MU_floating soils

PAN srl

folding structures
for temporary human settlements

moving land
for people on move

rome_march 2023

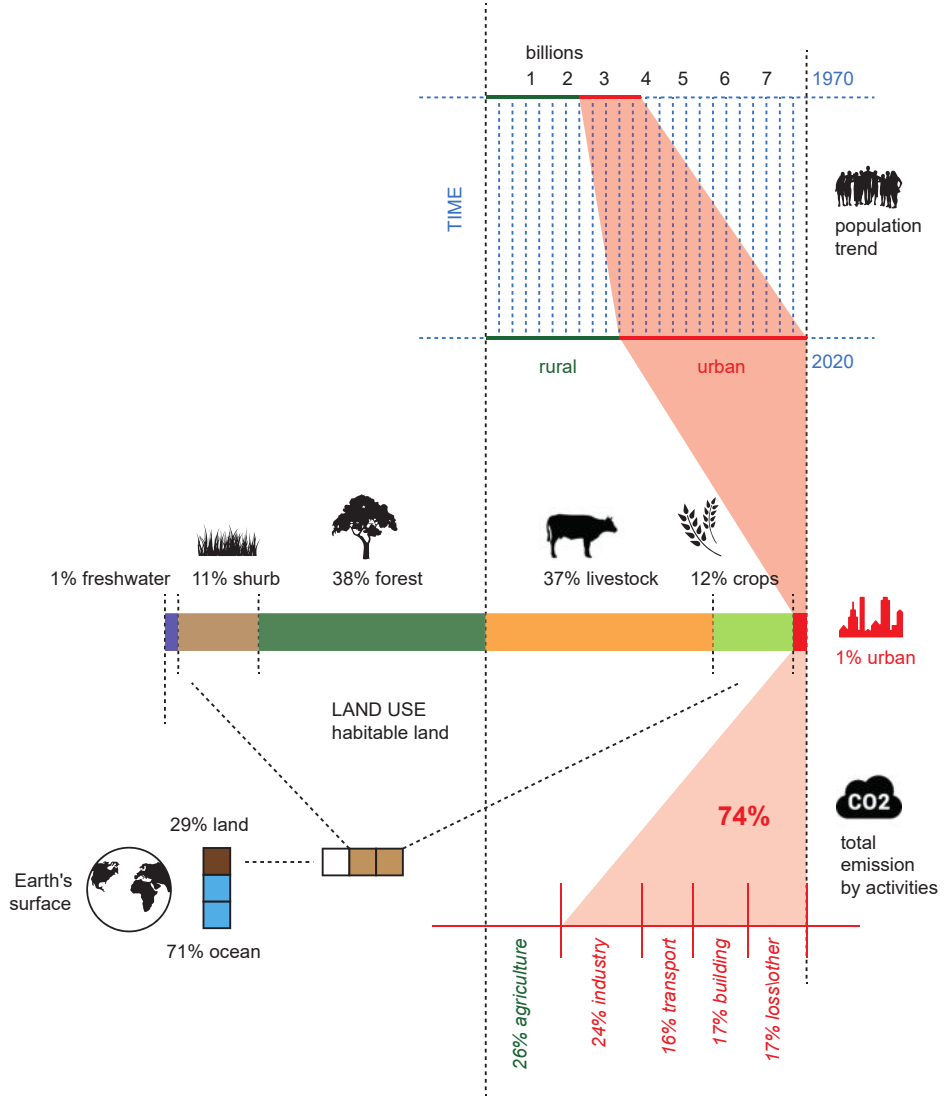
johnny miller_inequal scene_kibera slum (kenia)_2016__detail

01_the soil

the process of urbanization starts the imbalance of the ecologic system, with an exponential growth compressed in a denser relatively small space, which has global effect

the growth of the new urban organism, requires in fact the progressive consumption of limited resources, which rapidly empities the natural capital, artificializing the soil

at the same time, it introduces waste and emissions, which can not be reabsorbed by natural cycles, fueling the state of crisis



in the last 50 years, the human population has doubled, has never happened before in history

60% resides in urban area, where the world's GDP is produced, which quadrupled in the same period

urban areas and infrastructures occupy 1% of the habitable land

in 50 years, 6% the forests have been destroyed for pastures and industrial soybean cultivation

human activities generated by cities produce three-quaters of Climate Change emissions

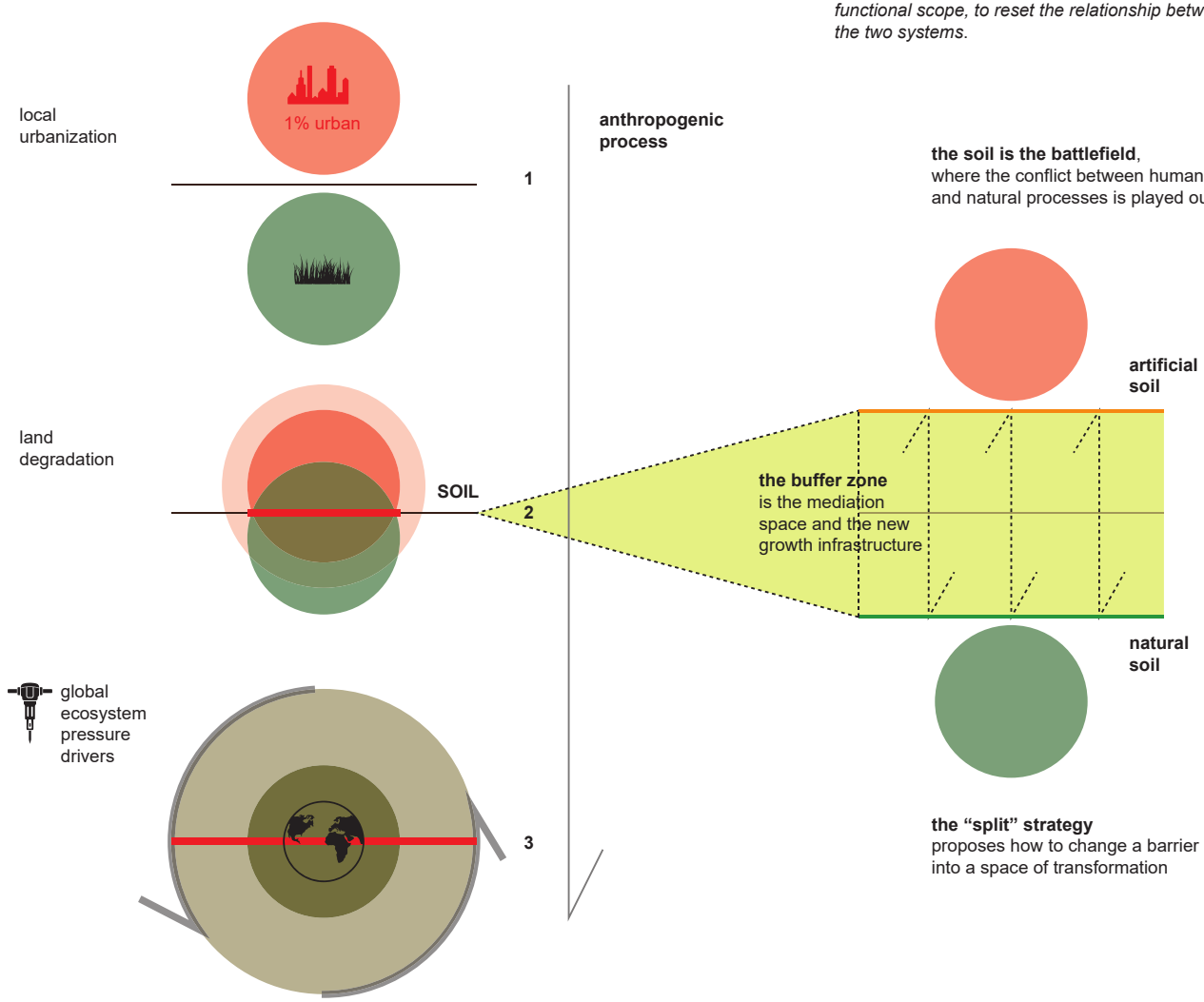
urbanization process

02_the buffer zone

the anthropogenic process of current urbanization leads to the degradation of the soil and acceleration of the global ecosystem crisis

the clash between human activities and natural processes occurs mainly on the soil, which is the main capital from which we draw food, energy and raw materials

the introduction of a buffer zone between the two systems, allows to mediate exchanges, to acquire a new spatial and functional scope, to reset the relationship between the two systems.

