20 FEBRUARY 2020
10:30 AM -12 PM CET

WEBINAR:
ENERGY EFFICIENCY AND DESIGNING FOR SUSTAINABILITY IN HUMANITARIAN RESPONSE

Webinar Series: Sustainable Energy in Humanitarian Settings

PAST WEBINARS

- Jun 2019: State of Play: Sustainable Energy in Humanitarian Settings
- Sep 2019: Sustainable Energy for Essential Humanitarian Services: Outline of Energy Solutions and a Case Study on Solar Pumping
- Nov 2019: Sustainable Energy for Powering Household and Community Lighting Needs in Humanitarian Settings
- Dec 2019: Sustainable Energy for Household Cooking Needs in Humanitarian Settings
- Jan 2020: Powering Humanitarian Facilities: Dialogue on Implementation Models

Stay tuned for our upcoming webinars!

Tell us about you!

- Poll -

- Agenda-

Presenter

PAVLOS TAMVAKIS, ICRC

Pavlos is the Head of Construction of the ICRC Water and Habitat Unit at Geneva HQ, leading large-scale health and other related infrastructure projects in countries affected by armed conflict and natural disasters. He studied Architecture Engineering at Cardiff University of Wales and Civil Engineering at Aristotle University of Thessaloniki. He holds a MSc in Environmental Sustainability & Environment, MSC in Construction Project Management and a Specialization in Assessment and Management of Geological and Climate – related risks.

ICRC

“The organization strives to position itself as a pioneer among those humanitarian organizations which are sincerely committed to meeting their social, economic and environmental responsibilities”

“Framework for Sustainable Development at ICRC” approved by Directorate on September 2011.

ICRC

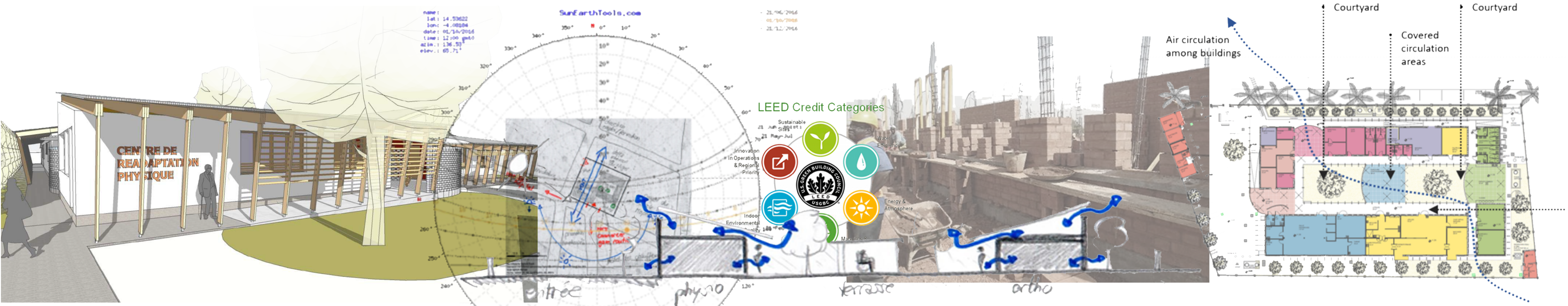
ICRC Water & Habitat Construction office

TOWARDS A SUSTAINABLE CONSTRUCTION PRACTICE

WHAT ARE WE DOING?

Bioclimatic Architecture & Sustainable Construction Principles

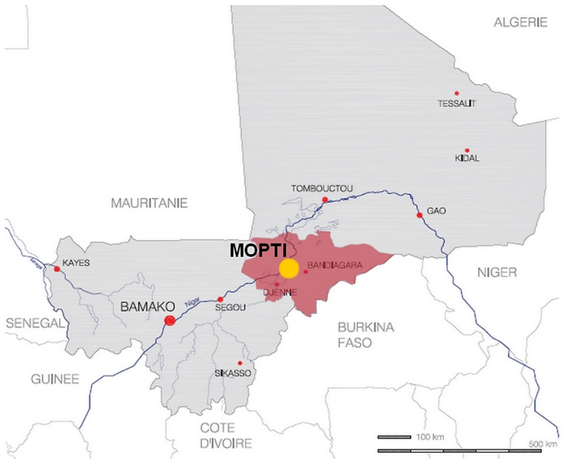
- A design approach that takes into consideration the regional climate conditions
- Introducing passive design strategies to reduce the building energy demands needed to achieve thermal comfort, which leads to long term energy savings
- Using the available local resources (materials and labour) and local construction techniques to ensure a feasible local maintenance and reduce the environmental impact of material transportation



