Intimate behavior,  
Storage

## MOON ACTIVITIES PREDICTED

- Watching the Earth view,
- Watching lunar lander site, machine
- Watching SF Film

- SF game
- Cultural activities in different gravity
- Research & Mining

- Essential activities for living : working, sleeping

## ARCHITECTURAL THEMES

Astronauts Experiences

Making a notion of vivable outside

FULL SUSTAINABLE BUILDING

In-situ ressources construction

Diversity and Flexibility of progra

## PROGRAMS & DIMENSIONS

### CABINES

- Bed
- Intimate work space
- Storage

### HYGIENE

- Toilet
- Landry
- Bathroom
- Medical office

### LEISURE/ RECREATION

- Degital library
- Atelier
- Gym(+training)
- Salon (Galerie & café)
- Storage (scientific sample)
- Green house (walk, gardening)

### WORK

- Meeting room
- Atelier
- Education
- Storage
- LAB
- Green house

### FOOD /GREEN

- Green house
- Storage

### TECHNICAL SPACES

- EVA
- Air lock
- Command control room
- Subsystem room
- Machine room
- Garage
- Safe-Haven
- Equipment stowage

### EXTERIOR FACILITY

- Landing Zone
- Solar thermal power station

## SCENARIO



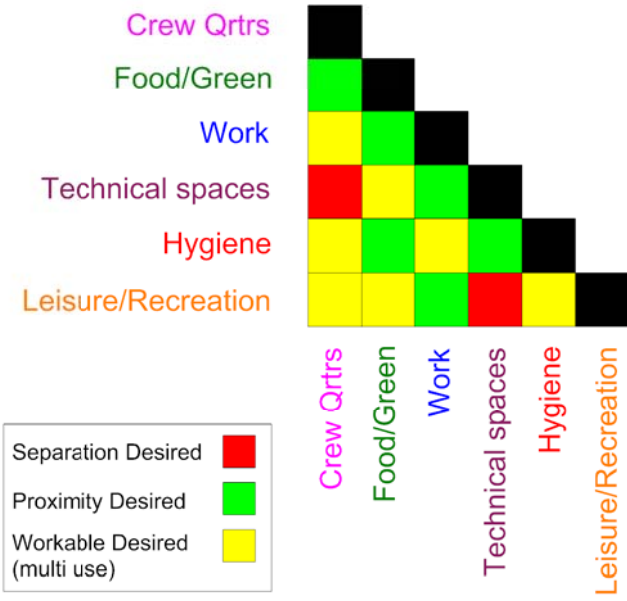
with a divers program , we need a good scenario(history of inhabitants)