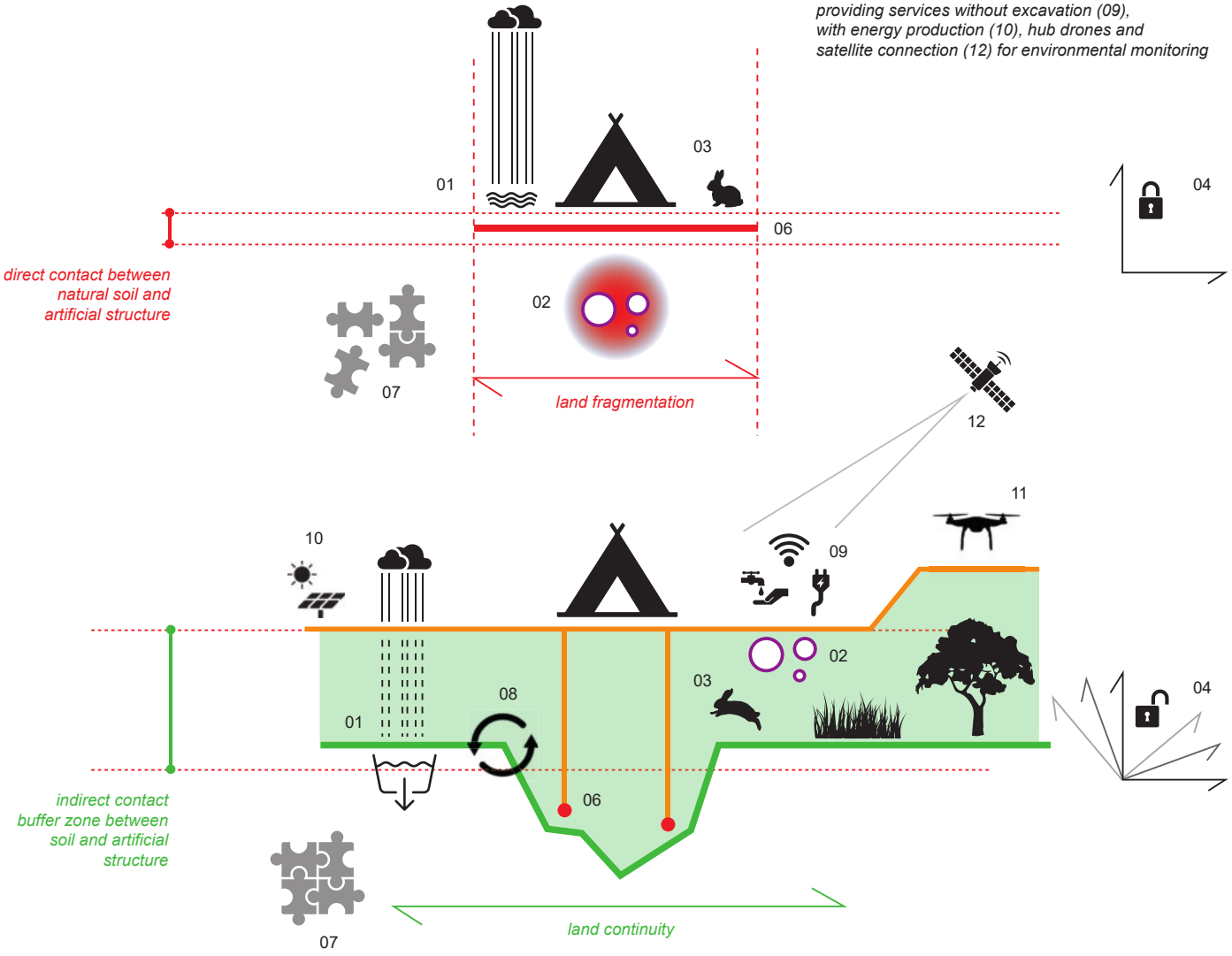


03_the green infrastructure

the creation of a new floating surface, allows the reactivation of soil permeability (01), the drainage and the cycle of absorption of CO2 (08)

the minimization of contact (06) allows to adapt to any type of soil (04) without having to transform and make it flat safeguarding the ecological paths (03) and continuity (07)

the plants come out from subsoil and go in suspension (02), providing services without excavation (09), with energy production (10), hub drones and satellite connection (12) for environmental monitoring



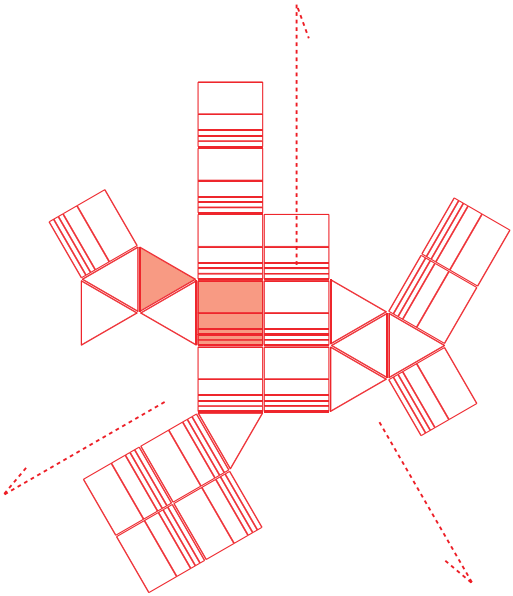
roots soil anchoring strategy_oak tree versus mangrovia

04_n-side surface's patterns

with almost all the same MU's components,
it is possible to make triangular and square modules

their combination allows the creation of volumes and
surfaces of any curvature and geometry

the open configuration can grow and adapt
to any soil and natural pre-existing ground



