



POLITECNICO
MILANO 1863

Knowledge transfer into a System Design Process

the case study of
“S(P)EEDKITS - Rapid deployable kits as seeds of self-recovery”



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RESEARCH OVERVIEW



COLLABORATIVE PROJECT (2012-2016) → co-financed by European Union's 7th Framework Programme under the Security Theme (SEC-2011.4.2-3)

AIM → rethinking shelters, medical care resources and other facilities provided in case of natural disaster and conflicts.

PARTNERS → research institutes, universities, private companies and non-profit organizations operating in the emergency sector





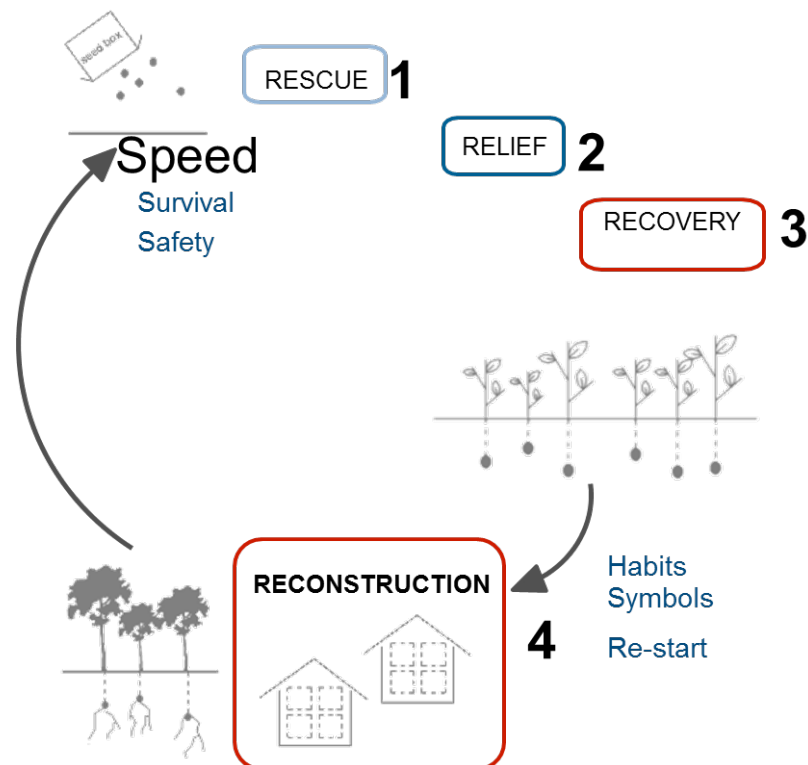
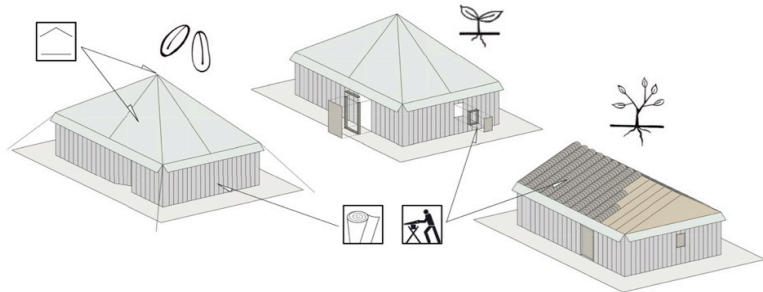
RESEARCH OVERVIEW → Challenges

SPEEDKITS

rapid deployable kits as seeds for self-recovery



From SPEED to SEED



Source: Tents, UN/OCHA, 2004

different phases





RESEARCH OVERVIEW → Challenges



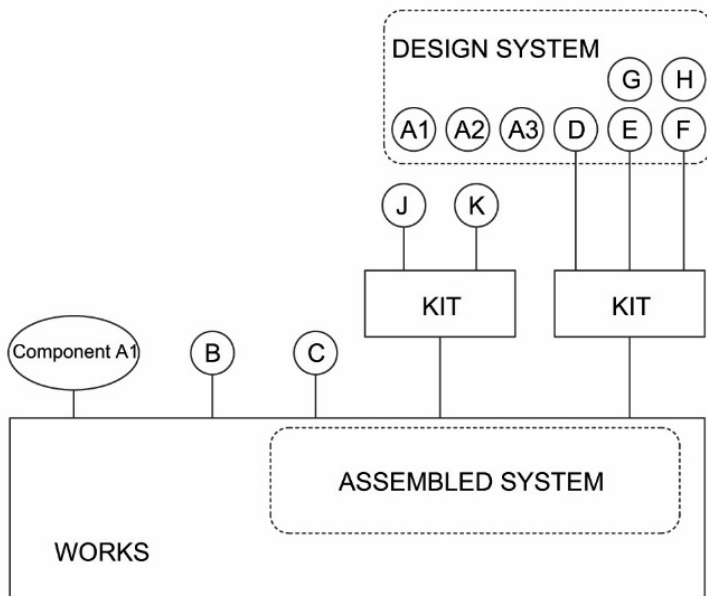
Collaborative partnership between
NGOs (= real needs), Academia (=research)
and Private Companies (=Production)

Bottom-up approach →
Designing Components (no prefab shelters)