ICRC

PHYSICAL REHABILITATION CENTRE IN MOPTI, MALI

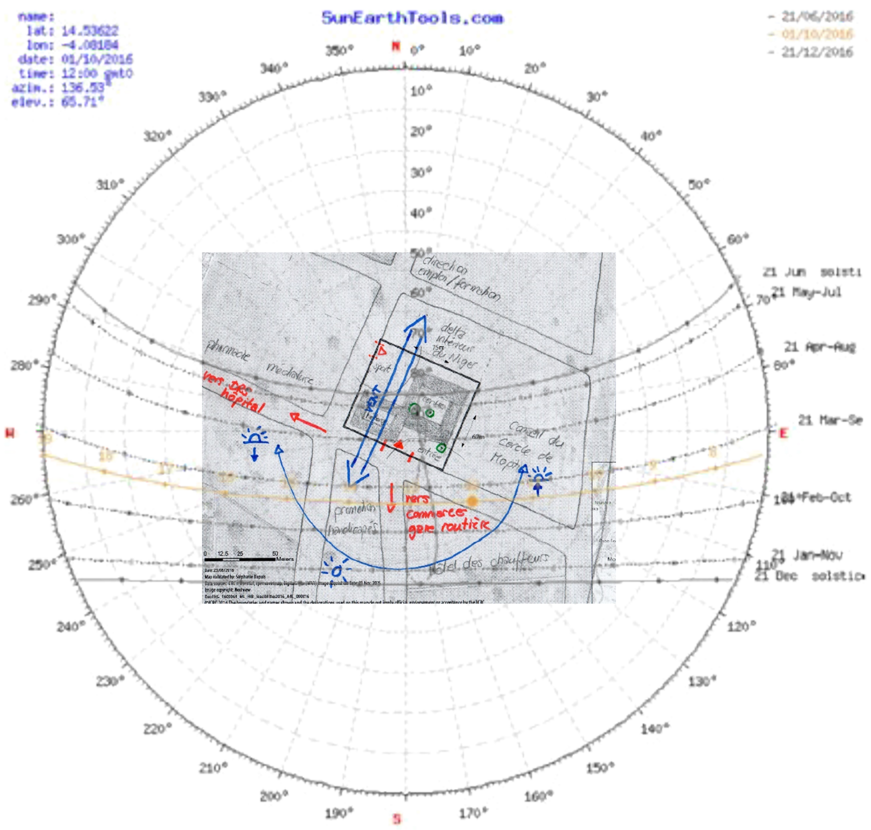
OPTIMISING THE PASSIVE COOLING OF SPACES TO REDUCE THE NEED FOR AIR CONDITIONING



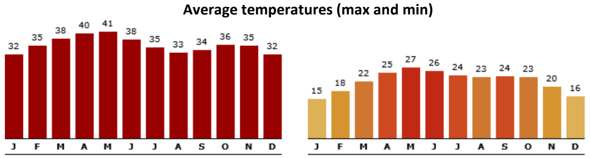
ICRC

FROM THE CLIMATE AND ENVIRONMENTAL DATA

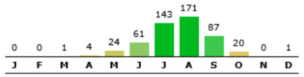
Semi-arid climate: Dry climate + well-defined rainy season
Temperature shift between day/night: 9-17°C



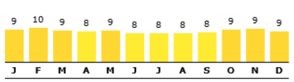
Average temperatures (max and min)



Monthly Rainfall (mm)