2019

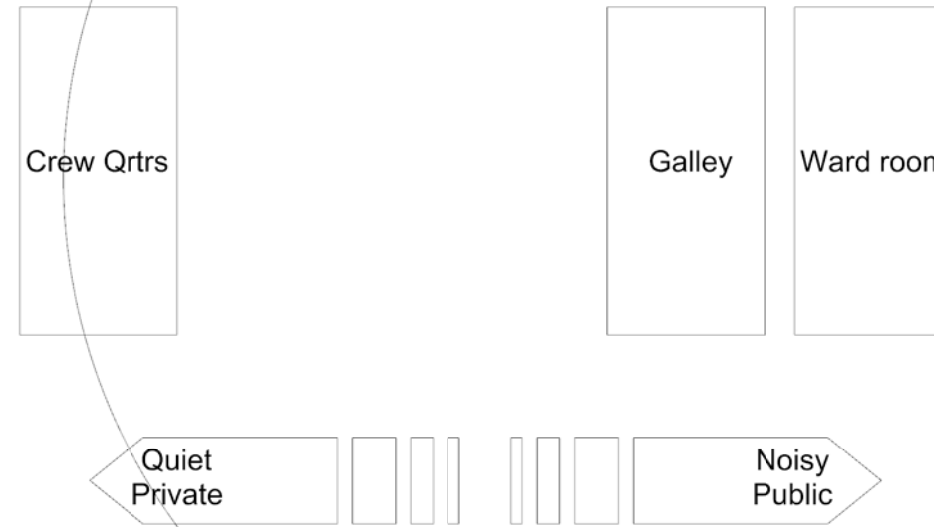
2020-2025

2025-2030

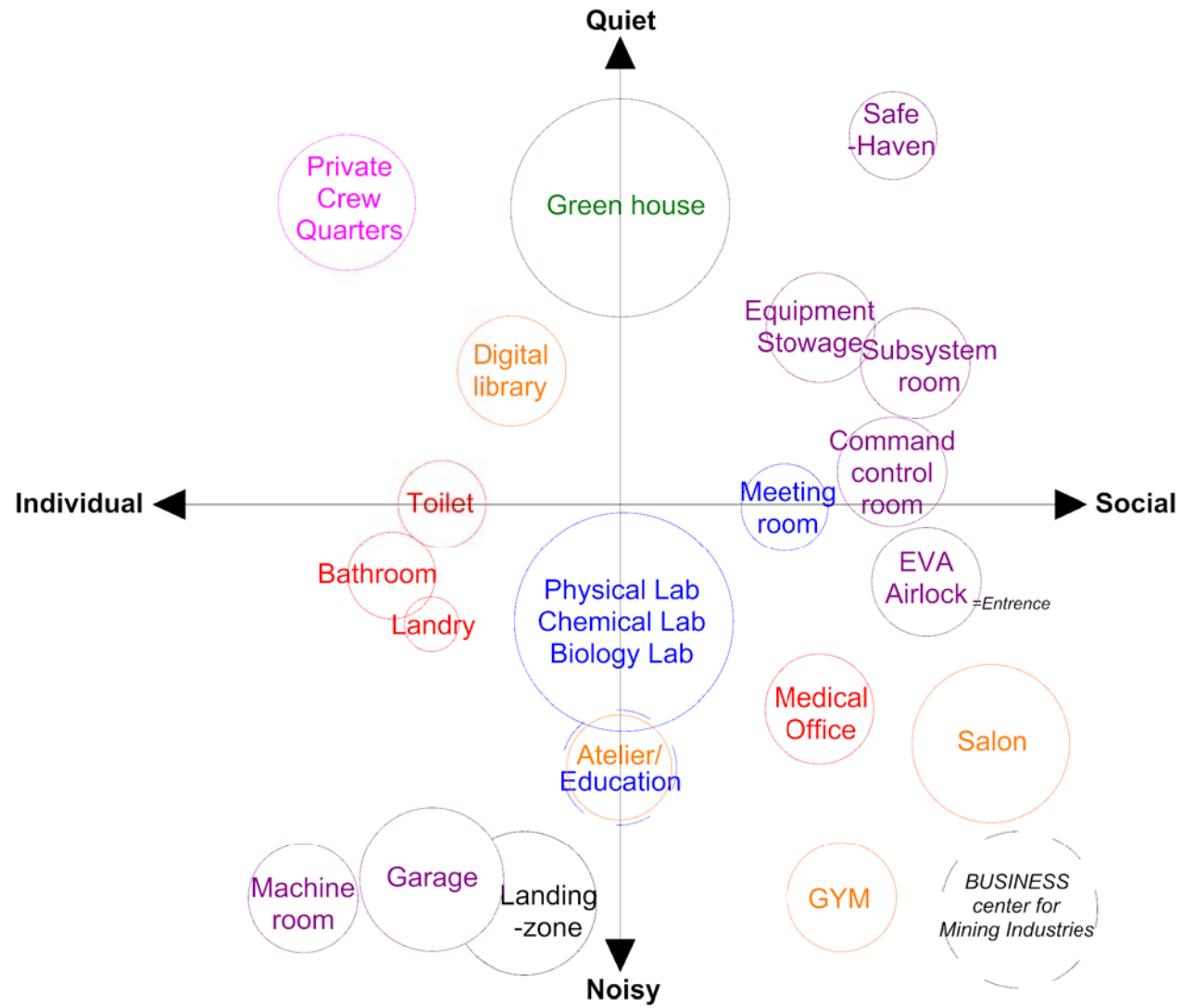
# FUNCTIONAL ADJACENCY MATRIX



# ZONING

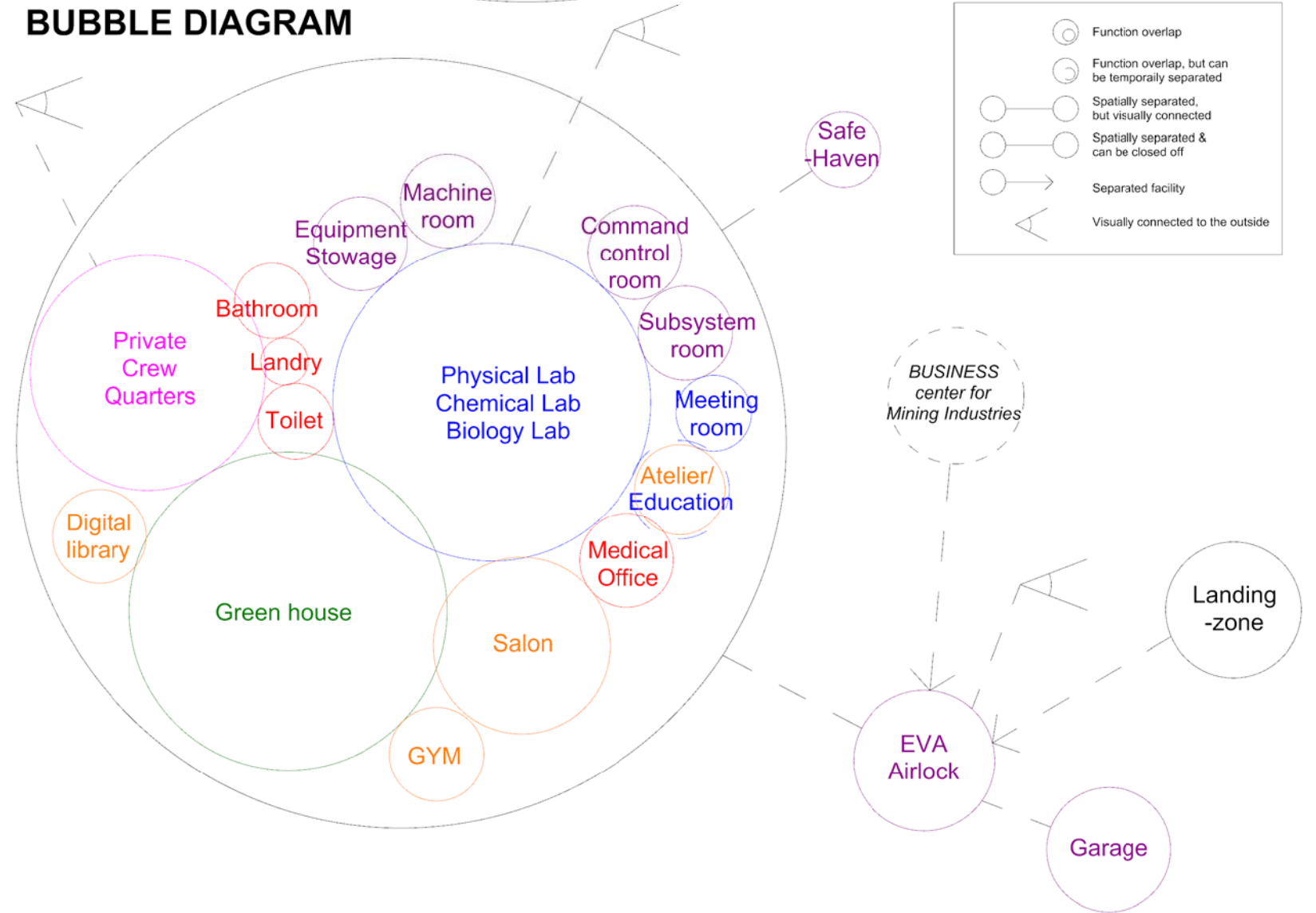


# DIAGRAM (used for the principle zoning of areas)



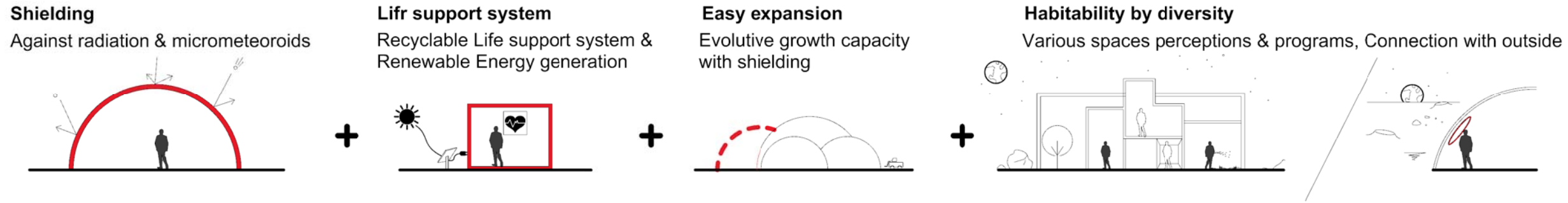
\*EVA: extravehicular activity

# BUBBLE DIAGRAM

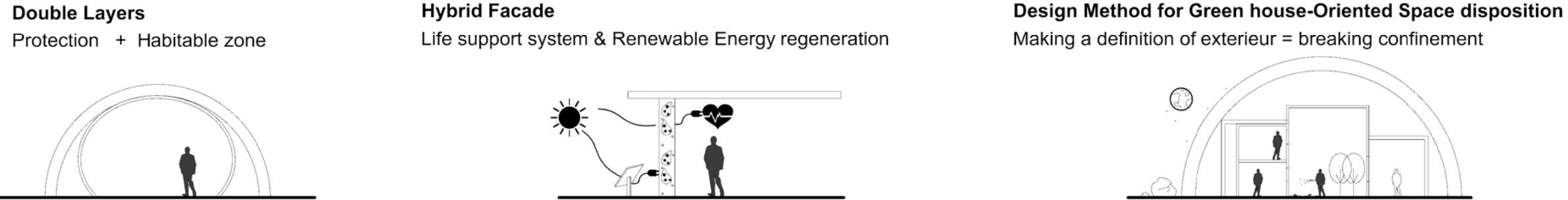


\*Ref. "Space Architecture Education for Engineers and Architects" \_Springer International Publishing Switzerland 2016, Sandra Häuplik-Meusburger, Olga Bannova,

# LUNAR ARCHITECTURE TYPOLOGIES

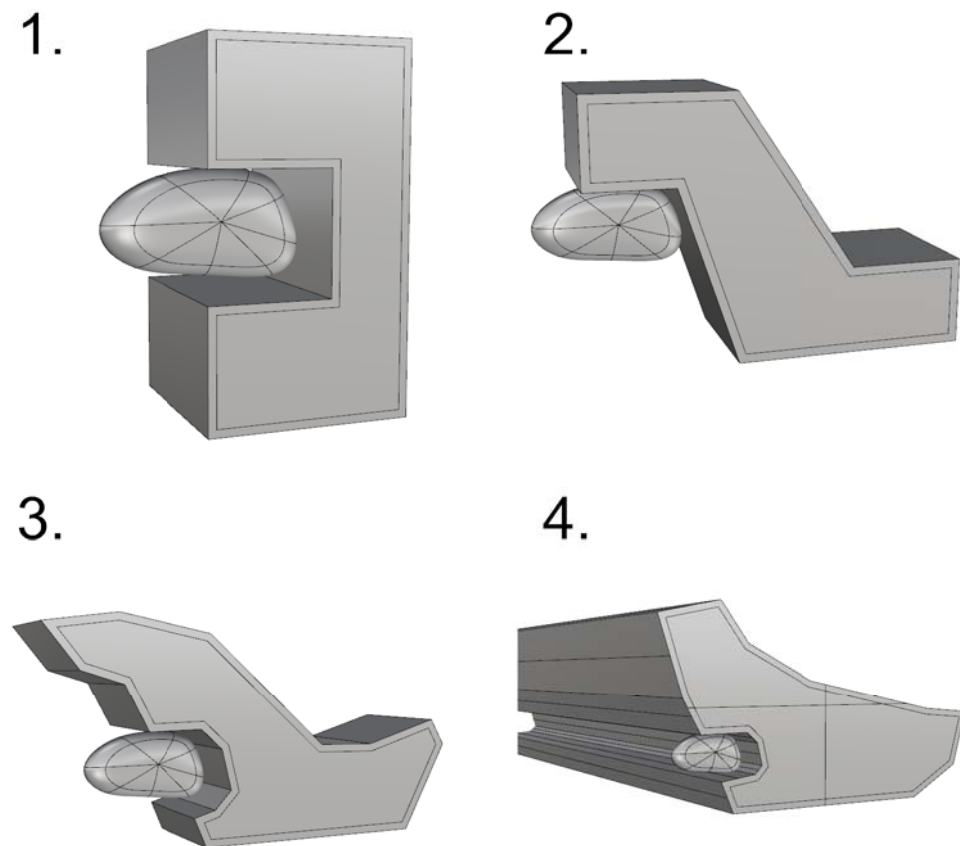


# ARCHITECTURE CONCEPT STRATEGY

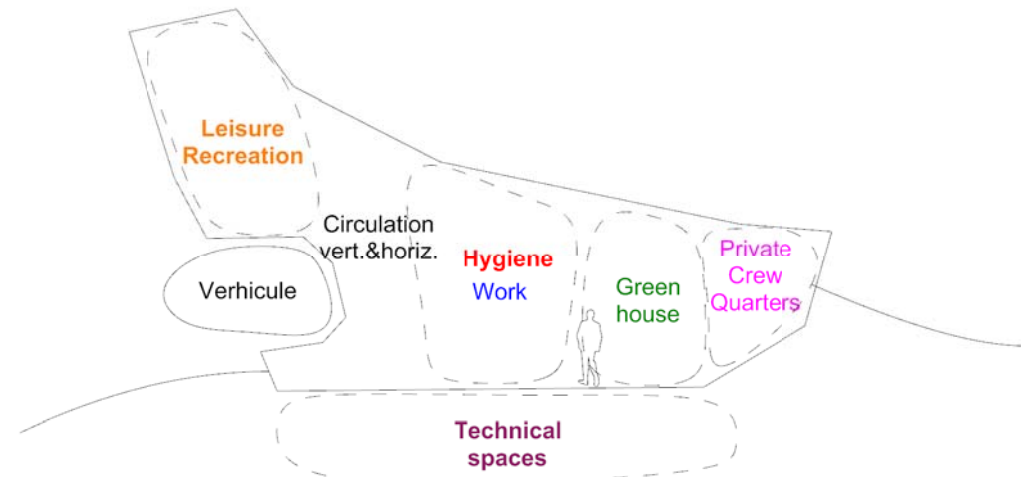


**HYPOTHESIS - 1** : Habitable infrastructure  
: Infrastructure will be needed for long term sustainable development of large scale development