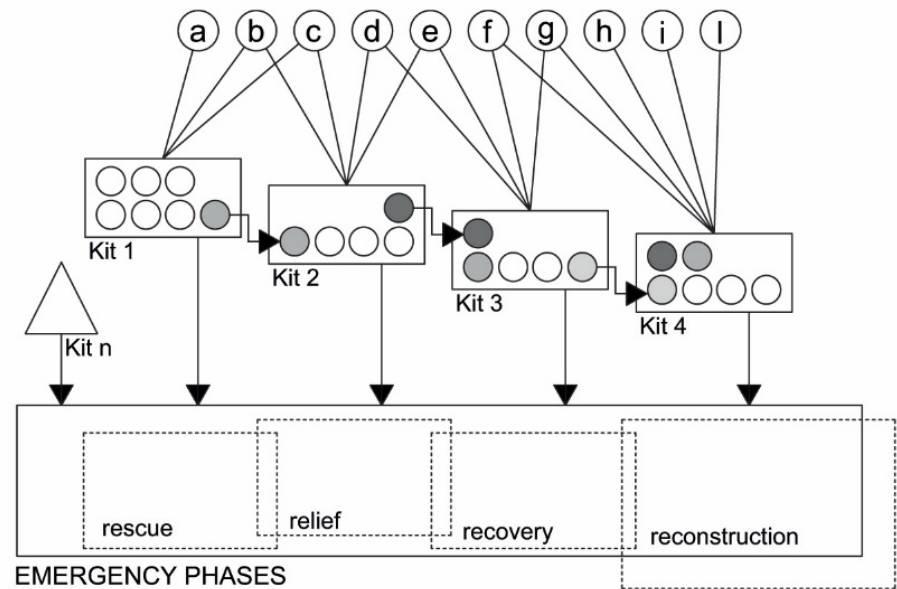




SYSTEMIC APPROACH → Rhizomatic design



a



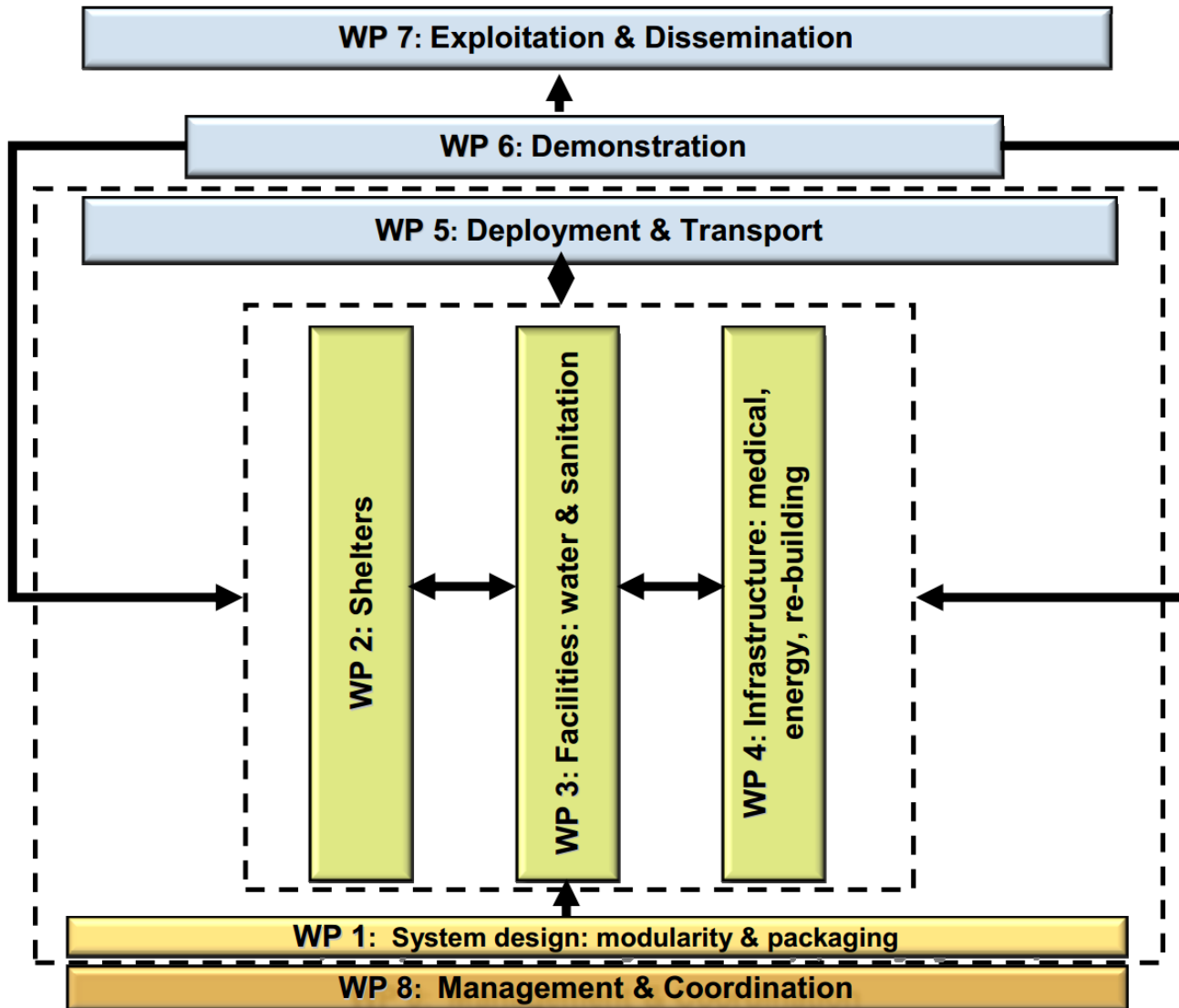
b

- a. The relation between 'Design System' and 'Kit' in the Building Sector (Construction Products Directive - 89/106/EEC)
b. The S(P)EEDKITS System design and the seed concept

- Combination of components from different kits (for their adaptability to different climatic context, cultural and alternative means of transport);
- Re-usability of some components of the kit
- Usability for the subsequent emergency phases and the reconstruction phase.