05_n-side modules

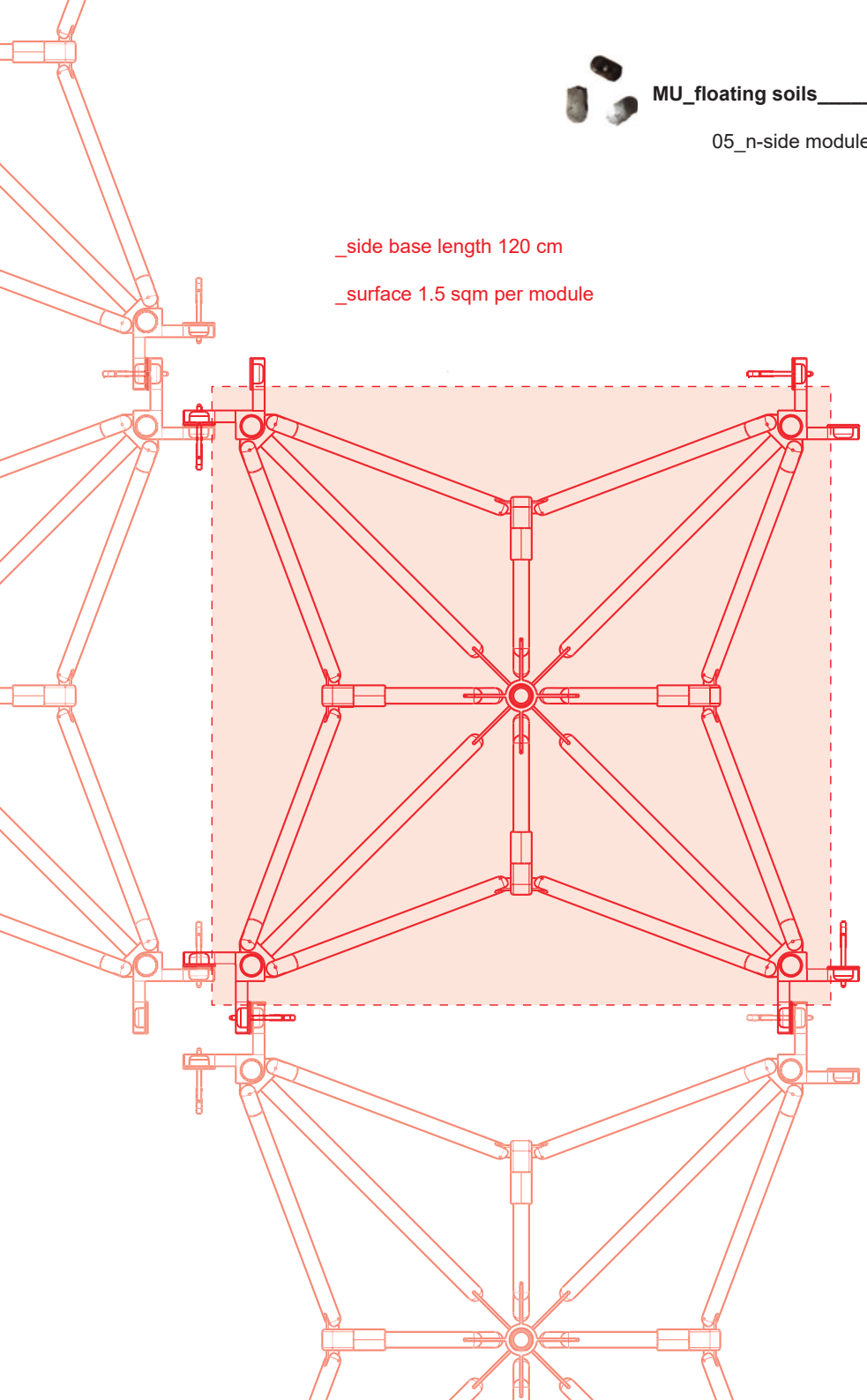
_side base length 120 cm

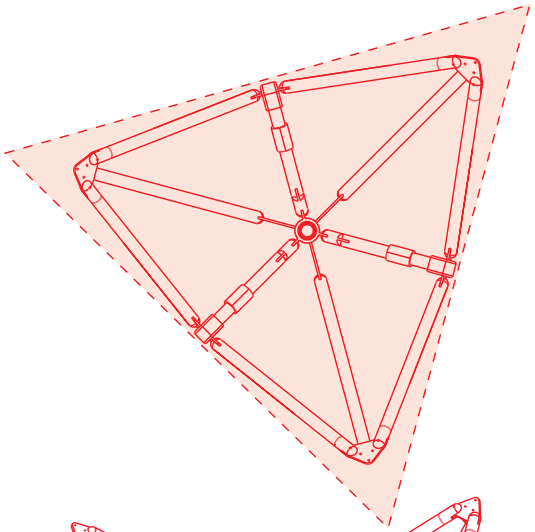
_surface 1.5 sqm per module

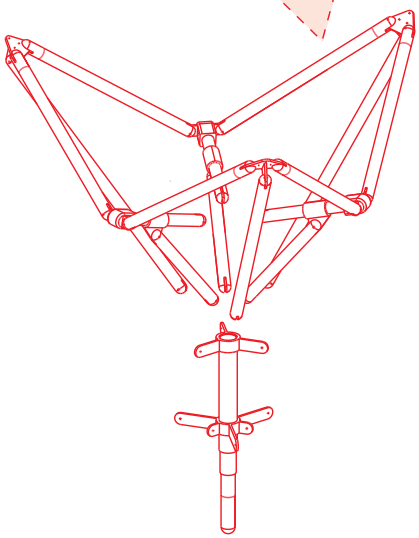
the three and four-way modules are perfectly modular and can be connected together along the 120 cm side

special corner joints allow 360 degree connection and mutual orientation in space

the number of sides of the module, can be incresed up to 6 and more







06_foldable structure

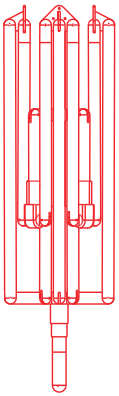
the module is easily foldable and transportable on pallets

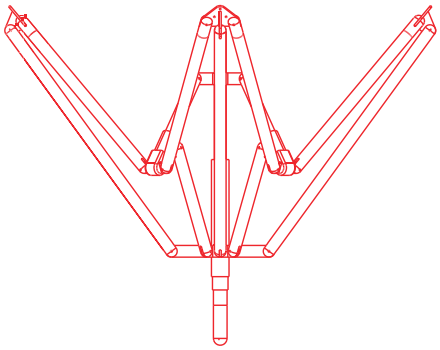
the opneing takes 2 second thank to gravity
and is safety lockeed in 3

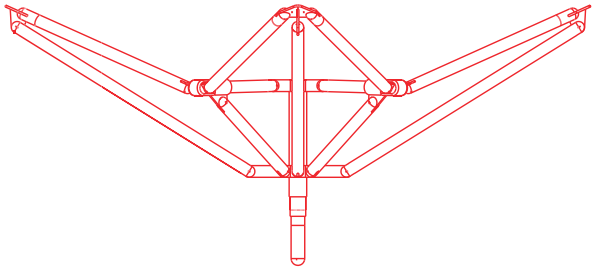
the minimum initial distance from the ground is 45 cm
with an inverted pyramid geometry

_closed dimensions 20x20x70 cm

_weight 7.5 kg







07_open equipment kit

_leg plug-in weight 1 kg

_3 interchangeable feet kit
for three soil types

the module includes a plug-in telescopic leg that can be extended up to 120 cm

a kit of feet allows for adaptation to any type of soil

specific and industrial hooks and connectors allow the module to be equipped with suspended systems and components

mounting holes are predrilled on all tubolar components

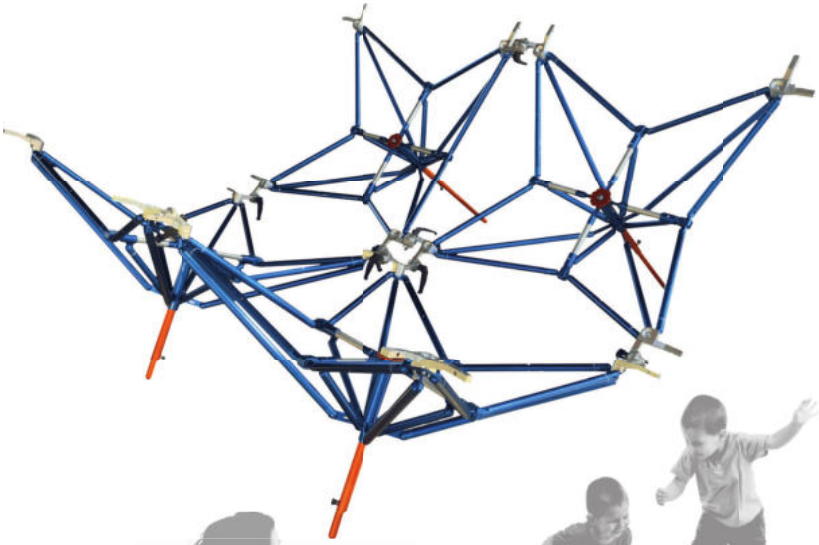
structure and components are made entirely of recycled aluminum

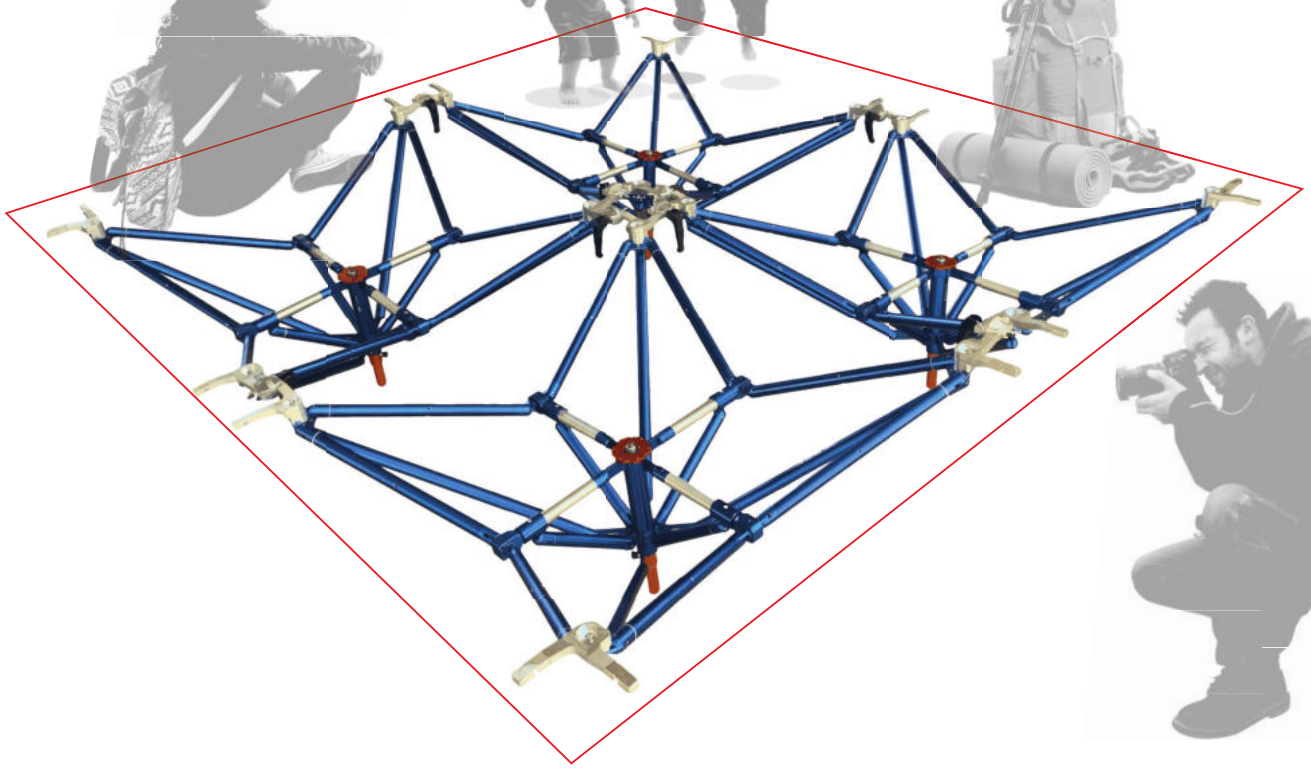
08_every possible plan

by adjusting the legs to different heights, it is possible to combine multiple modules creating horizontal and inclined floating surfaces on any base geometry