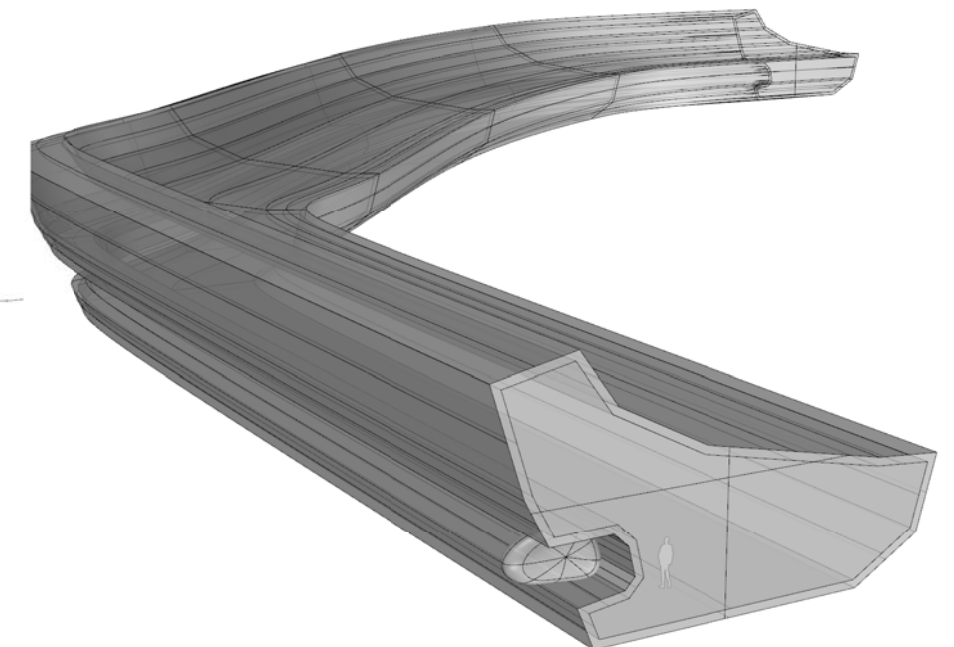
## Mass study



## Zoning

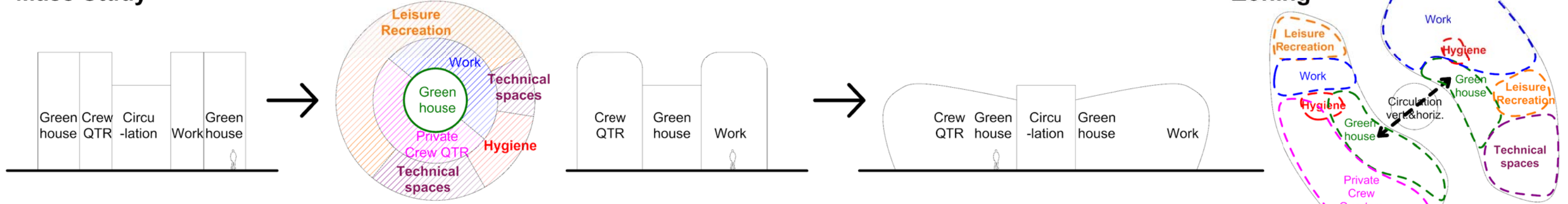


## Perspective

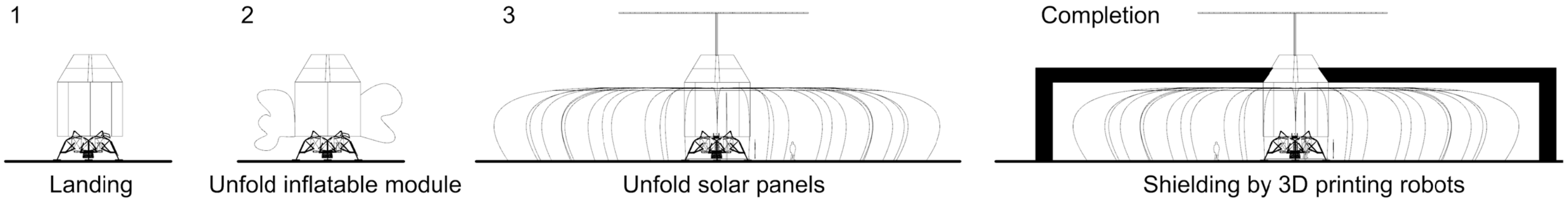


**HYPOTHESIS - 2** : Module inflatable + 3D concrete printing

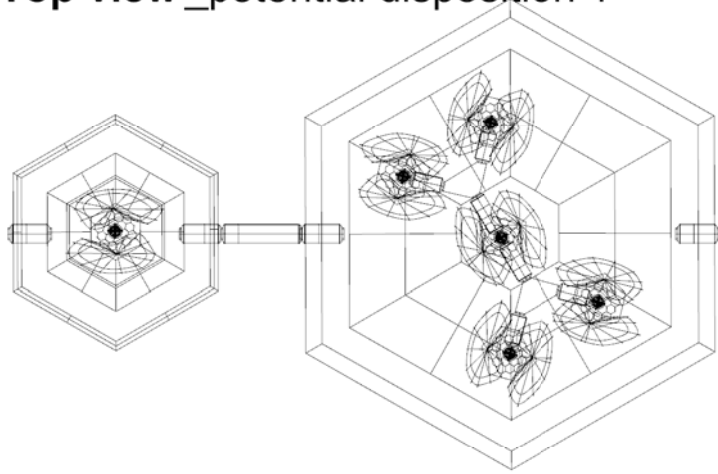
**Mass Study**



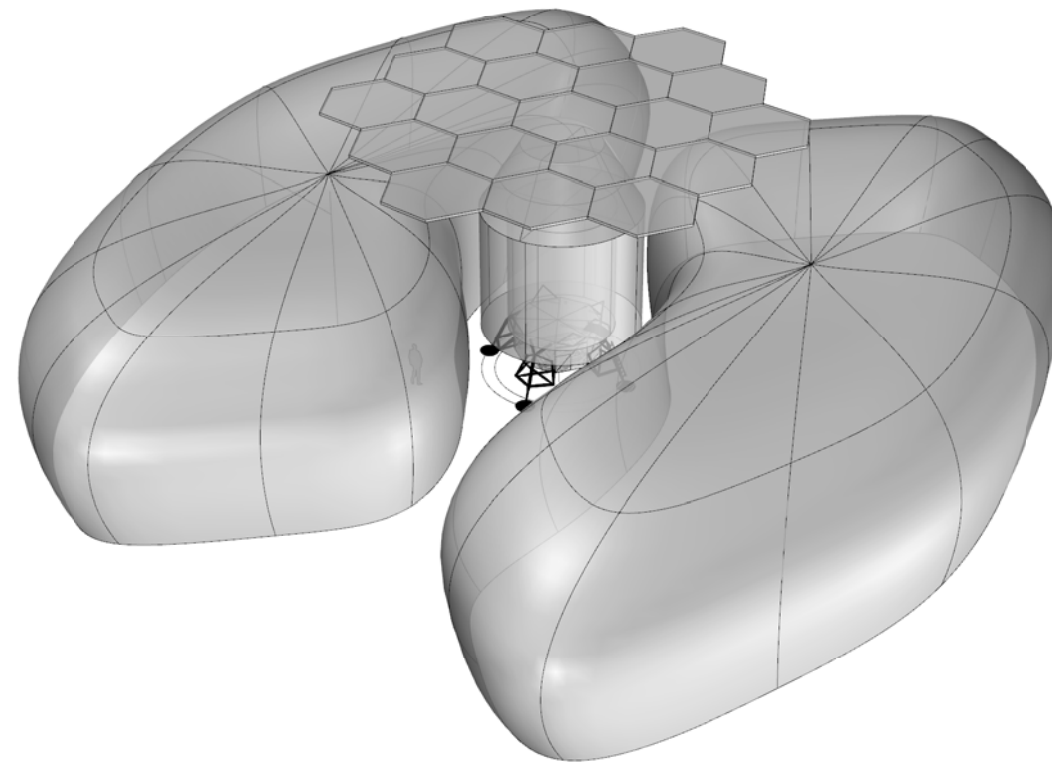
**Process of installation**



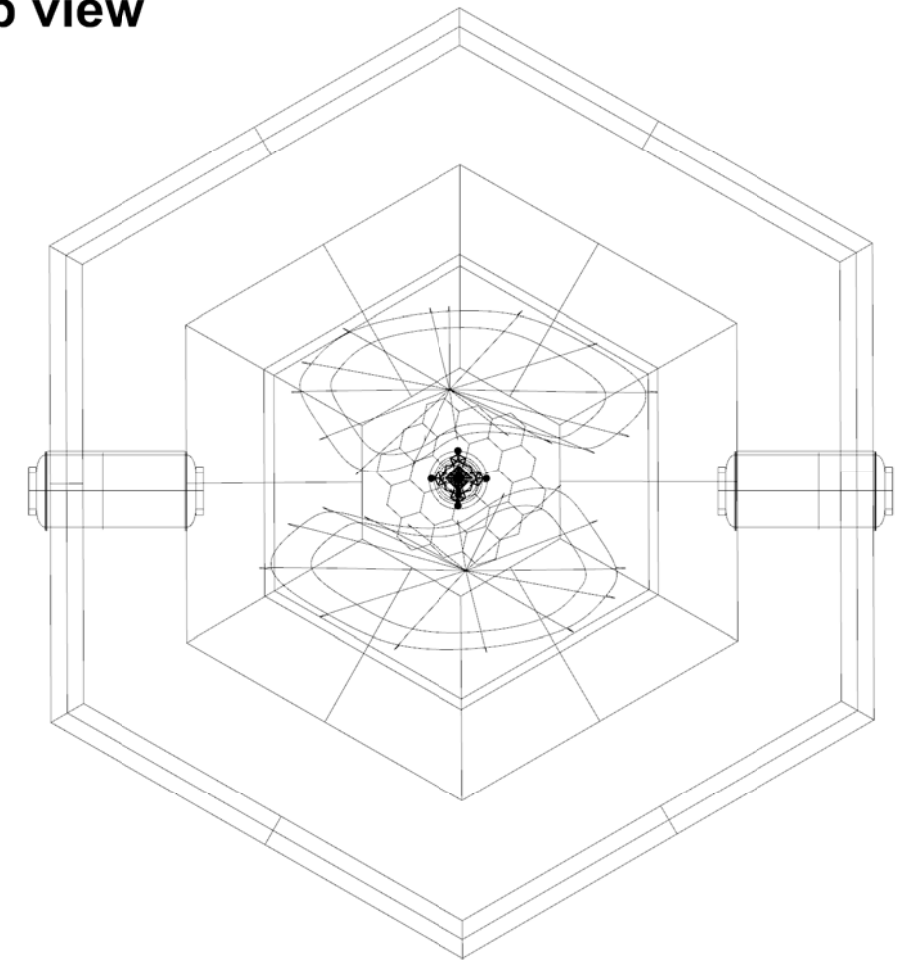
**Top view\_potential disposition 1**



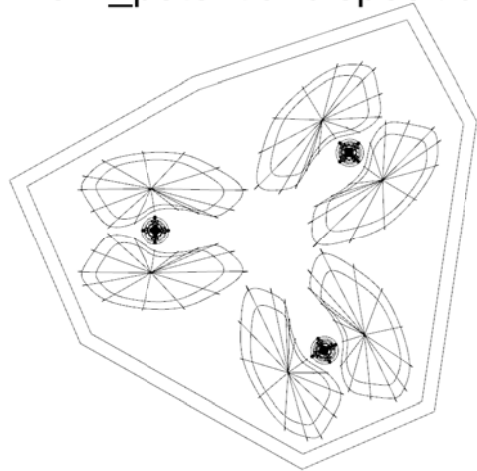
**Perspective of inflatable module**



**Top view**



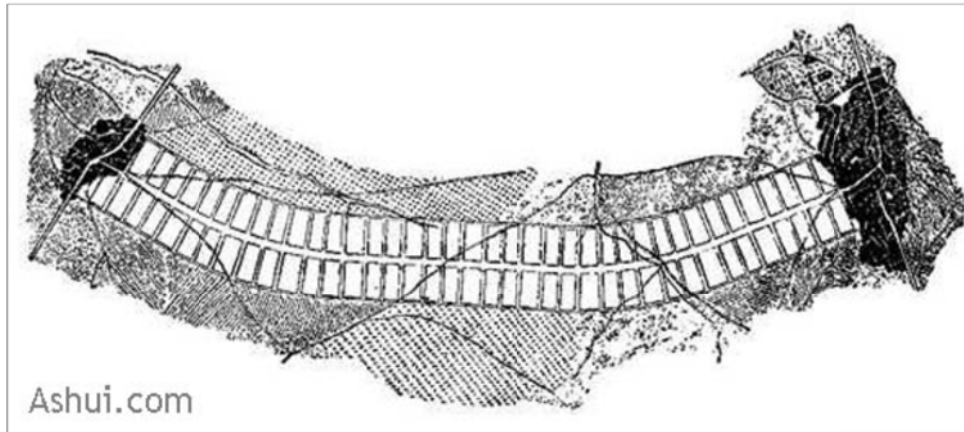
**Top view\_potential disposition 2**



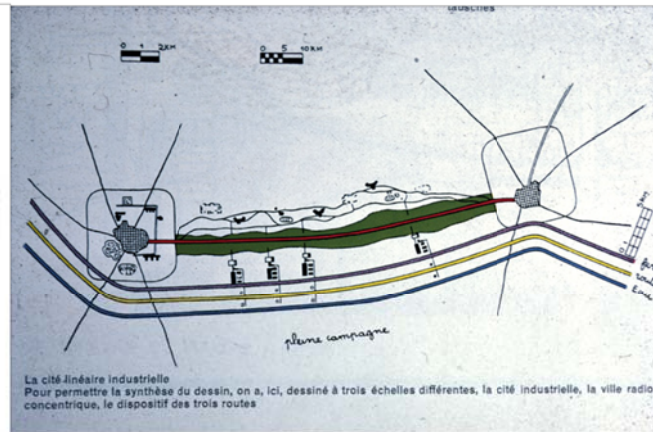
### HYPOTHESIS - 3 : Easy expansion habitable module