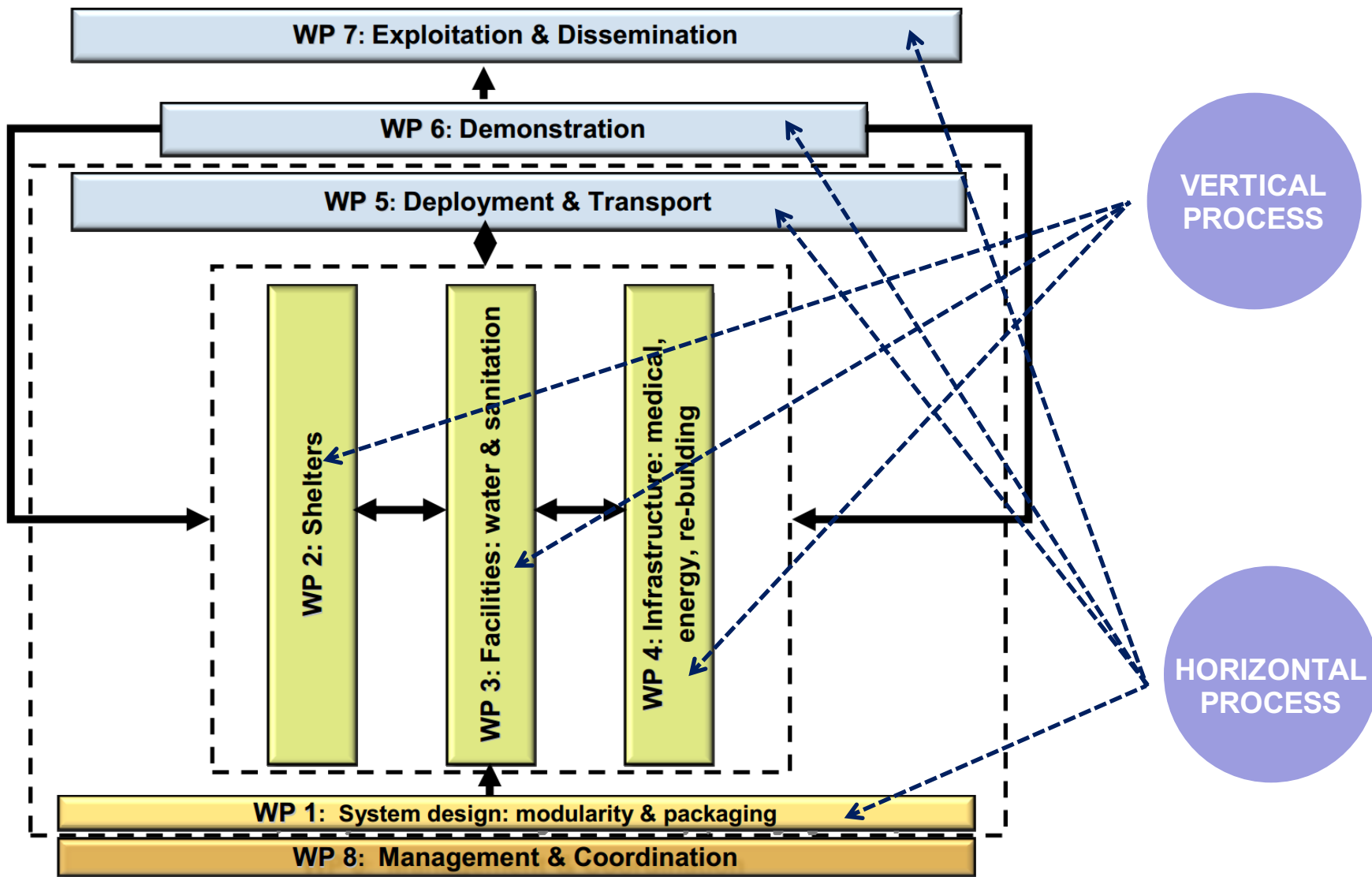


WPs STRUCTURE



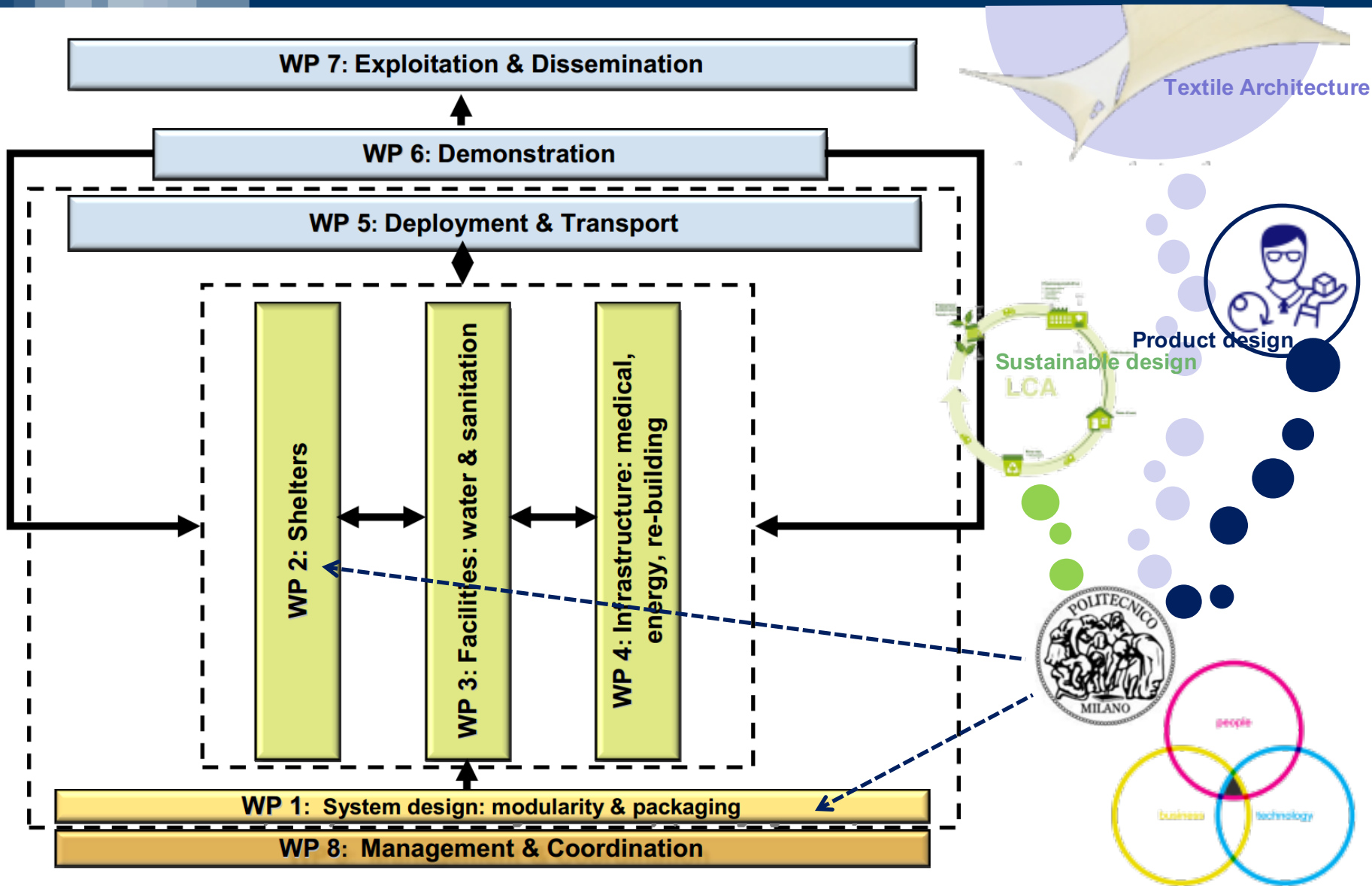


WPs STRUCTURE → Vertical Vs. Horizontal Process





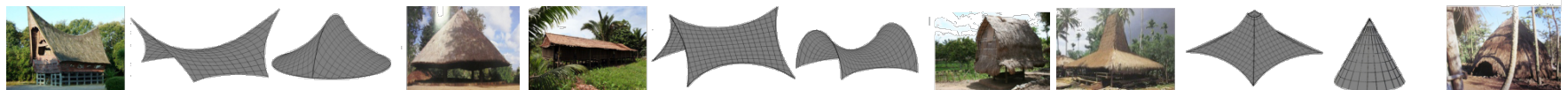
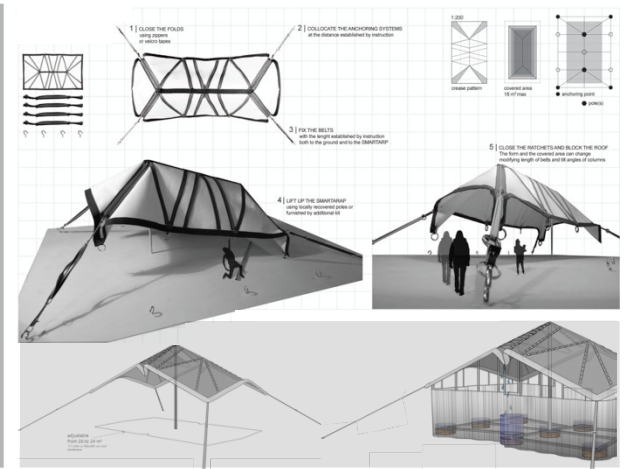
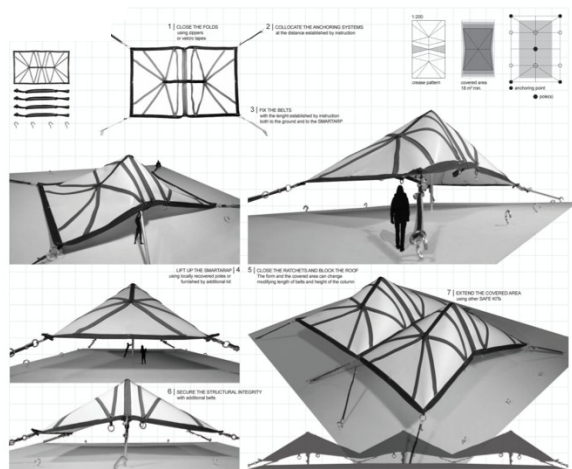
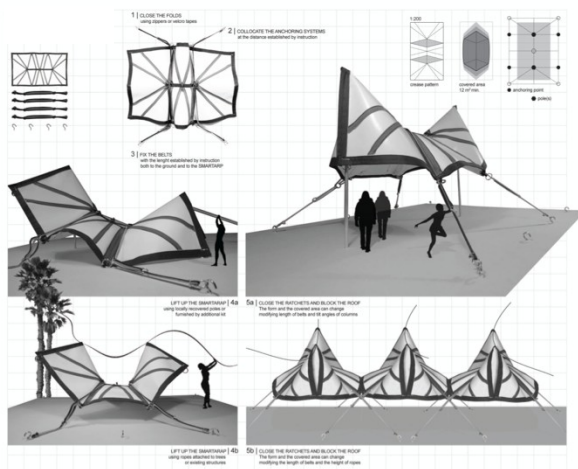
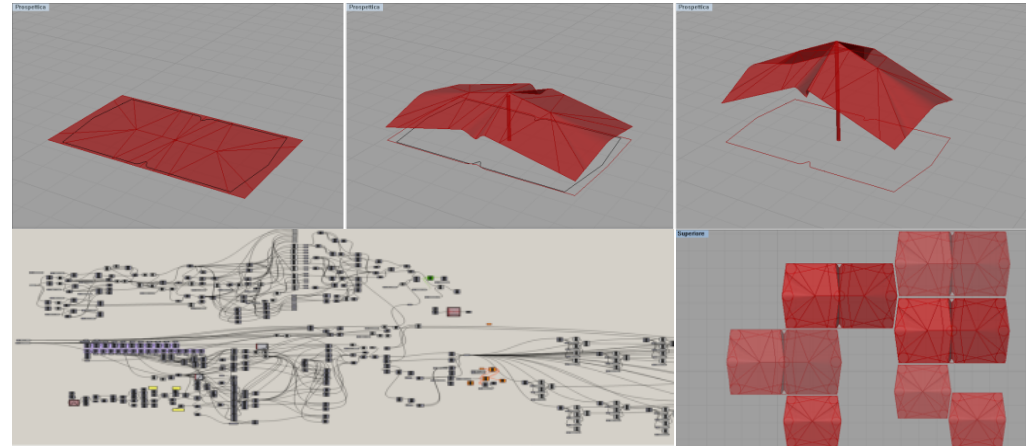
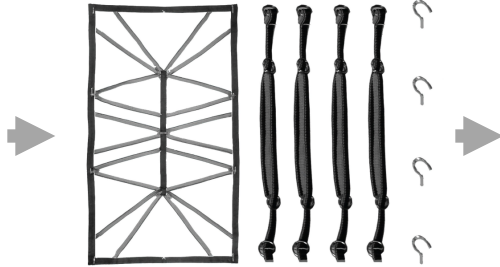
WPs STRUCTURE → POLIMI Research Tasks