the corner joints allow you to orient groups of modules to articulate complex surfaces

on floating soils it is possible to stop and set up tents and shelters for temporary or emergency stays



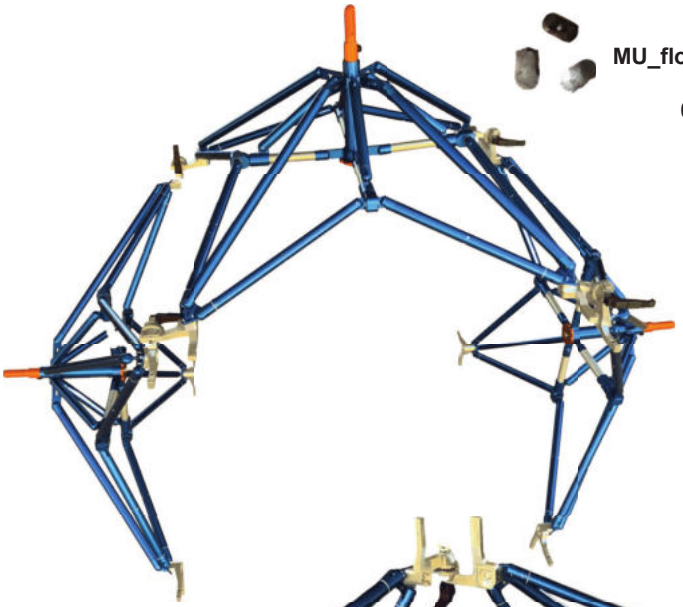


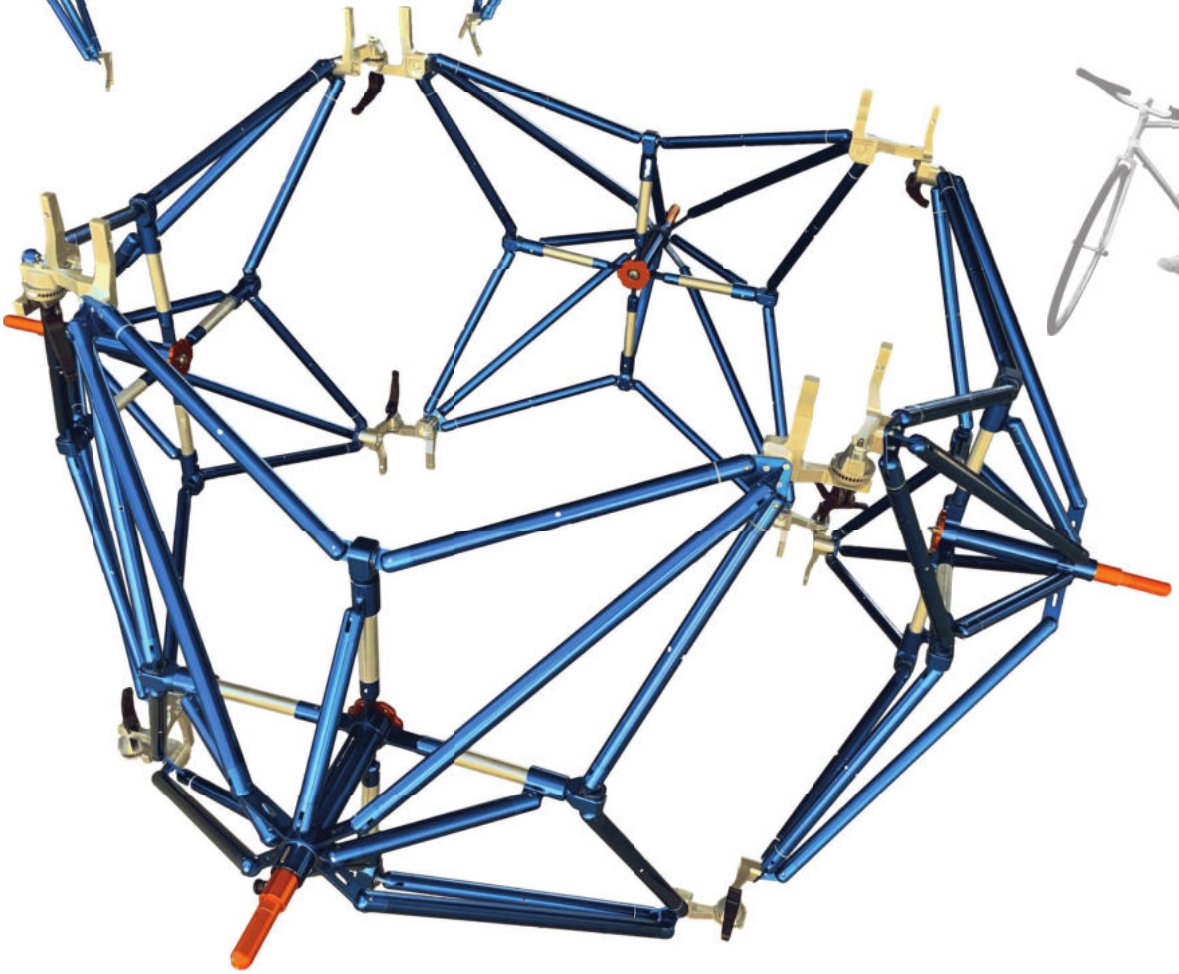
09_every possible volume

with the same system of floors, it is possible to combine modules in more directions in space

structural arches and closed geodes are achievable, which can be coated and used as a shelter

the closed structures are extraordinarily strong, and can be lifted and moved by untrained operators





10_any joints and decks

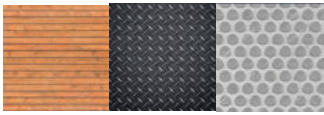
the modules can also be coupled by the vertices of the structural piramids:

horizontally, to produce large support plinths

vertically, to create pillars or hollow walls

a deck made of wood or any other material it can complete the module covering

the deck is fixed on the corner nodes, and can be opened, inspected and replaced easily



11_mountains configuration

the floating platforms in the mountain configuration are a clear example of the potential of the MU system

pedestrian paths, passages and stalls for tents can be safely built on rough rocks and soils

the detachment from the natural ground allows protection from water and snow,
facilitating the stay in the winter season

under the deck food can be stored and electrical systems from local off grid production can be wired