Hours of Sunshine



Sources: www.worldclimateguide.co.uk

TO THE ARCHITECTURAL CONCEPT

Optimizing **passive cooling**

Reduced need for A/C

Reduced **operating costs**

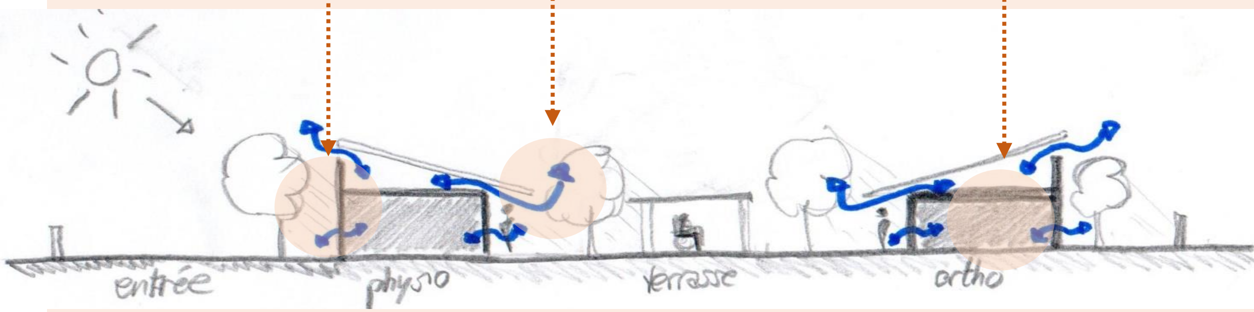
Long term **energy saving**

HOW TO REACH THERMAL COMFORT WITH LIMITED ENERGY INPUTS FOR COOLING:

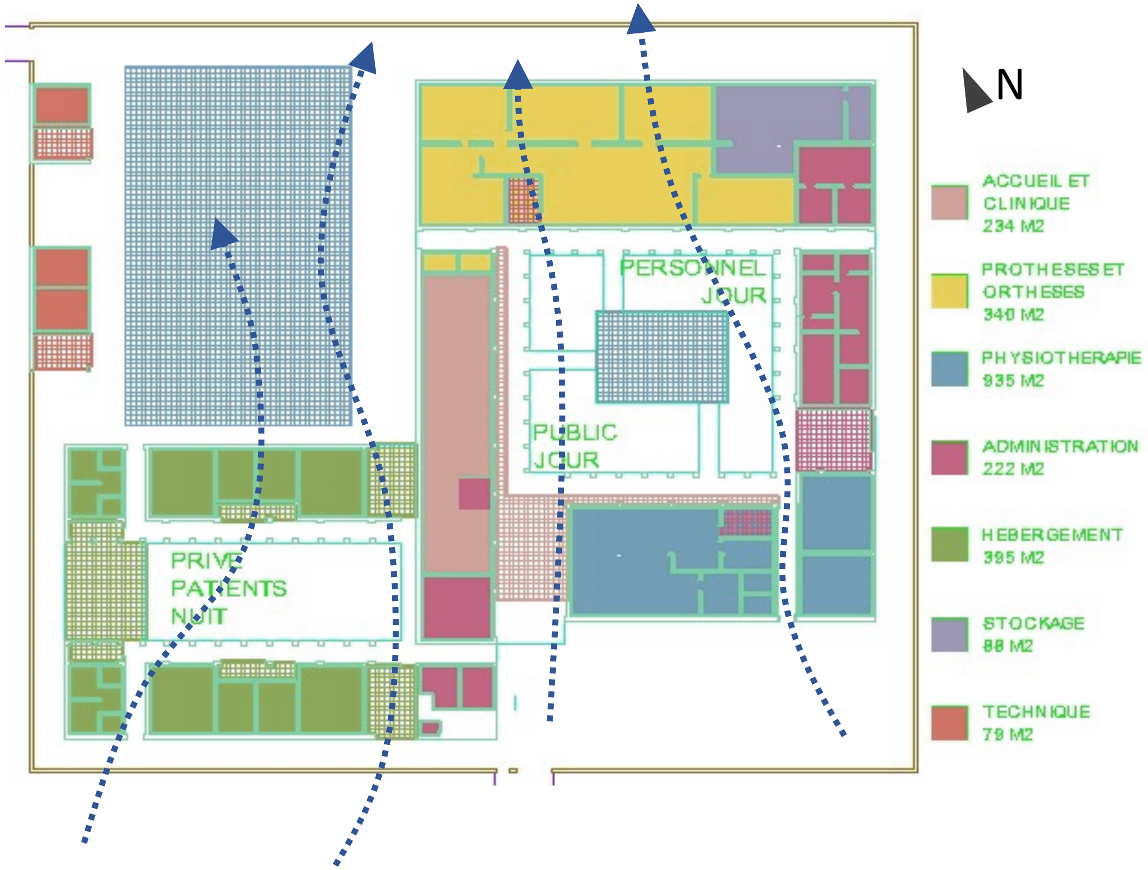
A. Protection of the enclosures from sun radiation