: Infrastructure will be needed for long term sustainable developpement of large scale

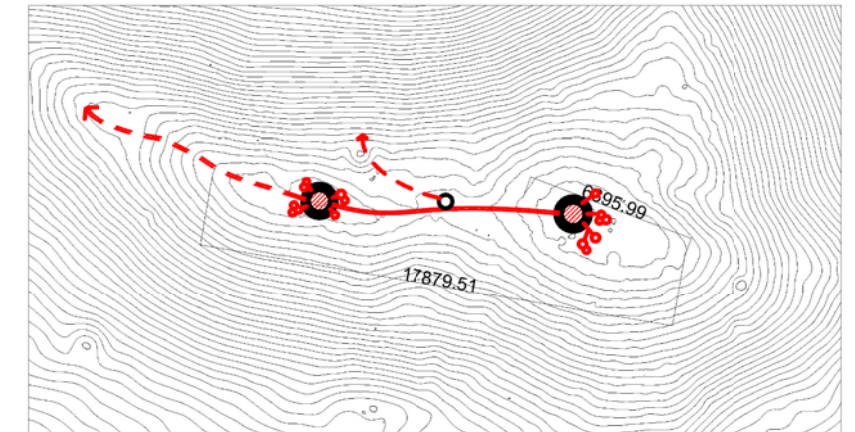
**Strategy for sustainable developpement** : Linear city = Easy expansion by flowing the road with a connection of transport, infrastructure, security,



Linear city by Arturo Soria

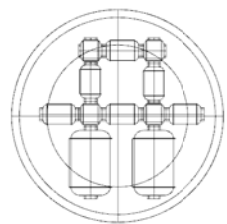


Liner city by Le Corbusier

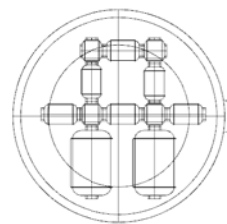


Linear developpement on the summit of the Malapert Mountain, Moon

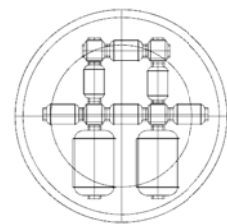
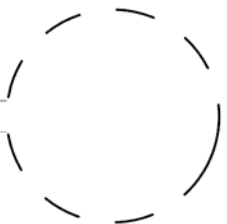
### Mass Development