12_off-shore piers configuration

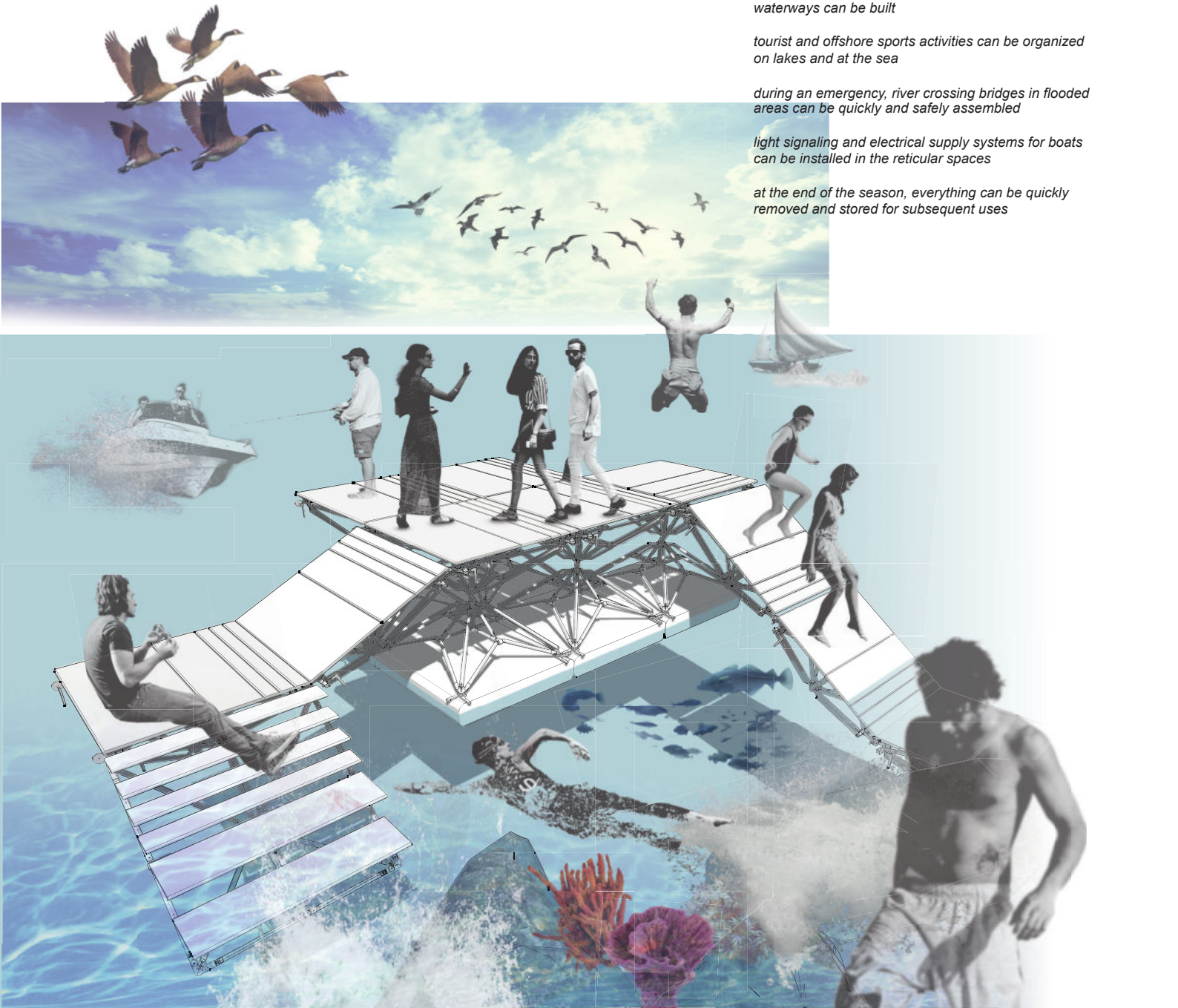
with a coupled module assembly, floating docks and waterways can be built

tourist and offshore sports activities can be organized on lakes and at the sea

during an emergency, river crossing bridges in flooded areas can be quickly and safely assembled

light signaling and electrical supply systems for boats can be installed in the reticular spaces

at the end of the season, everything can be quickly removed and stored for subsequent uses



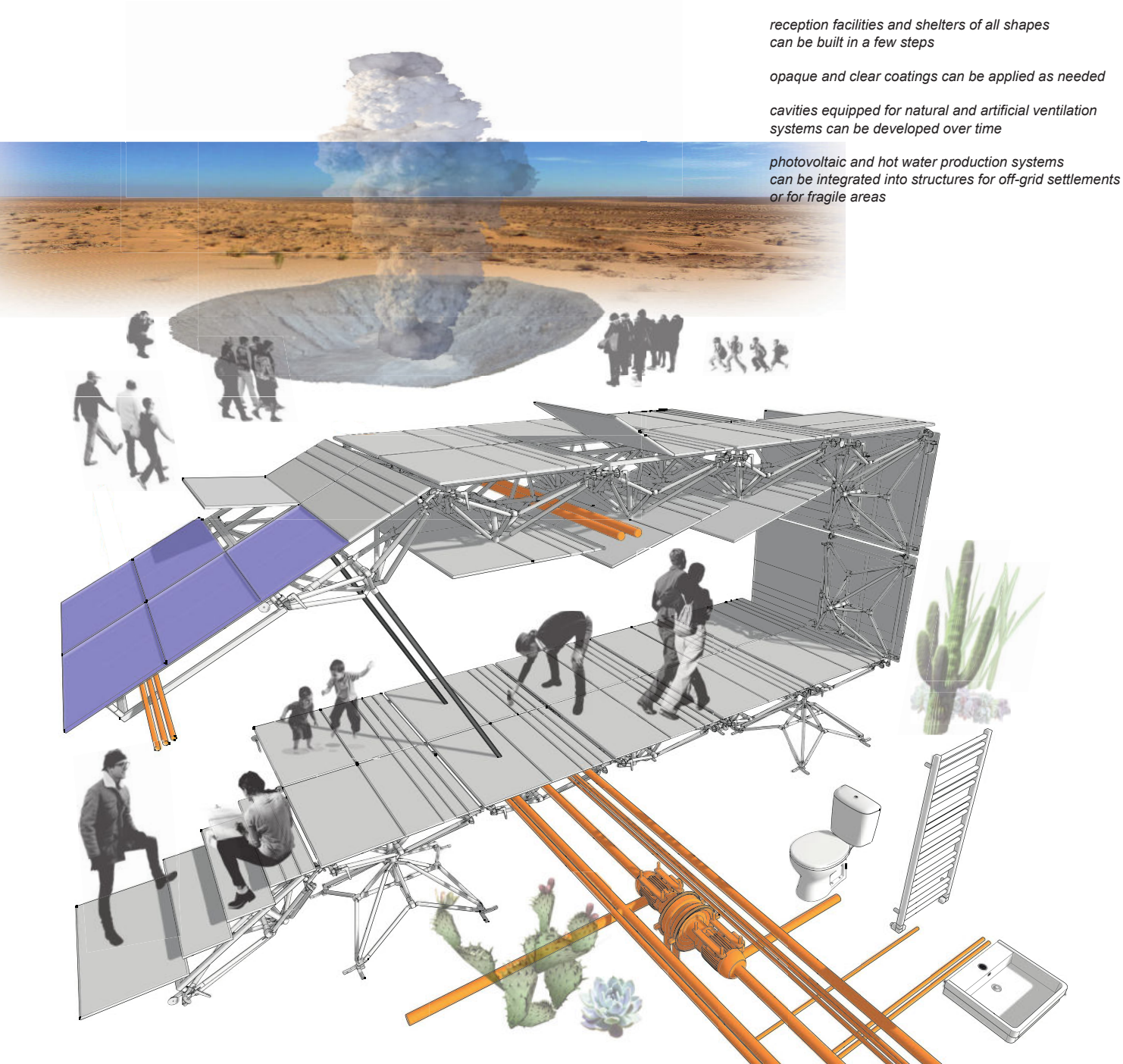
13_shelter configuration

reception facilities and shelters of all shapes can be built in a few steps

opaque and clear coatings can be applied as needed

cavities equipped for natural and artificial ventilation systems can be developed over time

photovoltaic and hot water production systems can be integrated into structures for off-grid settlements or for fragile areas