B. Maximize natural ventilation

C. High thermal inertia



ICRC



SPATIAL ORGANISATION

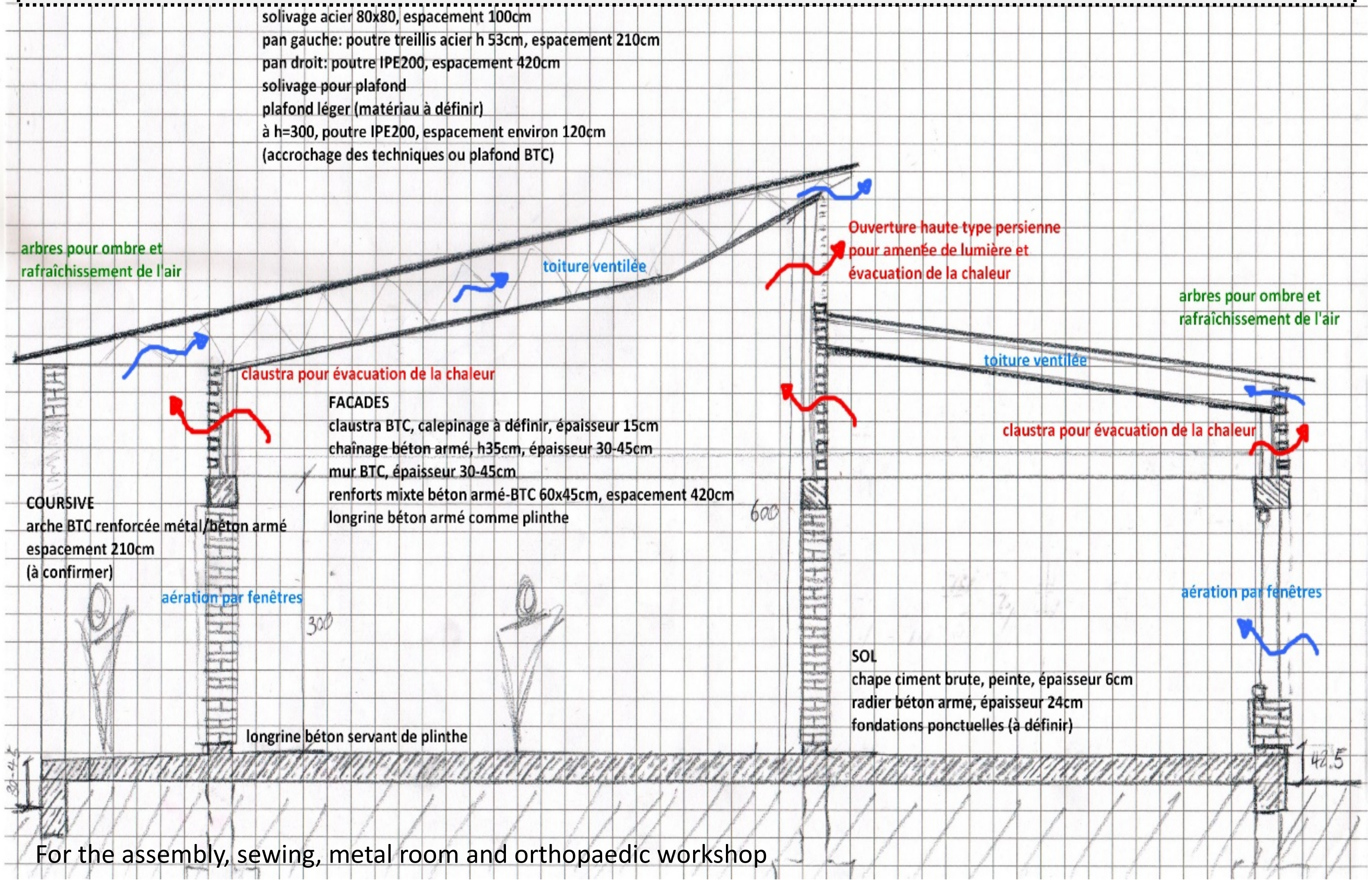
How natural ventilation and cooling down of spaces is optimized (I)