WORK PACKAGE 2 → Outcomes

Shelter Type 1 Adaptable Roof

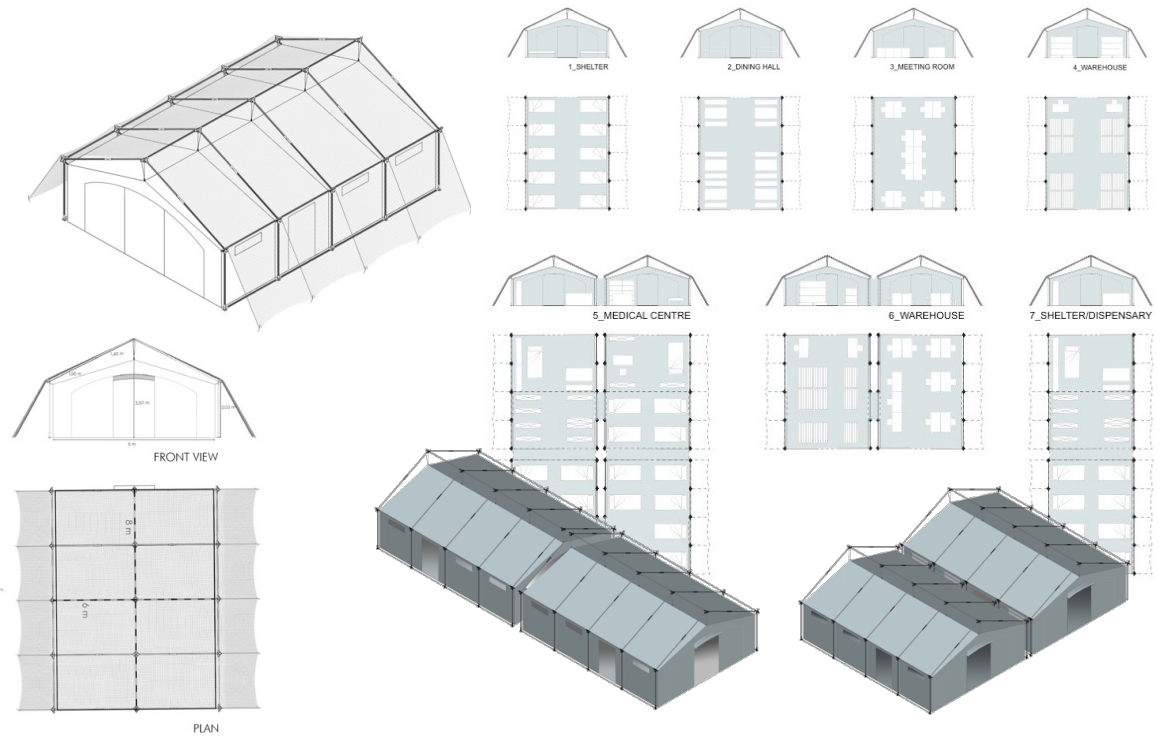




WORK PACKAGE 2 → Outcomes

Shelter Type 2 Collective Tent

- Universal connectors
- Multiuse poles



In collaboration with:

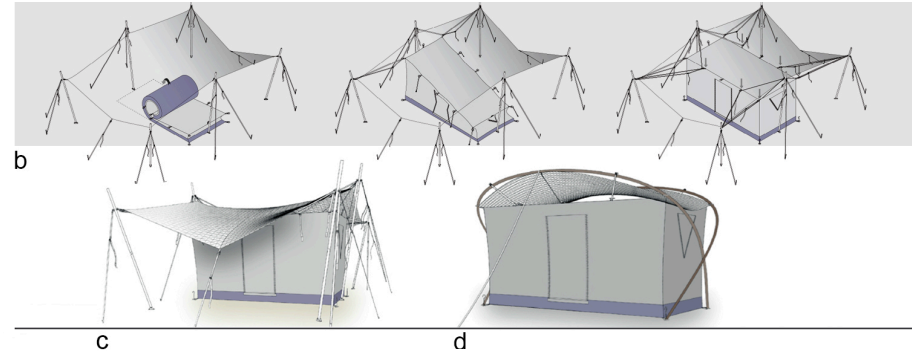




WORK PACKAGE 2 → Outcomes

Shelter Type 3/a Family Unit

In collaboration with:

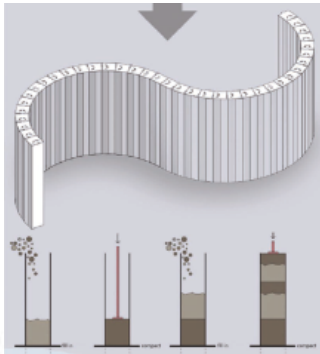
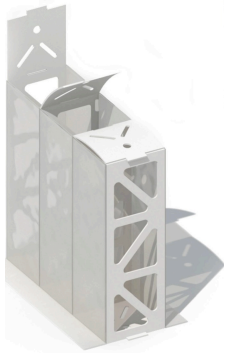
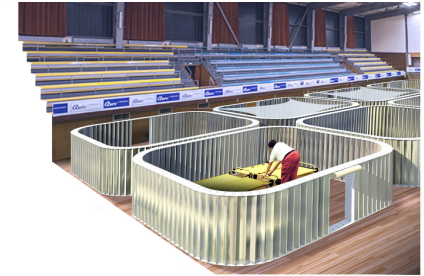
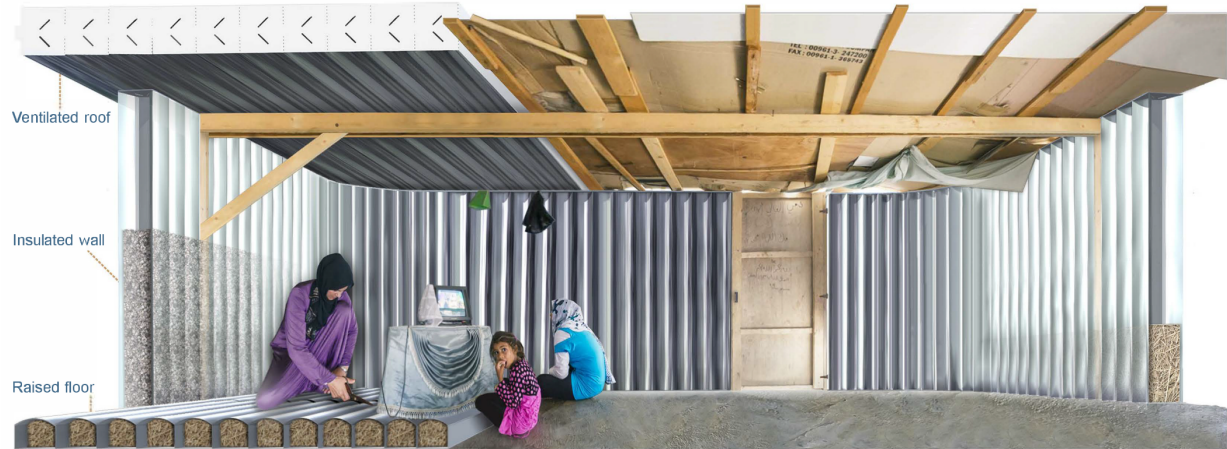




WORK PACKAGE 2 → Outcomes

Shelter Type 3/b Textile Wall

- Free-standing
- Fillable with locally available material

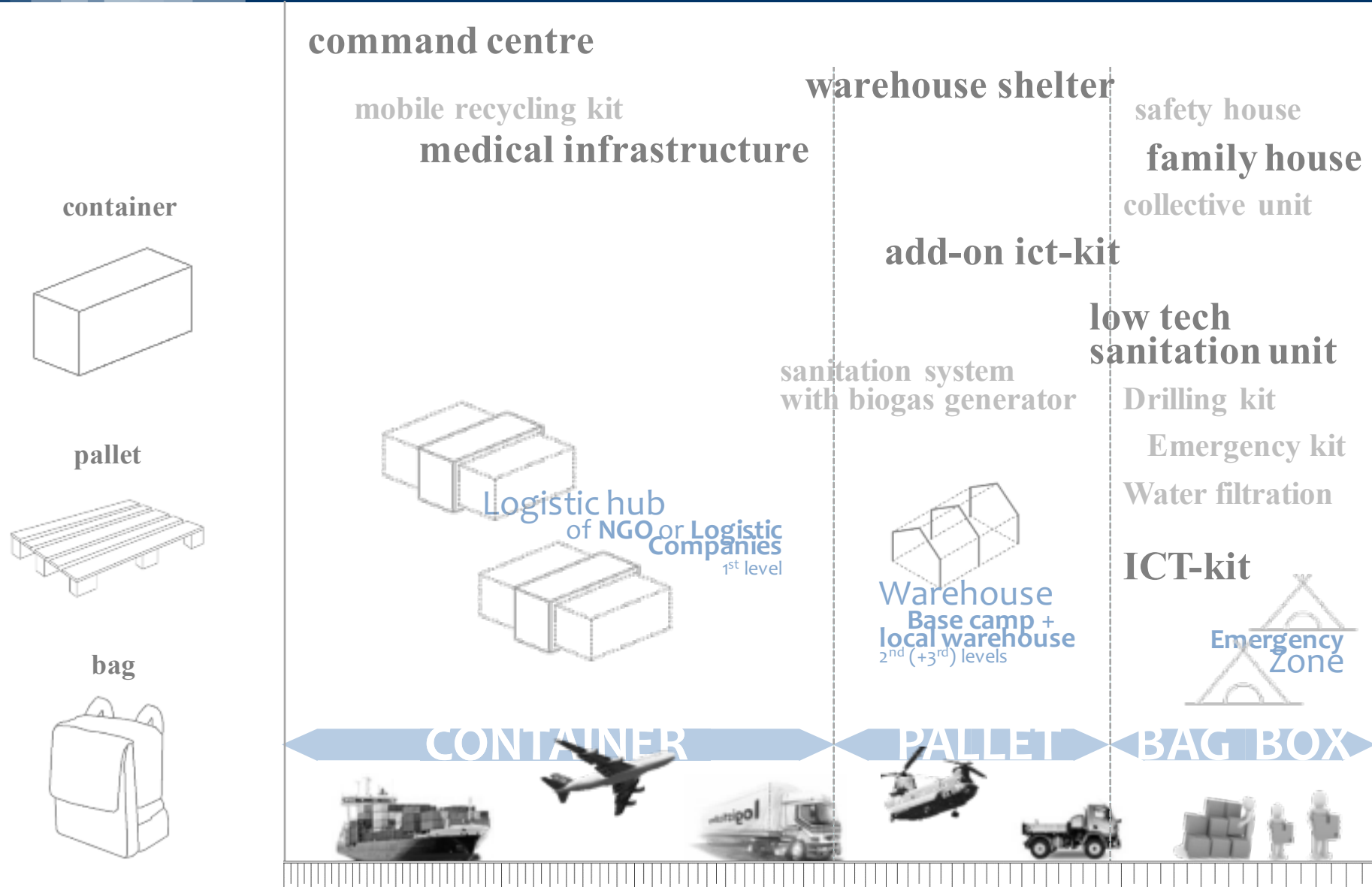


Field test in Burkina Faso, 2013

In collaboration with:



WORK PACKAGE 1 → Transportation levels





STATE OF THE ART → Current NFIs Packaging

UBER SHELTER T-Shel 2
Rabiat Smith | Uber shelter project 2011

T-Shel 2 is made from a **ADVANCED STEEL FRAME** and fire **RETARDANT UV-RESISTANT POLYPROPYLENE PANELS**. By adding SIP, CGI, or other permanent sheathing materials, the existing structure can transition to permanent housing. More rooms can be added using modular extensions or local construction.

All components that create the modular living unit are stored inside the shelter in its collapsed position during transport. It is then taken apart and assembled on location. When it is no longer needed, it can be dismantled, packed flat again, and moved to the next disaster area. The aim has been to design a shelter that is compatible with the current systems used in refugee camps and emergencies by organizations such as the UNHCR (United Nations High Commissioner for Refugees).

TER Mk 5
International Pty Ltd

S Shelter is the most compliant with the 'Transitional Shelter' document developed by Shelter Centre.

STEEL WELDED FRAME, LESS CONSTRUCTION SYSTEM IN A SECOND TIME. It can be engineered and distributed on and wind ratings, **cladded externally and fixed internally building materials and fixed out with separate rooms, technical services.**

Shelter Description
Area: 100m²
Capacity: 2500
Weight: 2500kg
Size: 10m x 25m
Height: 2.5m
Material: Steel
Finish: Galvanized
Color: Grey
Type: Shelter
Usage: Temporary housing
Location: Refugee camps
Status: In use

disaster relief shelter solution. It stands (flaps), one of the most solid structure that can be folded flat and loaded into an immediately deployable to the larger areas. It is called "flap-in" type. Same as in an Emergency Response case plan. It is a challenge to be manufactured from supporting the entire side further development of the shelter. The Shelter Centre, the Geneva at around the end floor area per person can be a completely challenge with the 10.

temporary communities. Finally the design offers a structural template for permanent housing upon return or relocation. This project was carried out with on-site contacts from the UNHCR and WFP in the refugee camps and shelters.