MU_floating soils

14_any places

a Brain applied on the leg of MU, allows you to remotely manage the height of the module, thanks to a stepper motor powered by a lithium battery

the board with microprocessor is set up with environmental monitoring sensors

An app on the device guarantees the remote control

brain
leg movements and environmental monitoring

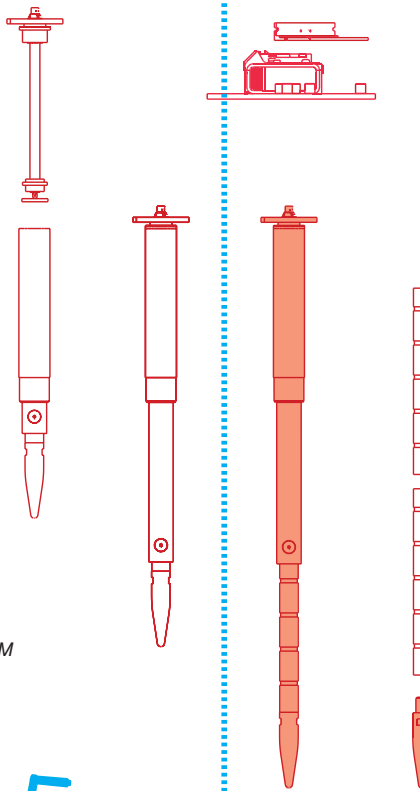
MU app
remote brain/leg control

_stepper engine
_sensors
_microprocessor
_lithium battery

U_space
drones/com infrastructure

leg
deck height control

infinite screw_ telescopic_ extension system



***MU_IOT** ACTUATOR SYSTEM*

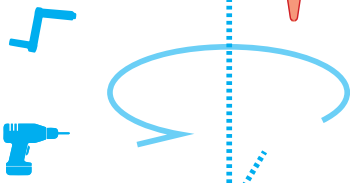
feet
manual soil contact adaptation

_rocks

_grass

_sand

crank/drill
alternative manual leg control

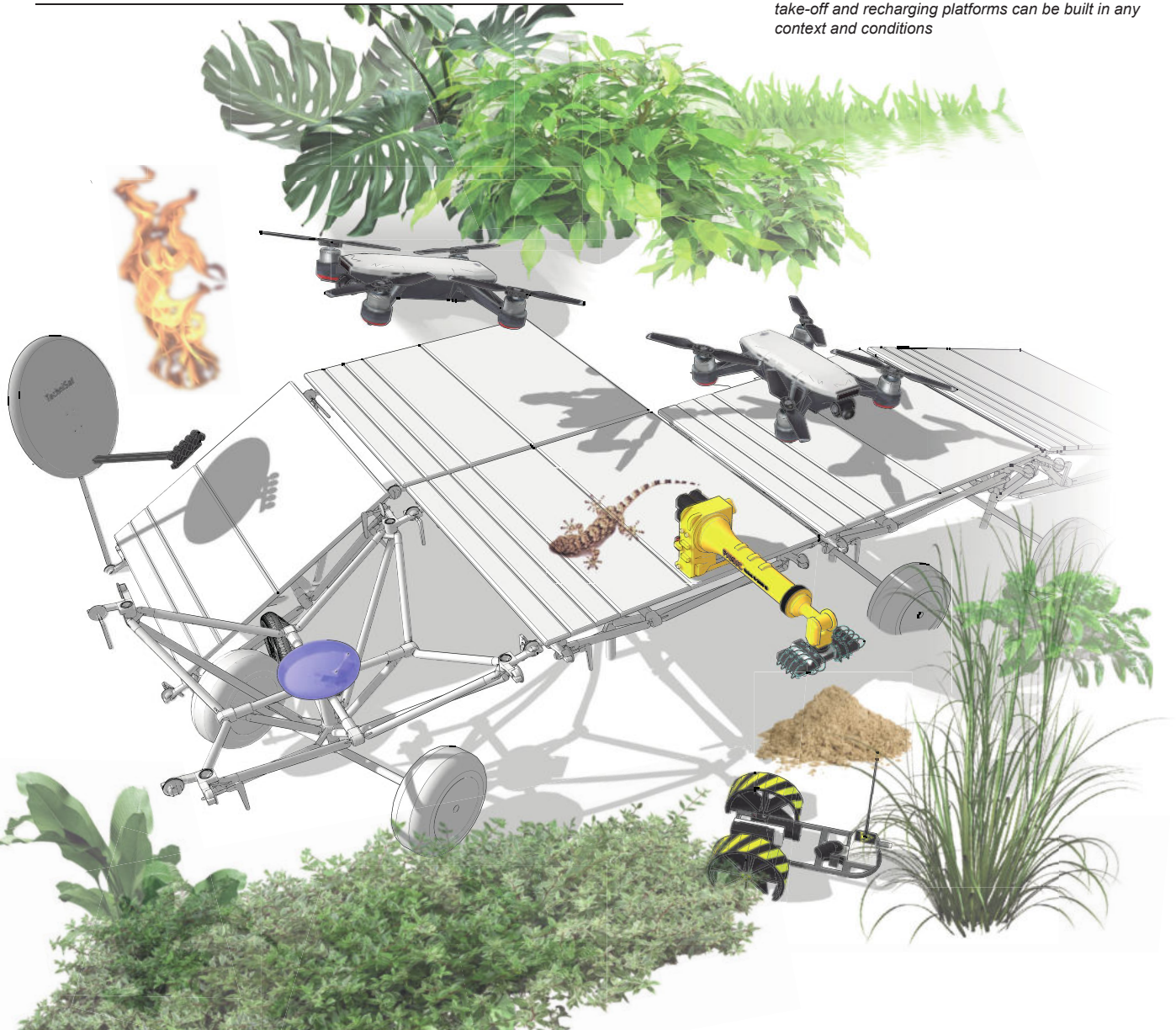


15_mobile drones platform configuration

mobile platforms and structures for the research and analysis of natural reserve areas can be suitably set up with the MU modules

in anticipation of the opening of the European U-space for the transport of goods and people via drone

take-off and recharging platforms can be built in any context and conditions



calais 2016_"the jungle" refugees camp

_URBANIZATION
_INCREASE POPULATION
_SOIL CONSUMPITION

AGEING POPULATION

CLIMATE CHANGE

_temperature increase
_extended summer season

COVID PANDEMIC

global pressure trends

ACCESSIBLE TOURISM

OUTDOOR LIFE REQUEST

DISASTER INCREASE PROTECTION

global trends opportunities

camping

protected natural areas

civil protection

market stakeholders

project match

SUSTAINABLE DEVELOPMENT GOALS

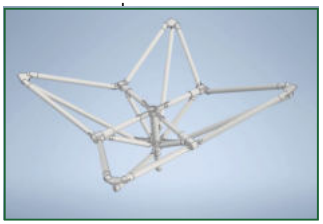
13 CLIMATE ACTION

11 SUSTAINABLE CITIES AND COMMUNITIES

15 LIFE ON LAND

UN goals

MU floating soils



the convergence between serious global pressure factors in progress and the UN 2030 objectives, make Mu a natural tool for mitigation and adaptation to Climate Change

numerous are the stakeholders of a new market in extraordinary development to be involved

CAMPING
_extension to impervious soils
_increase in commercial useful area
Europe hosted in 2016 half of the world tourism.
Italy is the 3rd destination, which hosted one third of the tourists in its 3000 campings *for 1 million beds and 70 million admissions per year (Eurostat 2016)*

SENIOR and DISABLED
_extension of accessibility to new social categories
the Eurostat 2016 projection foresees that in 2050, 28% of the population will be over 65

NATIONAL PARKS/NATURAL RESERVES
_earnings for temporary activities in reserve areas
_creation of environmental **monitoring hubs**
with 24 national parks and 27 marine protected areas, Italy is the fourth country in Europe for protected territory (10% of the total)

GLOBAL CLIMATE CHANGE
_mitigation: soil consumpiton reduction
_adaptation: developement of outdoor activities for the increase of temperate climate zones
primary EU goal achievement:
reduce land use to zero by 2050
(Green New Deal 2021)

INTERNATIONAL PROTECTION ORGS
_rapid assembly, disassembly and storage of emergency settlement systems
in 2018 there were 80 million REFUGEES on the move (UNHCR), 20 of which are due to climate crisis.
The projection at 30 years is 250 million

UNHCR The UN Refugee Agency

DRONES' COMMERCIAL FLYZONE
_developement of temporary **landing platform** along safe urban corridors
in european U-Space, the first commercial flight and passengers transport it is expected by 2030

MU has obtained the maximum score in the Research Report for the Italian patent, from the point of view of Novelty, Inventive Activity and Industrial Application

The modular system has been included in the family of structures for Aerospace, as an improvement tool for similar NASA systems

Ministero dello Sviluppo Economico

DIREZIONE GENERALE SVILUPPO PRODUTTIVO E COMPETITIVITA'-
UFFICIO ITALIANO BREVETTI E MARCHI

RAPPORTO DI RICERCA

Numero della domanda

IO 111658
IT 202100018956

Riquadro N. VDichiarazione motivata a riguardo di novità, attività inventiva o applicazione industriale; citazioni e spiegazioni giustificative della dichiarazione

1. 1. Dichiarazione

Novità (N)	Sì:	Rivendicazioni	1-10
	No:	Rivendicazioni	
Attività inventiva (IS)	Sì:	Rivendicazioni	1-10
	No:	Rivendicazioni	
Applicazione industriale (IA)	Sì:	Rivendicazioni	1-10
	No:	Rivendicazioni	

2.1 The subject-matter of claim 1 therefore differs from this known portable construction module in that in the first configuration, i.e. the closed configuration, when the totality of the secondary tubular elements is arranged parallel to the main hub the second group of elements is **disconnected** from the point at the second end of the main hub and is therefore new.