- Layout around courtyards
- Circulation by pathways protected from the sun
- Covered exterior spaces
- Openings towards the prevailing winds (NE, SW)
- Plantation of 74 trees and shrubs
- Laid of green covers in the courtyards

SECTION CONCEPT

How natural ventilation and cooling down of spaces is optimized (II)

EXPECTED **9-10°C DIFFERENCE** WITH OUTSIDE TEMPERATURE



For the assembly, sewing, metal room and orthopaedic workshop

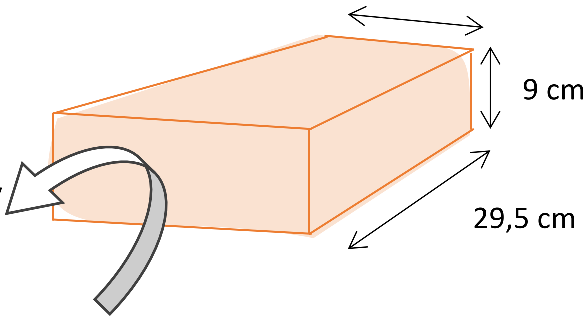
MATERIALS

- Stabilised Soil Bricks – walls and ceilings
- Bamboo – external roofs
- Reed mats – interior ceiling finishes

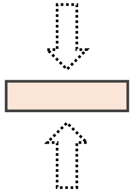
WHY STABILISED SOIL BRICKS?

Natural regulation of the atmosphere:

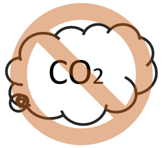
- Moisture absorption or release
- Constant Relative Humidity = 50% aprox, preventing the fungus
- High thermal inertia



- Cement: 5-10%
- No plaster



Compressive strength (+60Kg/cm2)

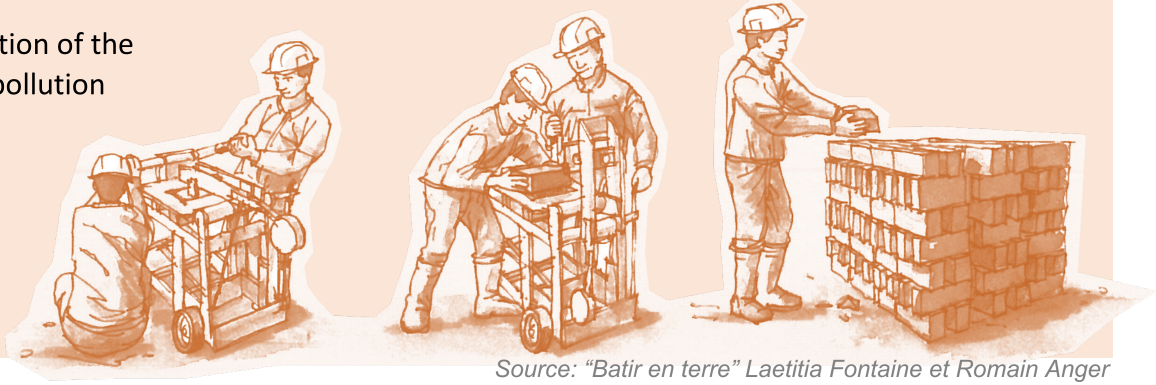


Less CO2 emissions: the production uses 1% of energy compared to fired bricks

Non harmful disposal of waste

No need for transportation of the bricks = saved energy/pollution

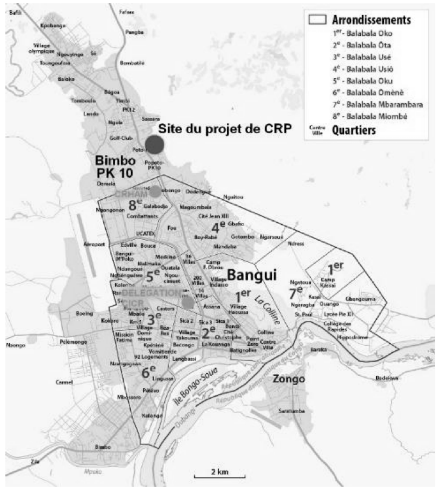
On-site production
+
Local material
+
Local skills