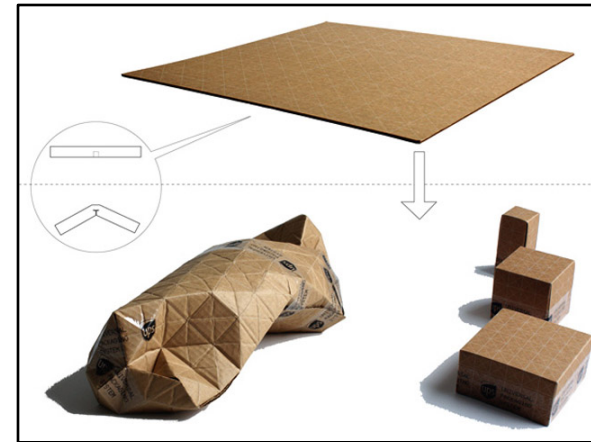
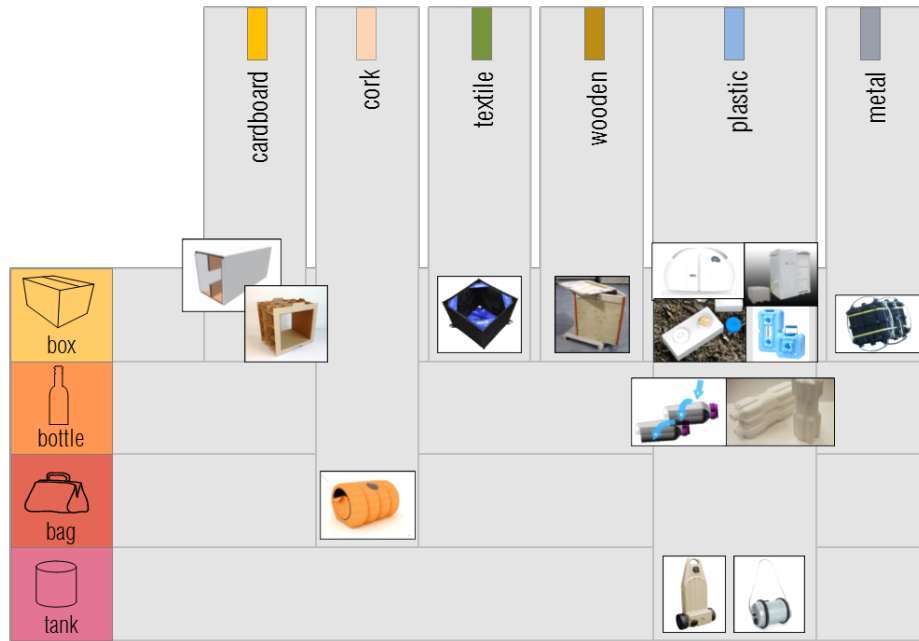


- Prefab shelter = Closed system
- Heavy packaging of NFIs
- Different Technical Specification for each NGO (*Multiplicity of kits Vs. Global disasters*)





STATE OF THE ART → Cross Cutting Analysis



box

bottle

bag

tank

cardboard
 cork
 textile
 wooden
 plastic
 metal

EXAMPLE in EMERGENCY

Website: <http://www.waterbrick.org/lp-water-containers.php>

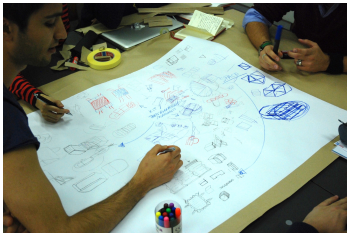
WATERBRICK

WaterBricks are unique water containers and food storage containers that can be re-used as building blocks for transitional shelter while eliminating plastic waste worldwide. Perfect for emergency preparedness, disaster relief or any outdoor activity.

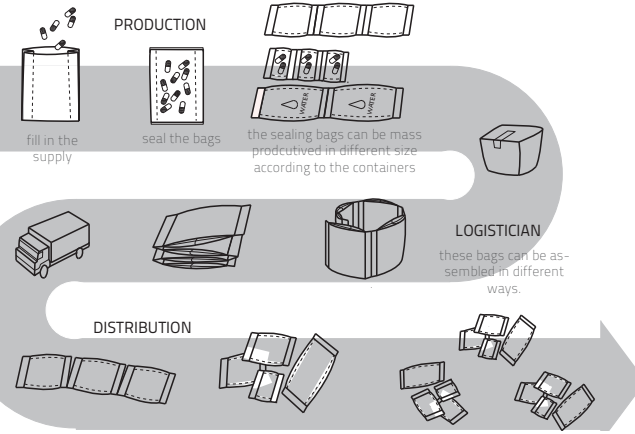
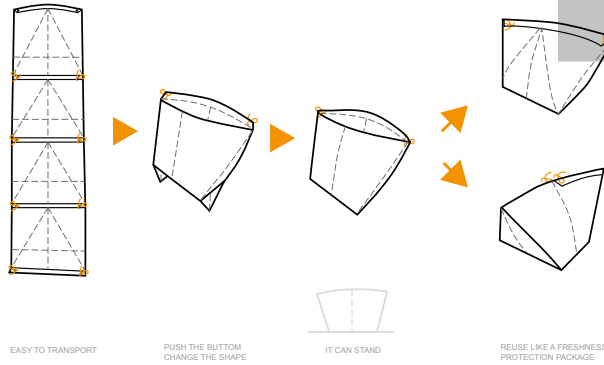




DESIGN STUDIO WORKSHOPS → Concept design



+USE



HOW TO USE IT Assembling and handling

1. Singular unit
2. Take the unit
3. Bend the two flaps
4. Insert the flaps
5. Make the flaps pass
6. Check if it is lock
7. Add more units

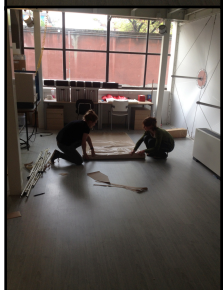
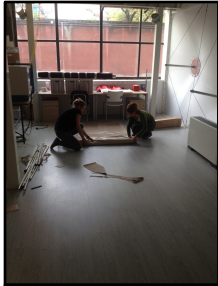
CONNECTIONS
A simple instruction to explain to the users how to join the bags.
Fold the flaps and insert in the top cut of another bag.