2.2 The problem to be solved by the present invention may be regarded as creating a structurally stronger module.

2.3 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step for the following reasons:

Although a module with full struts, i.e. where th struts do not hinge at their middle point, could be considered for making the cell of D1 stronger in its open configuration, it would not be obvious to the skilled person as it would need several related steps to maintain the foldability of the cell of D1.

Even if D2 and D3 disclose struts that disconnect from an end of a hub in a folded state of the module the skilled person would not combine this teaching with the foldable cell of D1, without inventive step, as several related steps would be needed.

Furthermore, it would result in a less compact folded unit and it would increase the risks of not deploying well, i.e. having elements not well aligned.

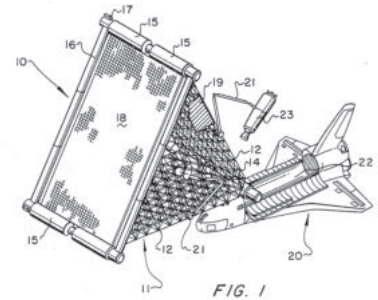


FIG. 1

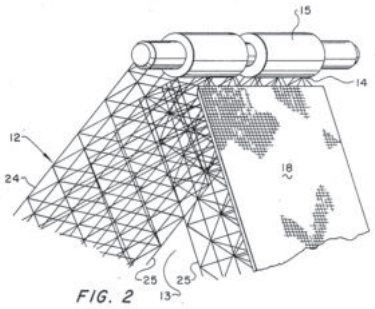


FIG. 2

Mu's long journey from the concept to the three prototypes up to the certification and verification phase proceeds towards the last steps

for 2024, a mini production is planned to test the market

the last in-depth project analysis of the combined 3 and 4-way aggregation system is currently underway, under the supervision of the CNR which follows the performance simulations

2007 _tasmania

CONCEPT
_travelling with backpack, direct experience of platforms for camping in wilderness areas

_dry and safe overnight stay respecting nature and soil integrity

_easy removal at the end of touristic the season

2017_venice

FIRST MODEL
_first prototype development in the laboratory, financed with European funds for 75,000 €

_separate management of deck and legs
_needs minimum two people for assembly

_handling and leveling by hand only

2020_rome

SECOND MODEL
_second European financing of 65,000 €
_birth of the dedicated innovative startup PAN srl to develop a new improved prototype

_development of the **Mu tatami** concept, with deck platform and legs combined in single integrated object

2022

ITALIAN PATENT ATTRIBUTION

2023

INVESTOR DECK
BUSINESS MODEL

earlly adopter validation

2024

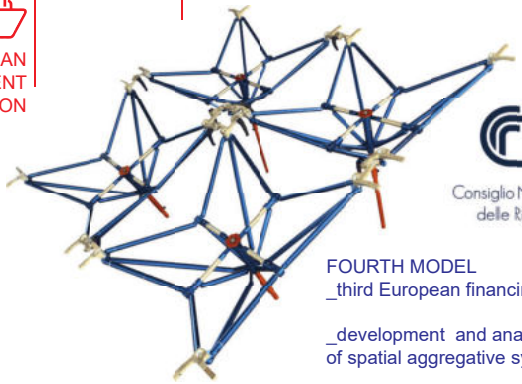
EARLY STAGE level

INVESTORS

PRODUCTIONS

THIRD MODEL
_complete final prototype with industrial basic components
_foldable, strong and resistant reticular structure manageable by a single operator
_usable like a brick to build complex shelter and limitless architectonic configurations

_start of the Italian patent attribution process



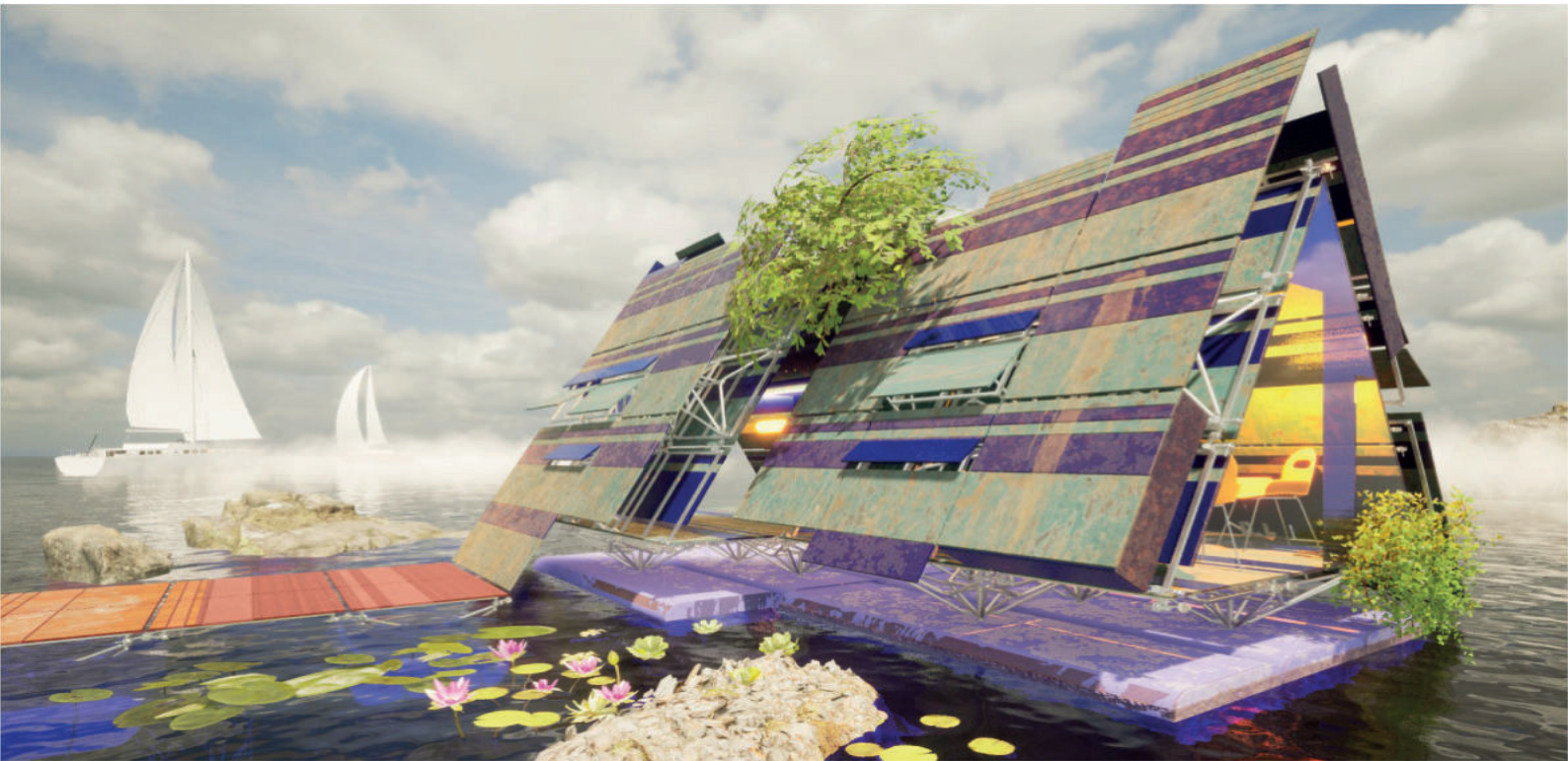
Consiglio Nazionale delle Ricerche

FOURTH MODEL
_third European financing of 100k €

_development and analysis of spatial aggregative systems

_CNRs performances certification

the MU modules combined in complex shelters, which can be built quickly both on land and on water



temporary residential structures can be assembled in natural reserves areas and in phases of environmental criticality

MU is a PAN srl project, a research startup-spinoff born in 2020 with European funding

deals with parametric design in architecture and in its laboratories, CNC prototyping in production processes

manages post graduate master courses in environmental parametric design for universities and private academies

project financed with
European Call for Proposals

PARAMETRIC
ARCHITETCTURE
NETWORK
Innovative Startup
Research Spinoff

PAN

01
European PATENTS

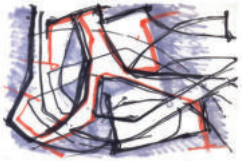
EUIPO
EUROPEAN UNION INTELLECTUAL PROPERTY OFFICE