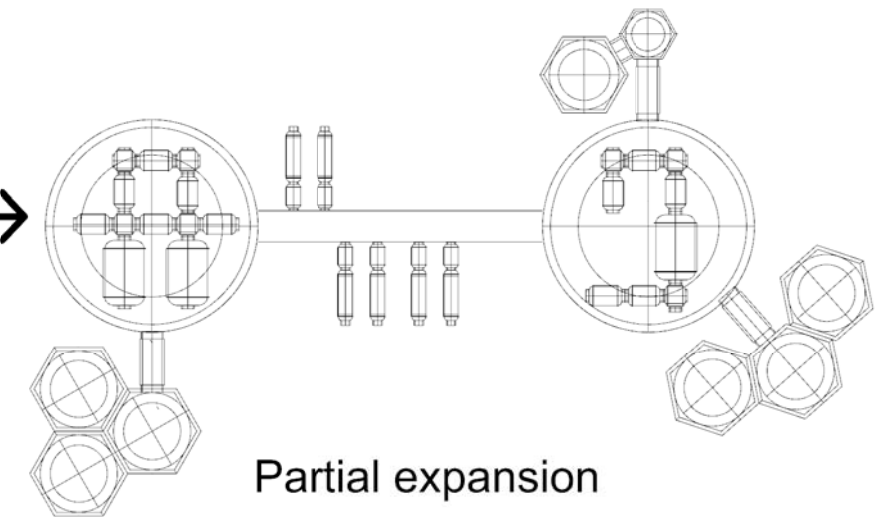
Composition of certain modules



Construction road, infrastructures

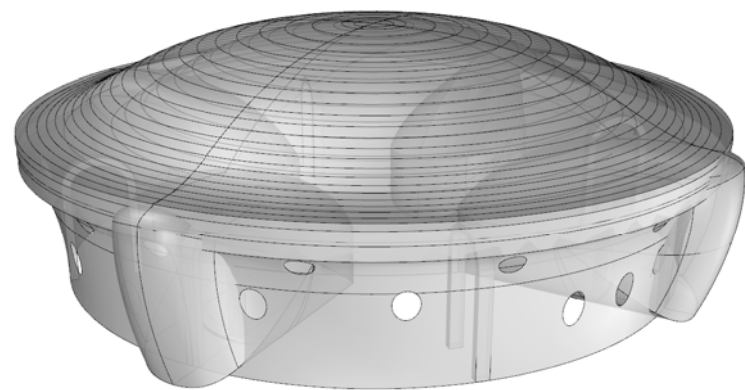


Construction second village

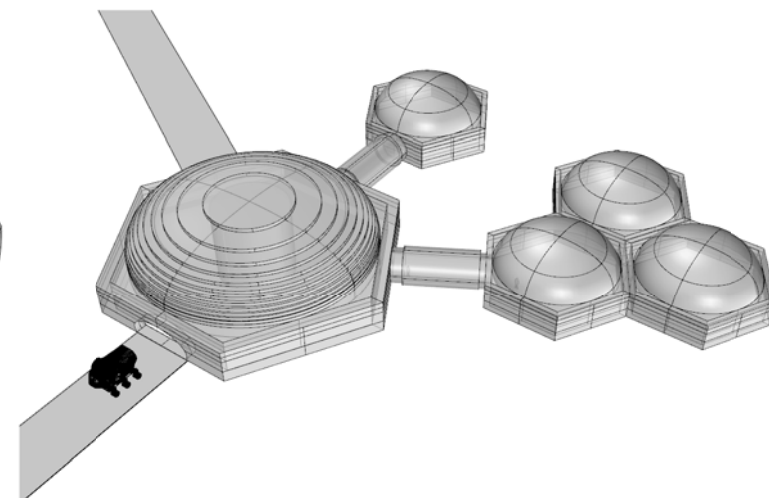


Partial expansion

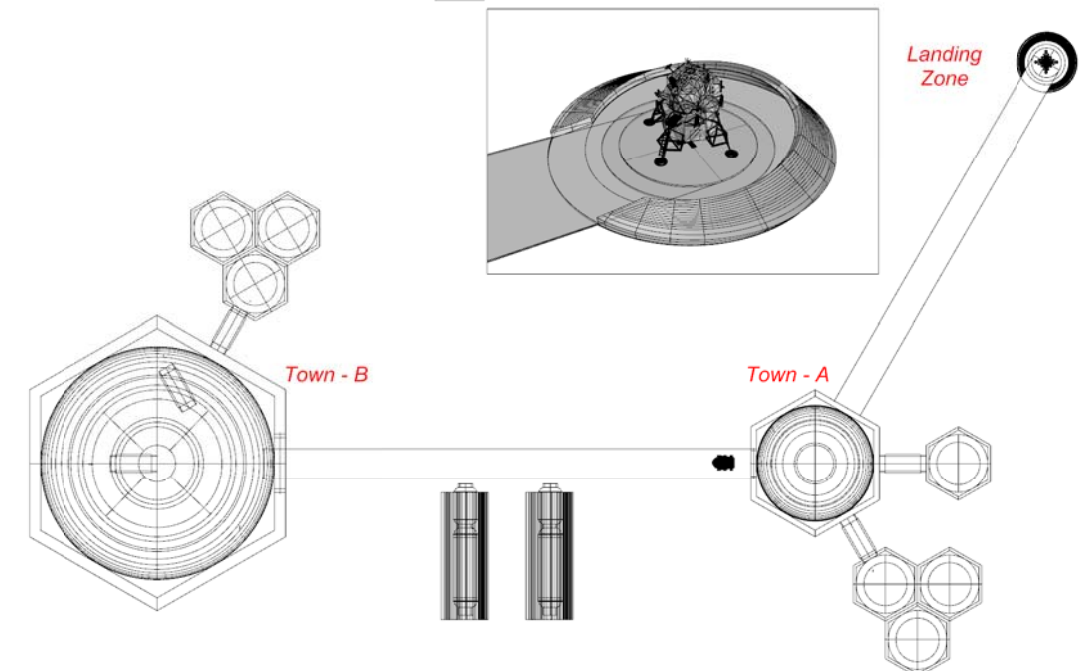
### Mass Study



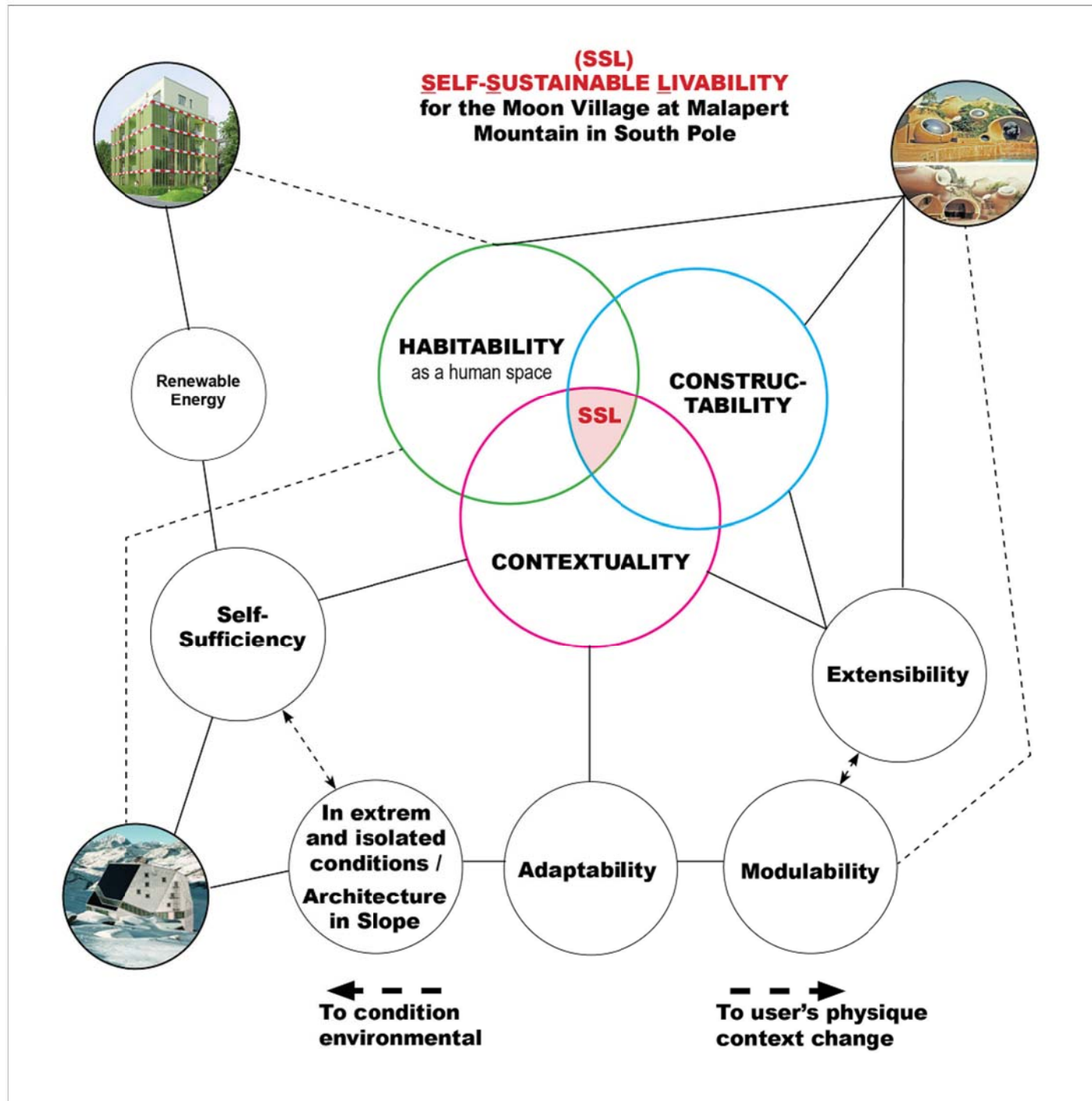
CONCEPT1



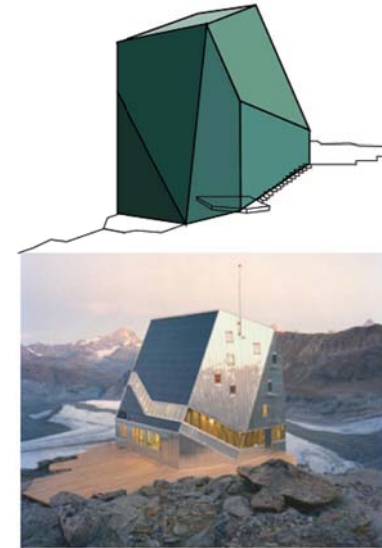
CONCEPT2



# SELECTION OF CASESTUDIES



**NEW MONTE ROSA HUT SAC , 2008**



**Architect**  
Bearth & Deplazes Architekten AG, Daniel Ladner  
**Location**  
Western Europe - Switzerland - Zermatt, canton Valais  
**Story**  
5 Stories  
**Climate Zone**  
Cold, mountains  
**Date of completion**  
2008  
**Type / Purpose**  
Gastronomy / Research Station (future)  
**Sustainability Features**  
Solar heating, energy recuperation, energy storage

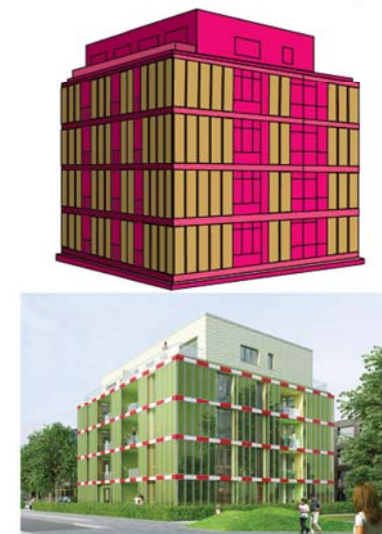
**LES MAISON BULLE, 1968-1996**



Palais Bulle (Espace Cardin), Théoule-sur-Mer, 1975-1989  
Maison Bulle Antoine Gaudet, 1968-1996  
Maison Yvonne Murard, 1972-1974  
Astronomical Observatory, Côte d'Azur, 1974/197

**Architect**  
Antti Lovag  
**Location**  
South France  
**Story**  
1 story or 2 stories.  
**Climate Zone**  
Temperate  
**Date of completion**  
1989 (Palais Bulle)  
**Type / Purpose**  
Residential / Observatory (Côte d'Azur, France)  
**Sustainability Features**  
Easy Construction, extensible modules, human centred design.

**BIQ-THE ALGAE HOUSE , 2013**

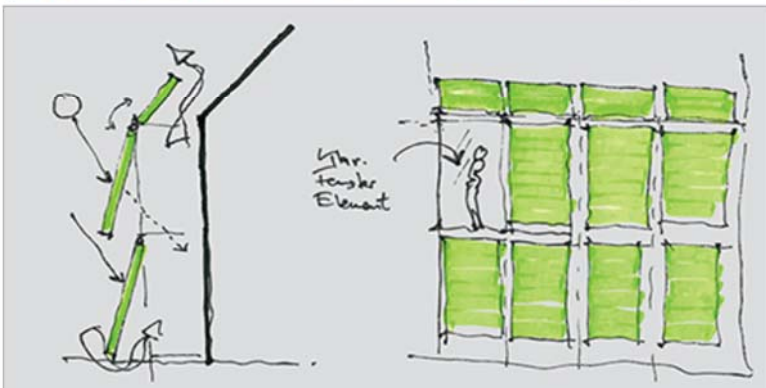
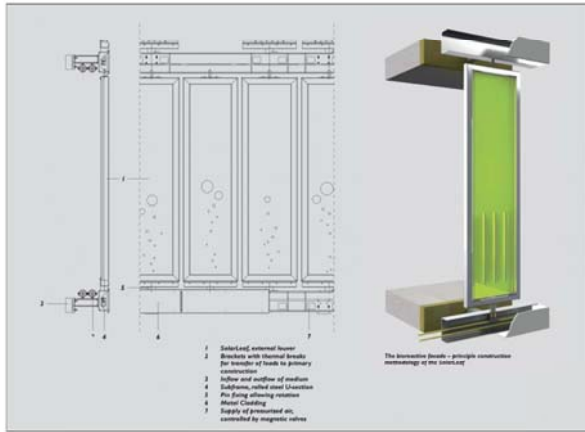


**Architect / Project Partner**  
Splitterwerk, Arup GmbH, B+G Engineers / Otto Wulff Bauunternehmung  
**Location**  
BIQ Das Algenhaus, Am Inseipark 17, 21109 Hamburg, Allemagne  
**Story**  
5 Stories  
**Climate Zone**  
Temperate  
**Date of completion**  
2013  
**Type / Purpose**  
Residential / Exposition  
**Sustainability Features**  
High efficient façade  
Biomass heating systems  
Ground Source Heat Pump

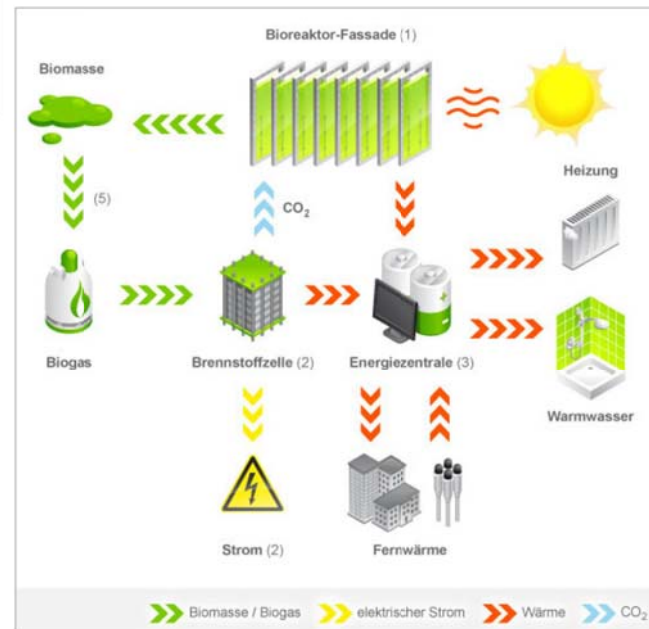


# SELECTION OF CASESTUDIES \_ ENVELOPPE

## BIQ\_ THE ALGAE HOUSE



„Napkin“ sketch showing concept for the building integration on bioreactors as a secondary skin of a building