ICONS
To differentiate the conten we have 3 different icons (white stroke on colored background)
Blue = water / Yellow = food / Red = Medicines

C: 92 M: 0 Y: 51 K: 0	C: 0 M: 23 Y: 80 K: 0	C: 0 M: 78 Y: 75 K: 0

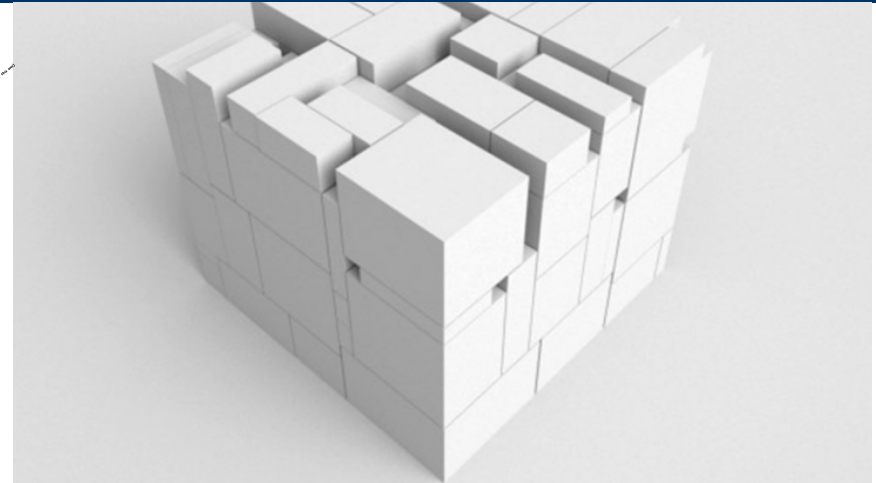
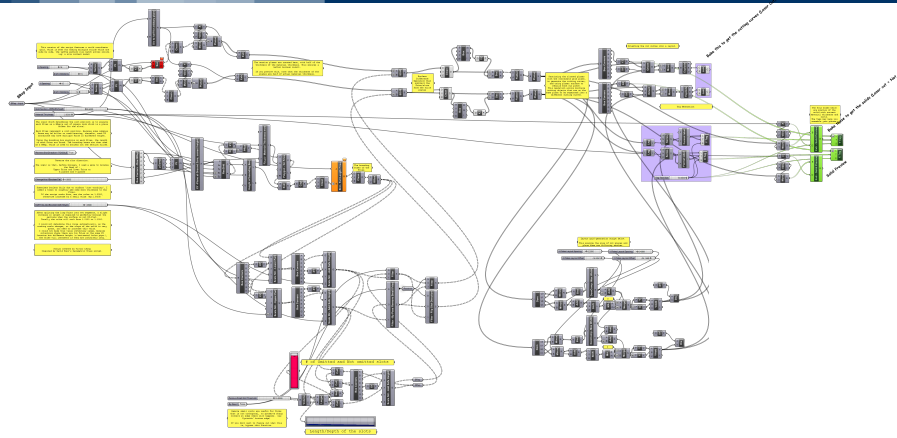


DESIGN STUDIO WORKSHOPS → Concept design





DESIGN STUDIO WORKSHOPS → Nesting design



input data



save data and calculate



view options



select a solution

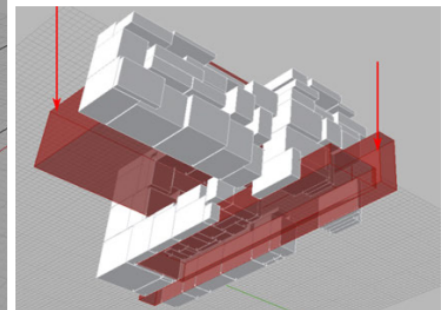
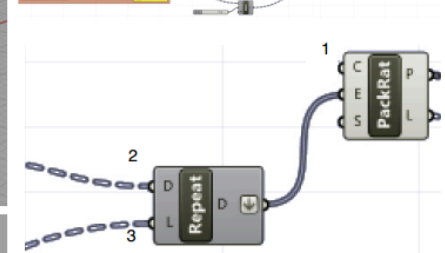
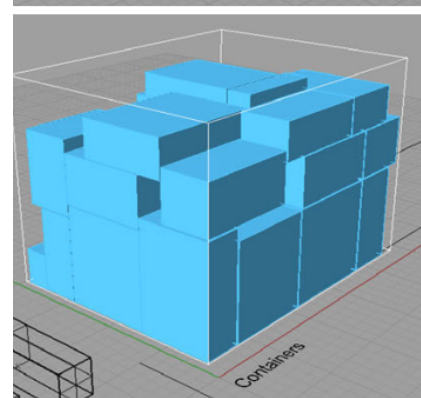
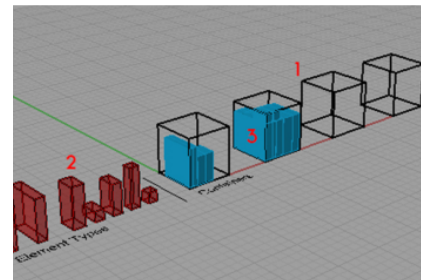
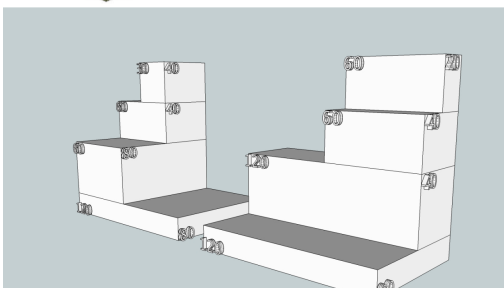
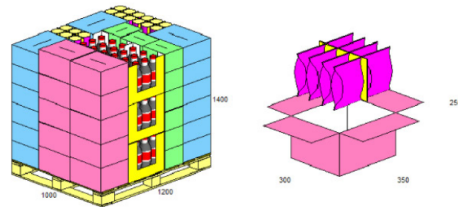
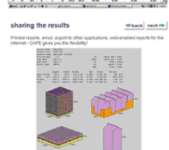
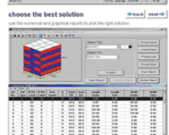


customize and share results



Product Name: Mixed products, Column stacked for display
 Product Code: Multiple views available
 Datafile Name: supermarket213 (25/03/2013)
 Load Ref.: 1 C
 Cube Used: 82.1 %
 Pallet type: 70 Packages / Load

Product	Length	Width	Height	Net	Gross	Volume
Load	1200.0	1000.0	1250.0 mm	-	318.600 Kg	1.50 m³
	1200.0	1000.0	1400.0 mm	318.600	343.600 Kg	1.68 m³





DESIGN STUDIO WORKSHOPS → Labelling design

INDICARE LA DIREZIONE

L'alfabeto arabo si presta molto alla modifica della sua struttura morfologica. Tale libertà espressiva, fondata sulla linearità dell'arabo, ma anche sulla sua possibile verticalità, permette di intervenire sulla direzione. La freccia, dunque, come elemento intrinseco al testo, una sua appendice, un suo prolungamento.

6 cm.

باب توما

Possibili forme e combinazioni delle frecce da unire al testo.

Damasco Street Signs Aprile 2006

Moschea

L'alfabeto arabo, scritto col carattere Yekan, è il punto di partenza della sintesi grafica.

Dopo avere individuato le lettere da utilizzare le ho unite e modificate per farle divenire un'icona.