02
European
FINANCING CALLS

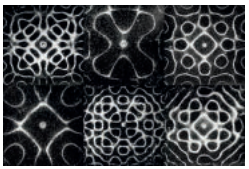
Funded by
the European Union

03
PROTOTYPES LABS
design and production
with CNC machines

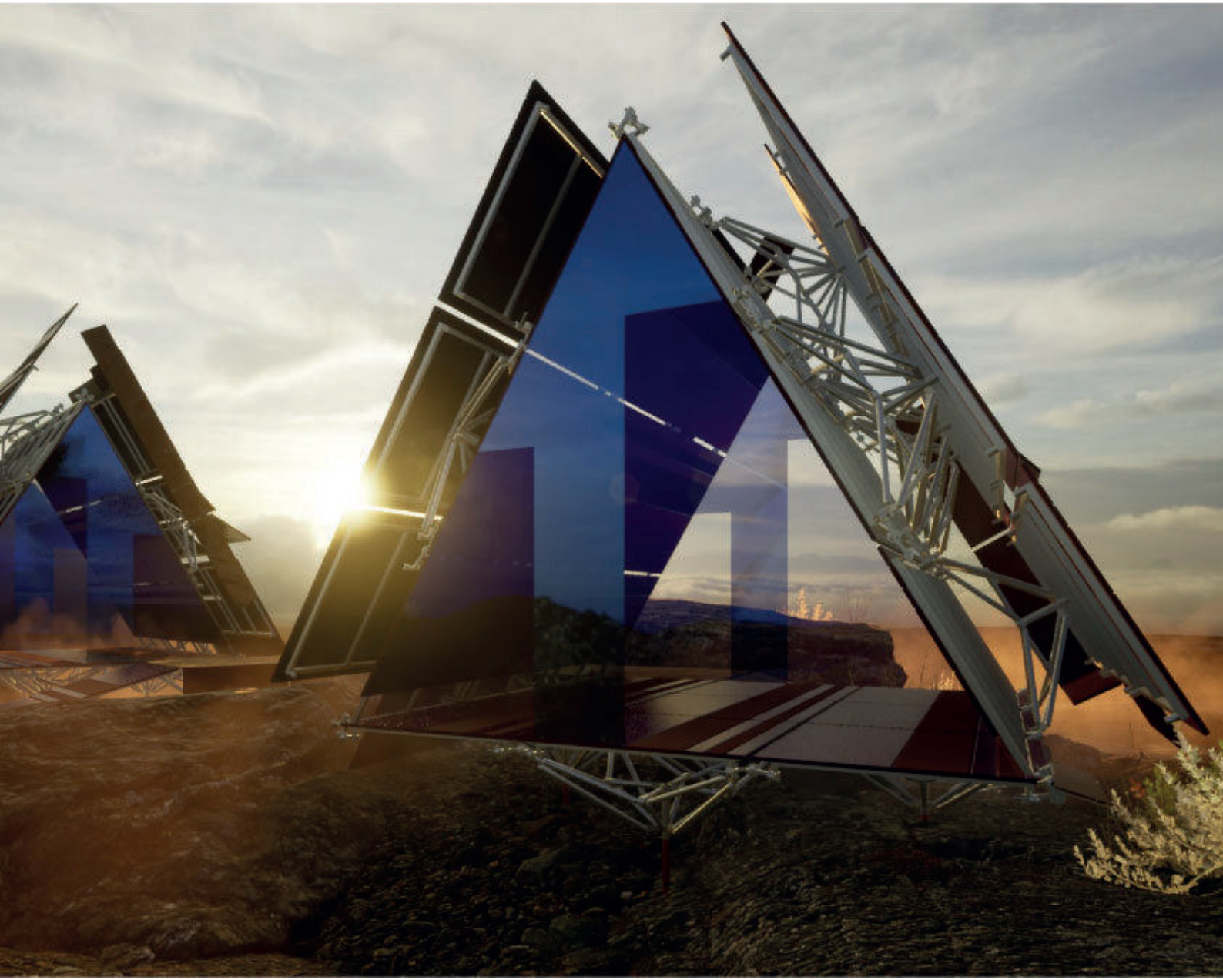
04
CONCEPT
ARCHITECTURES
PRODUCTS



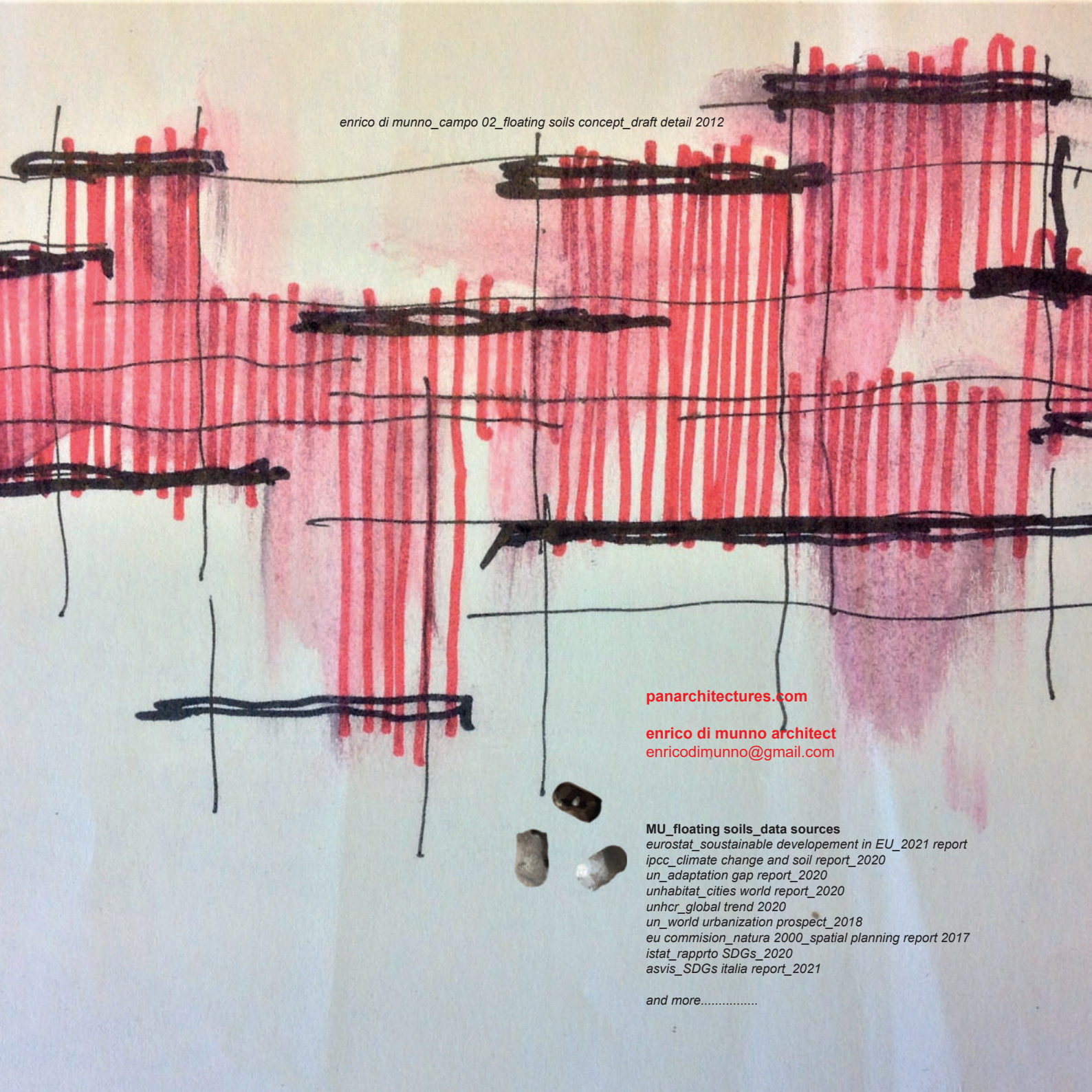
05
MASTER and
TRAINING COURSES
in Parametric Design



06
LEED rating protocol



safe campsite settlements can be set up in extreme environments, even on rocks and on all types of soil



enrico di munno_campo 02_floating soils concept_draft detail 2012

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MU_floating soils_data sources

eurostat_soustainable developement in EU_2021 report
ipcc_climate change and soil report_2020
un_adaptation gap report_2020
unhabitat_cities world report_2020
unhcr_global trend 2020
un_world urbanization prospect_2018
eu commision_natura 2000_spatial planning report 2017
istat_rapprto SDGs_2020
asvis_SDGs italia report_2021

and more.....