LIFE SUPPORT SYSTEM PROCESSUS BY ALGAE  
\_By Marc Cohen, Space Architect

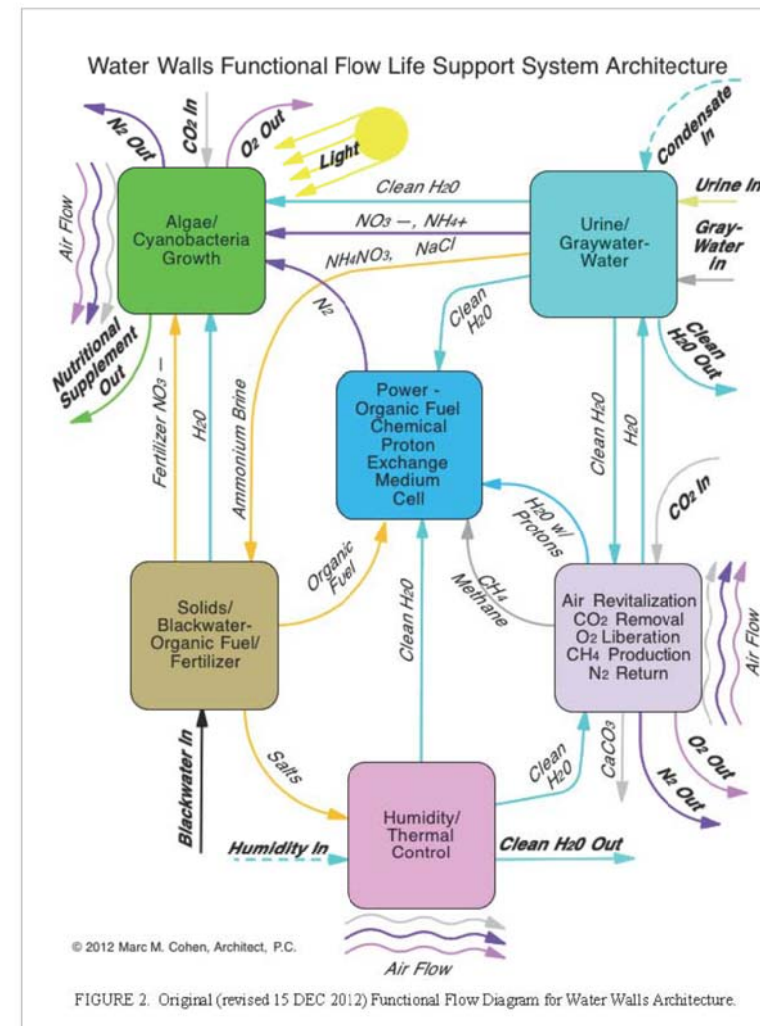


FIGURE 2. Original (revised 15 DEC 2012) Functional Flow Diagram for Water Walls Architecture.

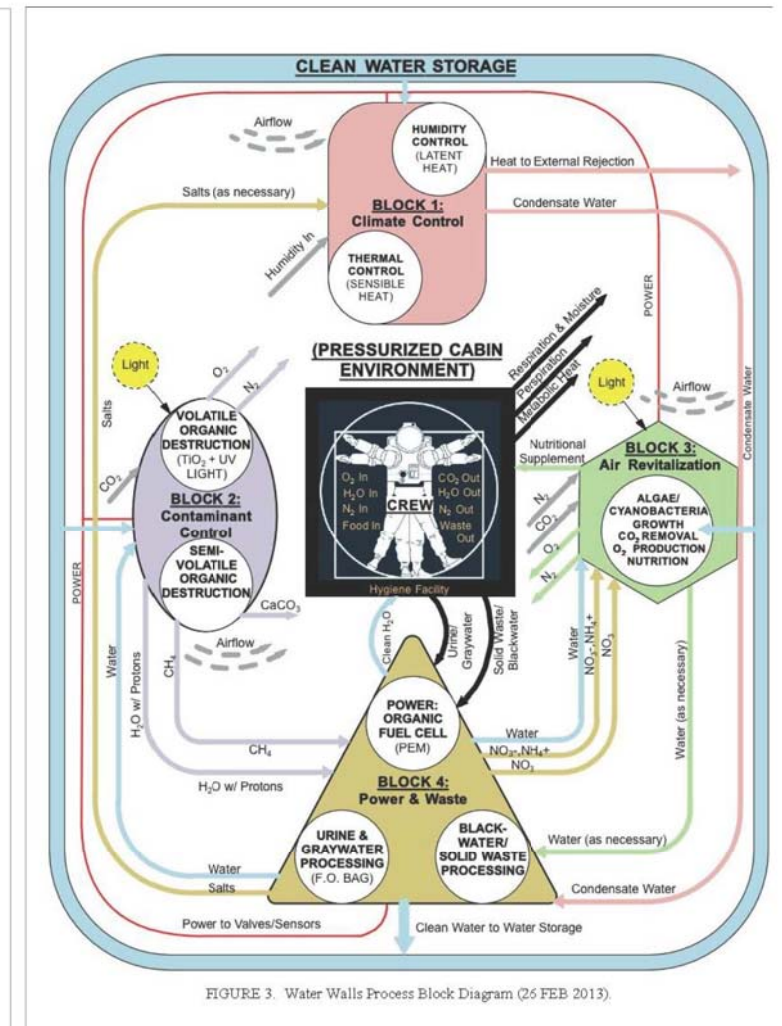
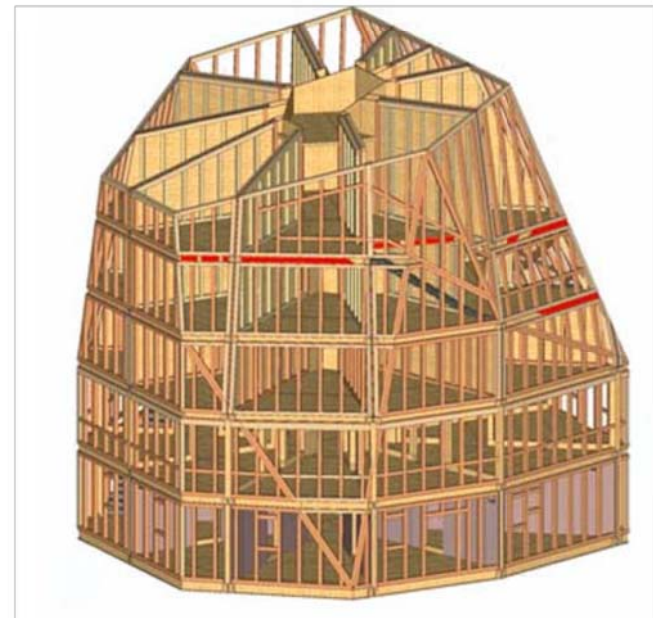
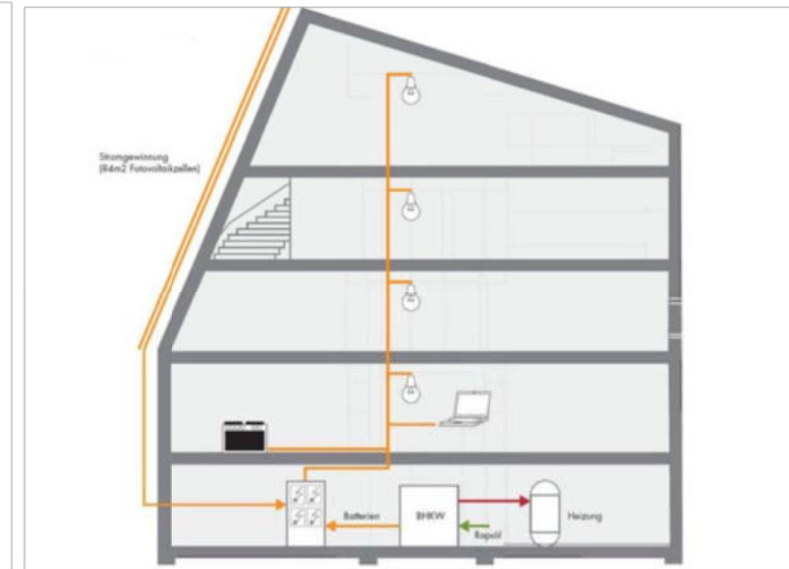
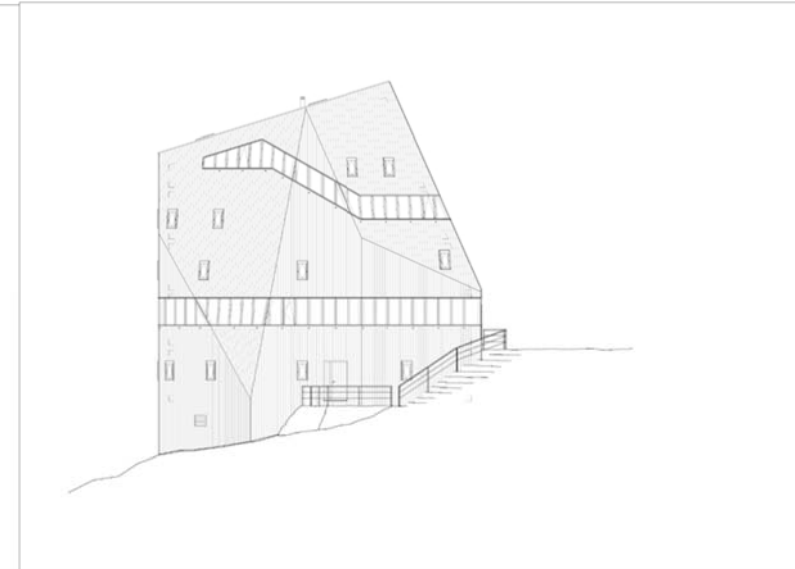
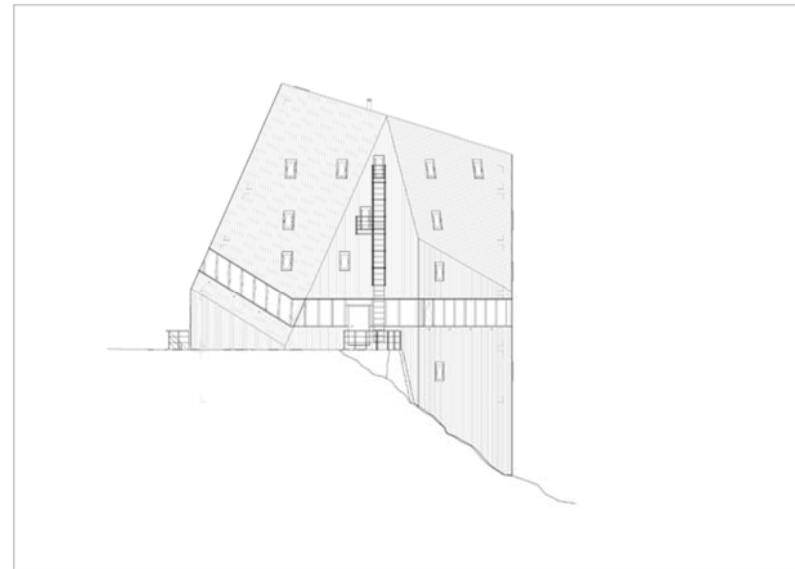
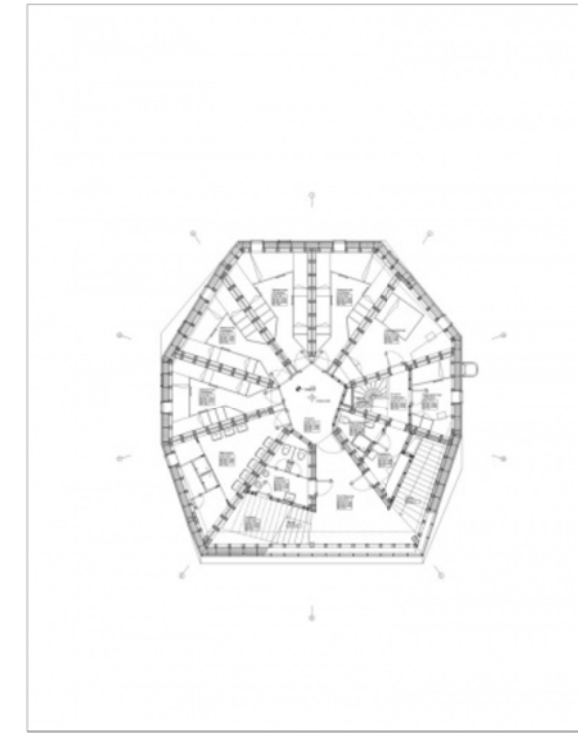
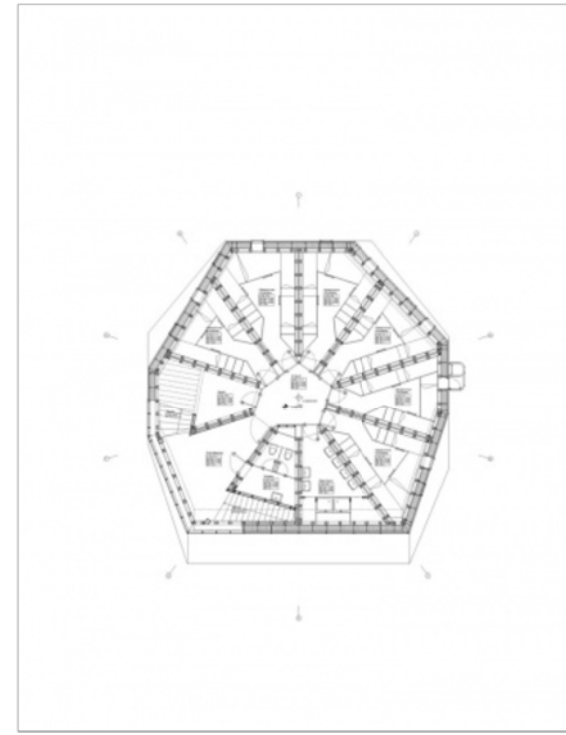
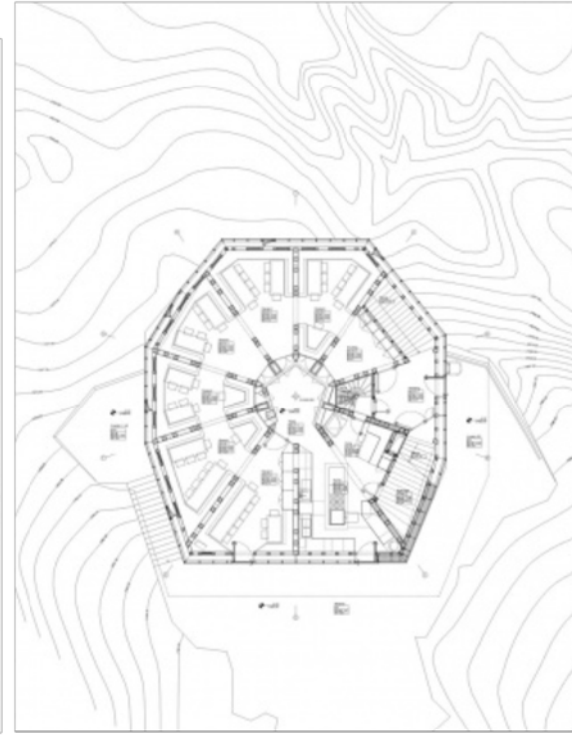
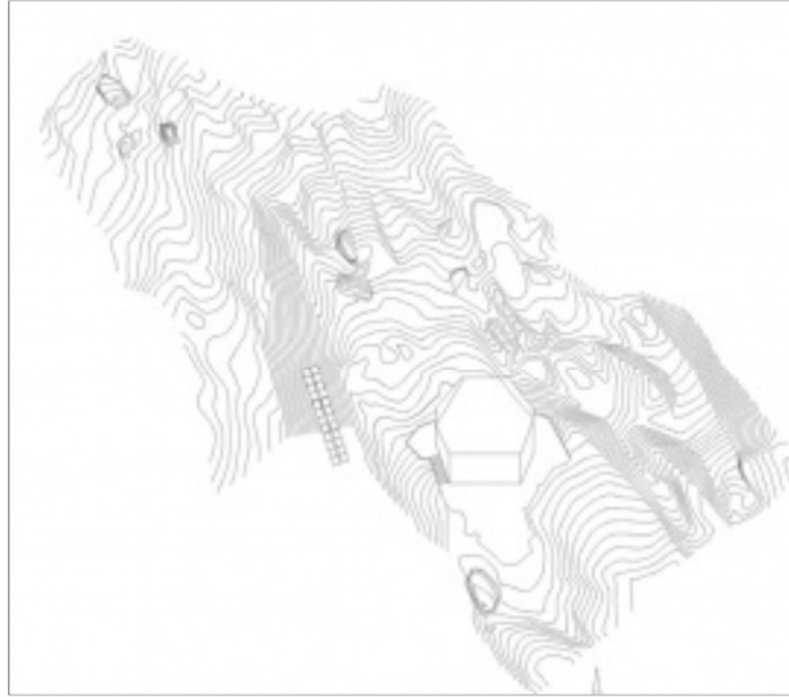