Luigi Farrauto (2005), Street signs for the Damasco's medina

		RED PANTONE 485U	DRUG MODULE
		GREEN PANTONE 359U	MEDICAL DISPOSABLE
		GREEN PANTONE 340U	ICU AND WARDS, MEDICAL EQUIPMENT
		ORANGE PANTONE 151U	OPD / REGISTRATION
		GREY PANTONE 428U	LABORATORY and X-RAY RENEWABLES and EQUIPMENT
		PURPLE PANTONE 515U	ADMINISTRATION and ANCILLARY RENEWABLES and EQUIPMENT
		YELLOW PANTONE 102U	OPERATING THEATRE
		BROWN PANTONE 471U	POWER SUPPLY
		BROWN PANTONE 471U	SHELTER
		BLUE PANTONE 305U	WATER AND SANITATION
		WHITE PANTONE	STAFF QUARTERS
		ORANGE PANTONE 151U	TRIAGE AND EMERGENCY CARE
		BLUE PANTONE 268U	MCH / DELIVERY
		WHITE PANTONE RED PANTONE 485U	START-UP BOXES

ColorADD symbols (www.coloradd.net)



DESIGN STUDIO WORKSHOPS → Labelling design



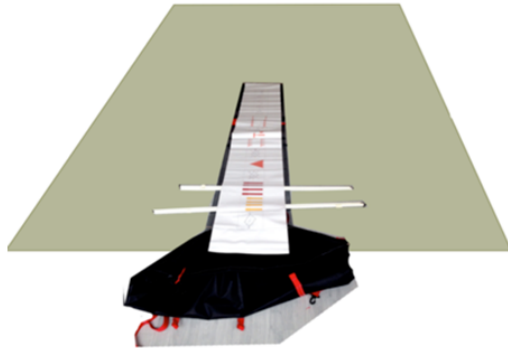
	warehouse 		warehouse 		warehouse
Item Number 1/3 	Assembled 01.08.2013 Structure Code:001-00453321	Item Number 2/3 	Assembled 01.08.2013 Cover Code:001-00453322	Item Number ALL/3 	Assembled 01.08.2013 Cover Code:001-00453322
Packing List • 20 Lorem Ipsum • 09 Lorem Ipsum • 01 Lorem Ipsum • 33 Lorem Ipsum • 10 Lorem Ipsum • 03 Lorem Ipsum	Shipping info 	Packing List • 20 Lorem Ipsum • 09 Lorem Ipsum • 01 Lorem Ipsum • 33 Lorem Ipsum • 10 Lorem Ipsum • 03 Lorem Ipsum	Shipping info 	Packing List • 20 Lorem Ipsum • 09 Lorem Ipsum • 01 Lorem Ipsum • 33 Lorem Ipsum • 10 Lorem Ipsum • 03 Lorem Ipsum	Shipping info 20 Complete Warehouse Kits on 20 EuroPallets



Field test in Senegal, 2015



DESIGN STUDIO WORKSHOPS → Instructions



INSTRUCTION FOR T1
Following the typology of the last prototype

We decide to adapt the previous template to the needs of this typology.
In the T1 we are going to have an internal part and an external one. The first one is printed on the curtain itself and will be on the roof of the structure by the end of the process. Instead the external part will be a separated strip that is used to close the packaging.
The external one will show to the user:
1) What is the object
2) How to build it
3) This external part can be removed from the user in order to have all the instructions near during the process, the structure of the object will be shown in the end because it will be the most visible part of the stripe

general infographic of the assembly	1 step	2 step	3 step	INSTRUCTIONS
-------------------------------------	--------	--------	--------	--------------

T1 - CLEVER ROOF

Short description: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat.

PEOPLE NEEDED: 1 person X5

TIME NEEDED: 10 minutes

1_T1

The TENT and the BAG are linked

4 m
1.4 m 1.2 m 1.4 m

part to bend part to bend

here we put the materials

6 m

the tent is already in the right building way

bag

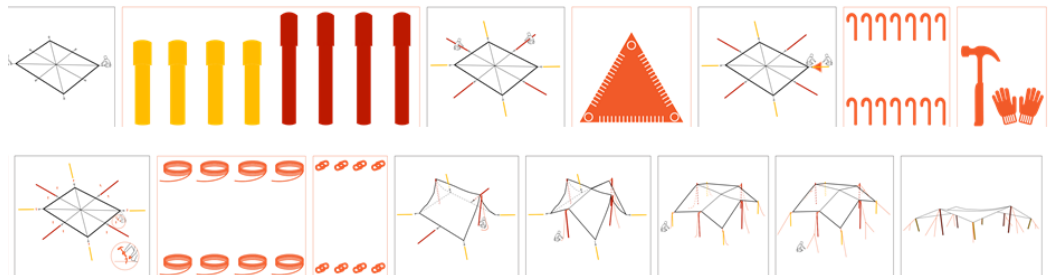
with this dimension a single person can transport the tent

1.2 m

this bag is useful to protect protect tent and materials from water infiltrations.
Once the tent is builded you can use the bag as a container

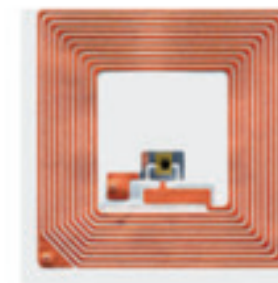
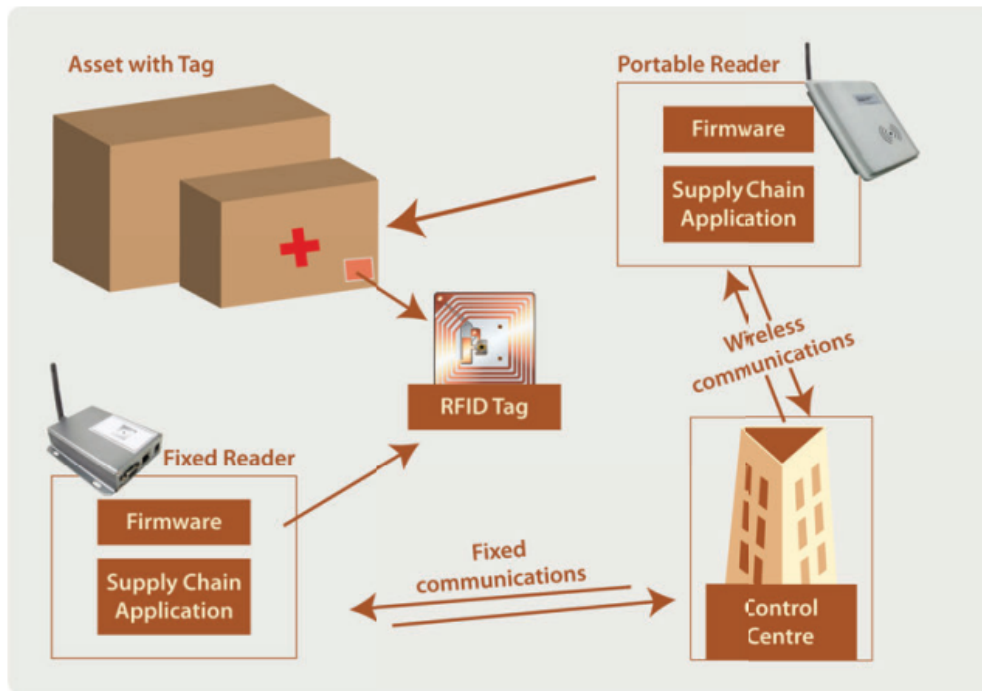
This red line is useful to the right materials disposition during the transportation show and explain in a easy way the instruction to build the tent. (materials are willing following a correct order that help during the construction step)

materials are near at the beginning of the tent to help the user to open it





DESIGN STUDIO WORKSHOPS → RFid Technology





CONCLUSION

ACHIEVEMENTS

- set up of constant properties or elements (e.g. size, weight, content);
- set up of standard capacity transport (e.g. euro-container and, as sub-systems, euro-pallet and bag);
- set up of a widely accepted phasing method, according to the different phasing methodologies in use by humanitarian organizations;
- drafting of standard guidelines for the packaging of the emergency kits;
- drafting of a framework for instructions and assembly manuals in order to harmonize and simplify the process to different users.

OUTCOMES

- 1 PCT Patent
- 1 Commercial agreement with manufacturers and NGOs
- 12 Tents tested and used in a refugee camp in Senegal
- Publications in Scientific journals and Conference Proceedings
- Mentioned in Stories of Cooperation at POLIMI 2011-2016



THANK YOU FOR THE ATTENTION

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