Source: "Batir en terre" Laetitia Fontaine et Romain Anger

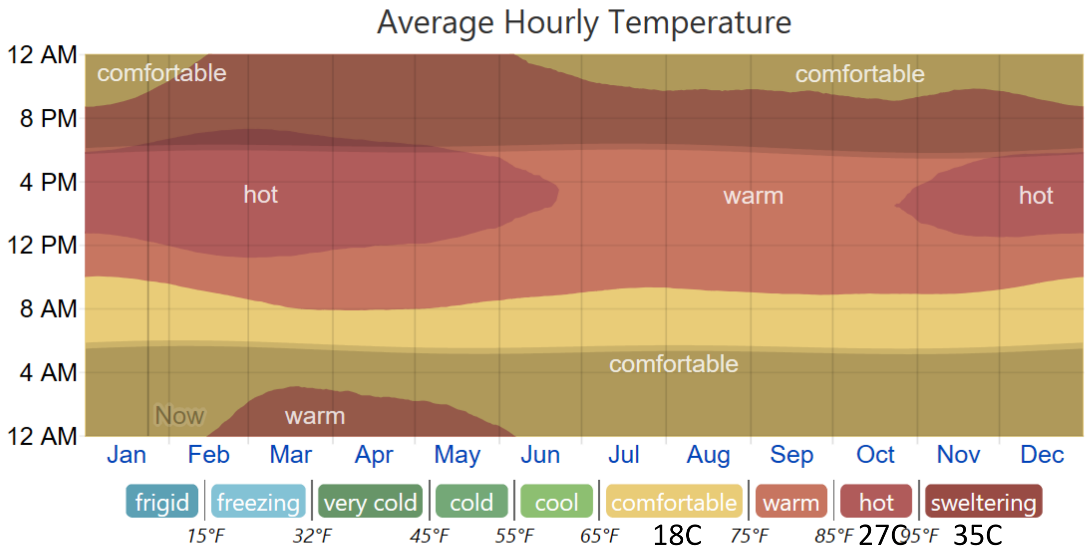
PHYSICAL REHABILITATION CENTRE IN BANGUI, CAR

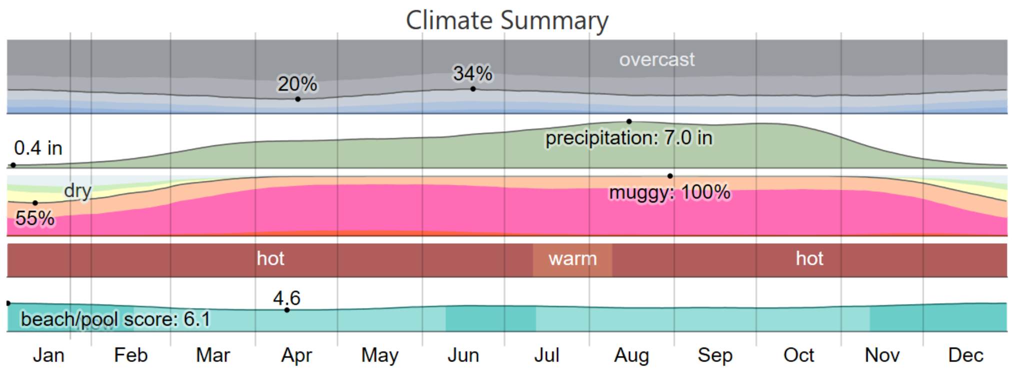
ENERGY AND WATER EFFICIENCY THROUGH BIOCLIMATIC ARCHITECTURE AND SUSTAINABLE CONSTRUCTION



ICRC

FROM THE CLIMATE AND ENVIRONMENTAL DATA TO THE ARCHITECTURAL CONCEPT





- Very high temperatures most of the year (specially between 12pm and 5pm)

- Good potential for rain water harvesting

Use of low-tech passive cooling solutions to avoid A/C and reduce the electricity demand