FIGURE 3. Water Walls Process Block Diagram (26 FEB 2013)

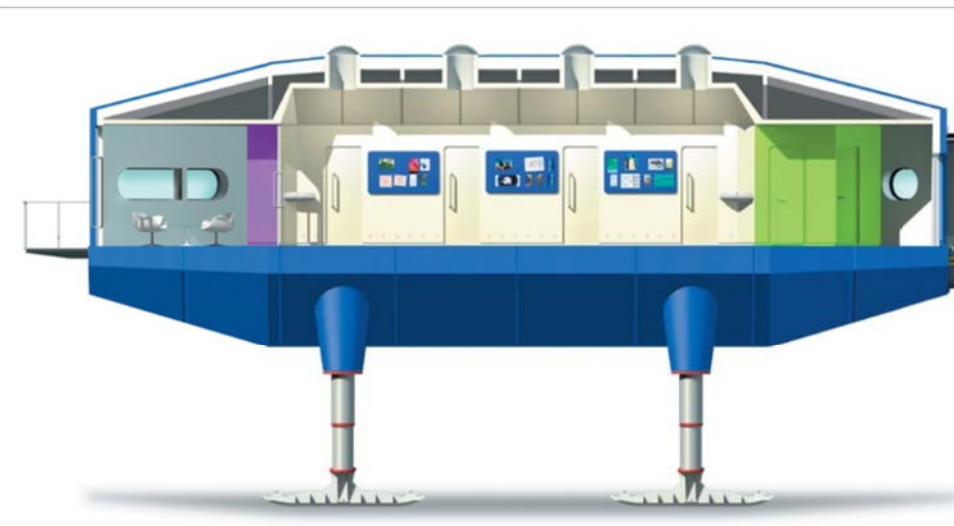
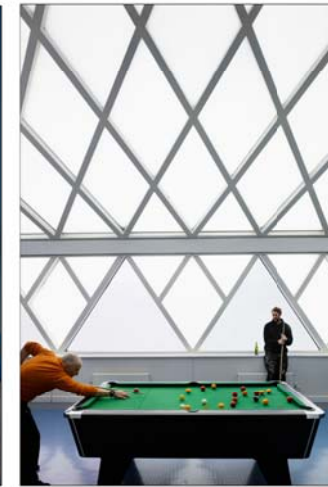
# SELECTION OF CASESTUDIES \_ ENVELOPPE