1. Natural air circulation (stack effect)

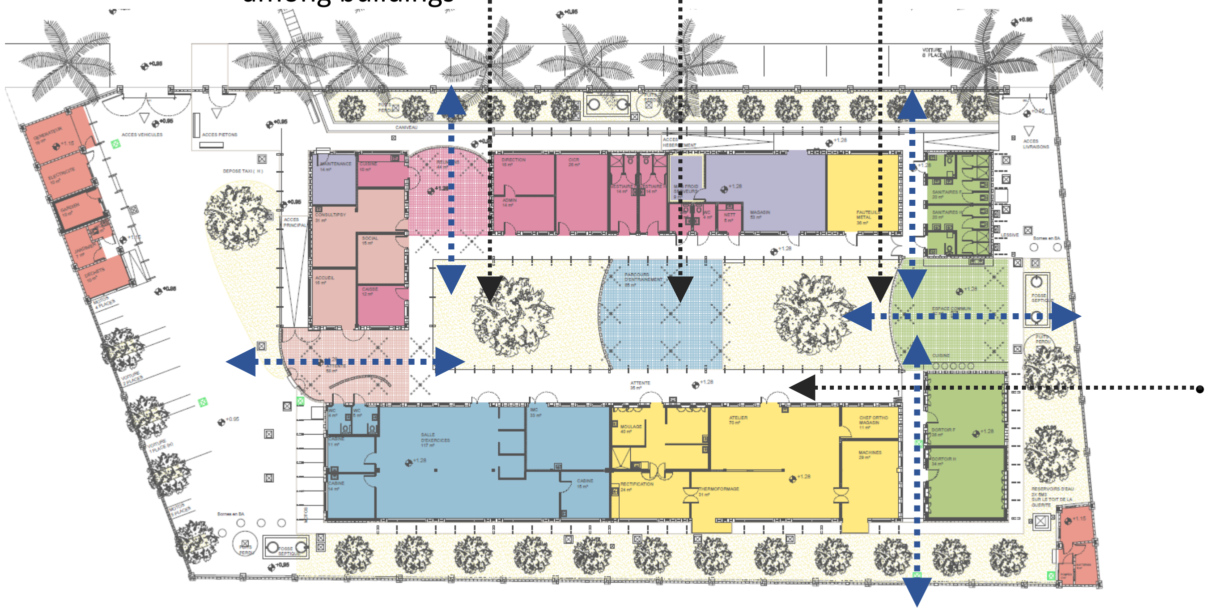
2. Regulation of solar gains through shading