## New Monte Rosa Hut

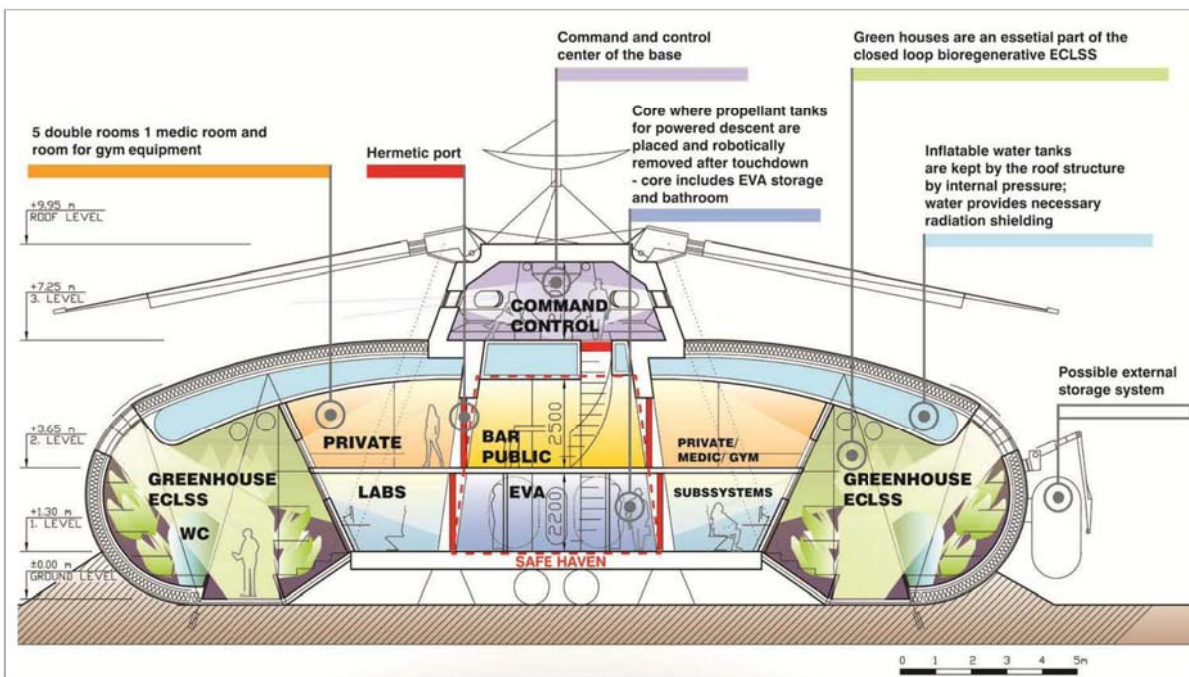


# SELECTION OF CASESTUDIES \_ PROGRAMS

## RESPECT LIFESTYLE OF INHABITANTS + EASY EXPENSION



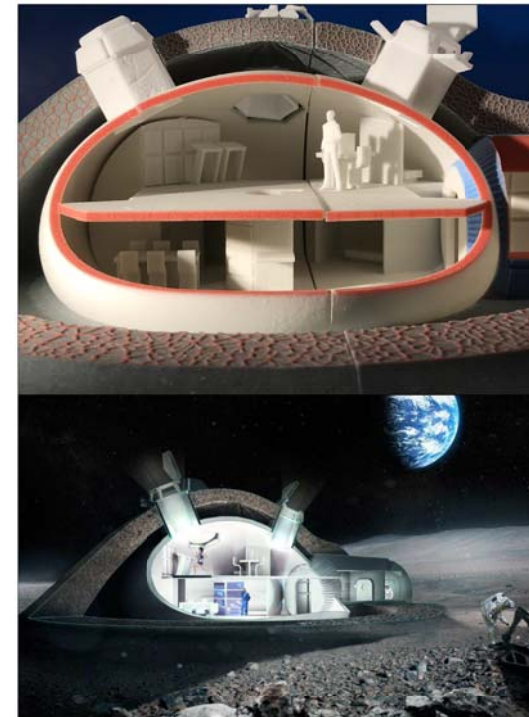
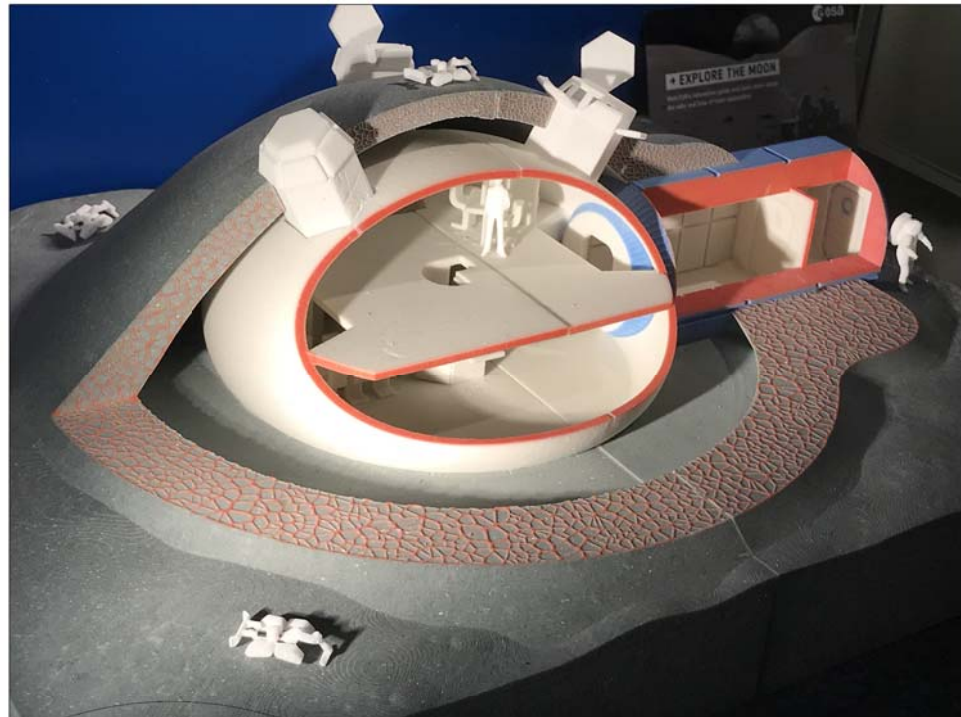
Halley VI British Antarctic Research Station | Hugh Broughton Architects



MB10\_Mars Base, Ondrej Doule (at NASA Ames Research Center)

# SELECTION OF CASESTUDIES \_ STRUCTURE

## CONCRETE SHELL WITH INFLATABLE MODULE



Foster + Partners, ESA, 2015

Wallace Neff's bubble domes  
Email check !!!

18

Perspective des établissements. Mars One, 2015

Plan. Mars One, 2015

Croquis du projet. Mars One, 2015

Dessins du projet. Mars One, 2015

Producteur : Mars One  
Date : 2015  
Type : Un module exposé à l'extérieur et résidence pneumatique et enterrée  
Fonction: industriel, laboratoire, résidentiel

<http://wwwmars-one.com/mission/simulation-outpost>

MEMOIRE \_ S813. Enseignants : Pr. Christian PEDELAHORE, Mme Julie JAUPITRE

Kim Kyunghwan

20

Etaps d'installation. Foster + Pateners. 2015

Architecte : Norman Foster  
Date : 2015  
Type : Architecture transportable /nomade.  
Fonction: résidence et laboratoire

Perspective du projet

Vue intérieur.

<http://www.dezeen.com/2015/09/25/foster-partners-concept-3d-printed-mars-habitat-robots-regolith/>

MEMOIRE \_ S813. Enseignants : Pr. Christian PEDELAHORE, Mme Julie JAUPITRE

Kim Kyunghwan

19

Croquis de construction

Méthodes de construction

Coupe AA

Coupe BB

Perspective des établissements. Mars Society, 2015

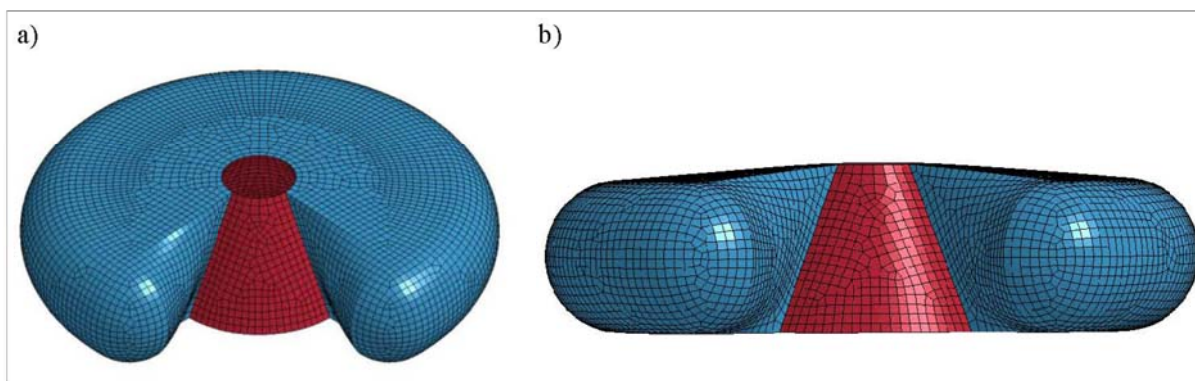
Producteur : Mars Society  
Date : 2005  
Type : Un module exposé à l'extérieur et résidence pneumatique et enterrée  
fonction: Un établissement permanent

<http://www.marshome.org/documents.php>

MEMOIRE \_ S813. Enseignants : Pr. Christian PEDELAHORE, Mme Julie JAUPITRE

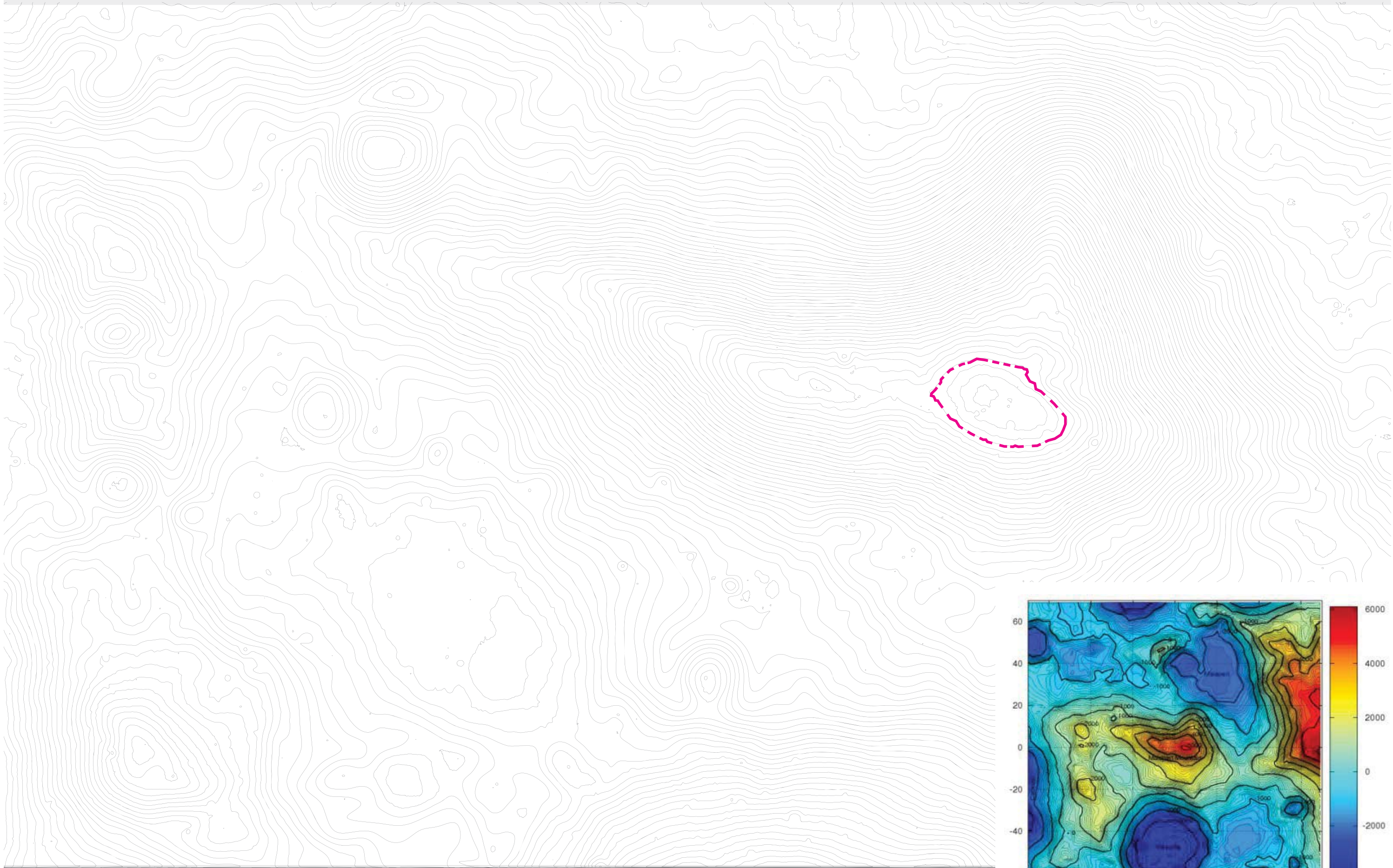
Kim Kyunghwan

### Inflatable module



### Concrete shell





ECHELLE | : 200,000