3. Dephasing of temperatures through the use of SSB

Source: www.weatherspark.com

ICRC

PROJECT OVERVIEW, PROTECTION OF FAçADES TO DIRECT SUN RADIATION



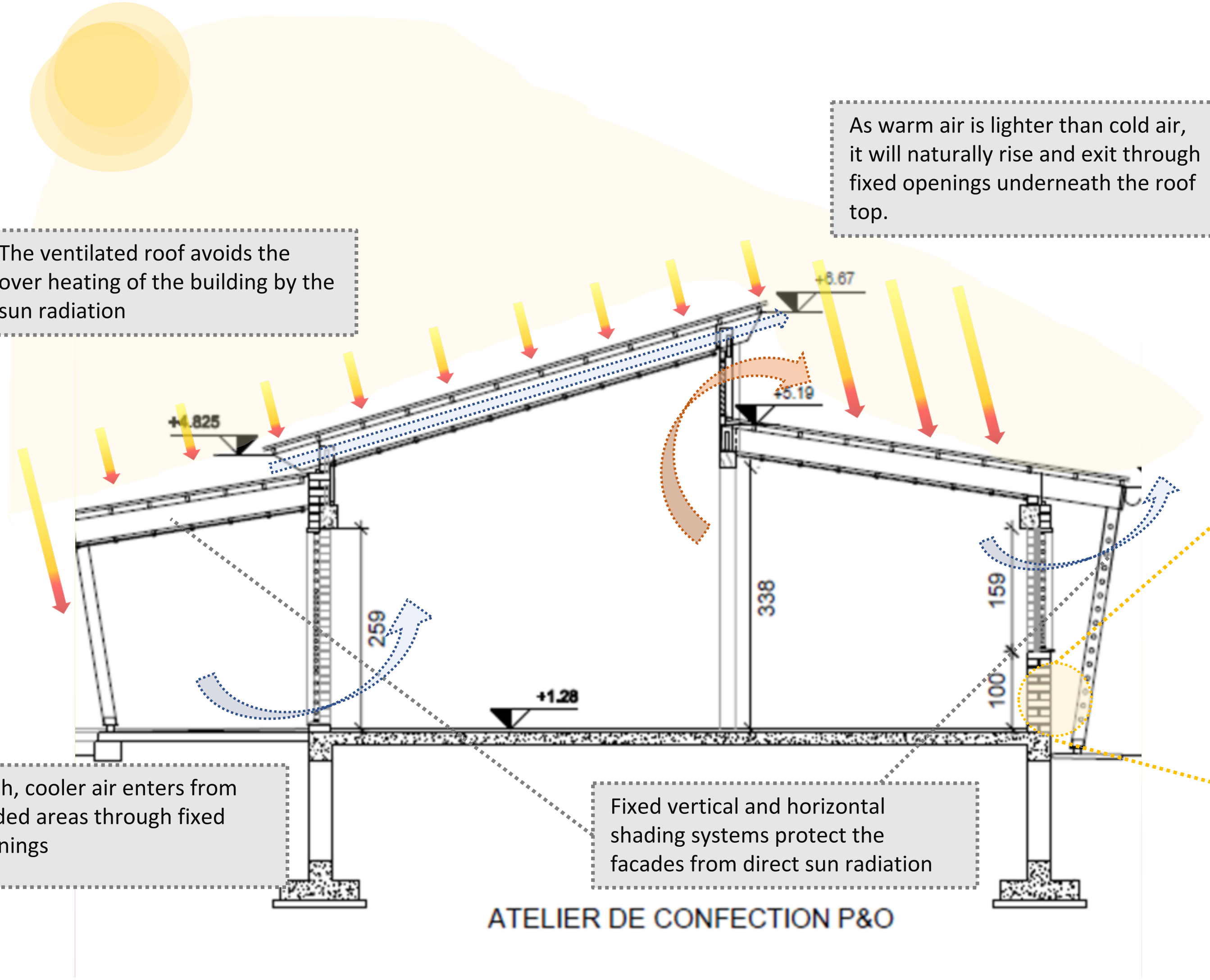
- 5 main buildings
- 4 exterior covered areas
- 2000 m2

N

ICRC

NATURAL AIR CIRCULATION AND SHADING

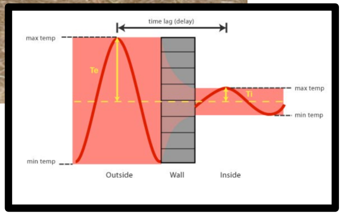
Use of low-tech passive cooling solutions to avoid A/C and reduce the electricity demand (I)



DEPHASING OF TEMPERATURES THROUGH SSB

Use of low-tech passive cooling solutions to avoid A/C and reduce the electricity demand (II)

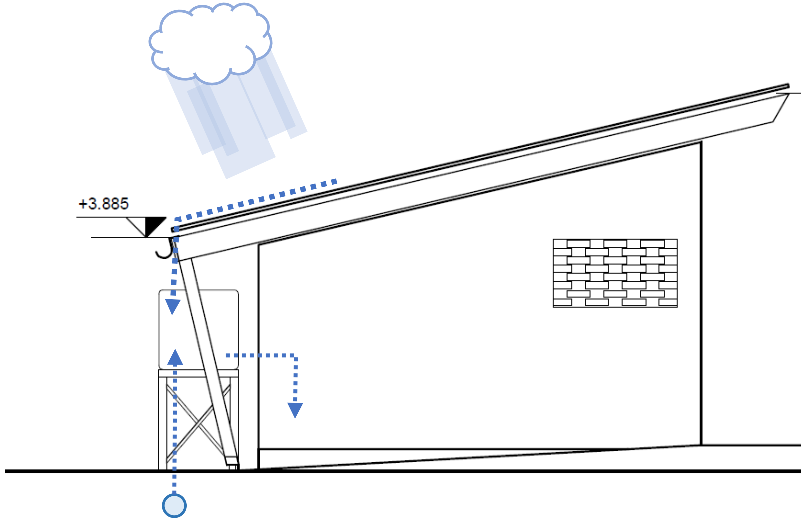
wall type	U value	internal temperature	time lag	temperature amplitude damping
cement block	2,928	23,8	3,5	1,3
simple SSB	2,655	23,5	5,7	2,1
double cement block	2,036	22,6	7,5	3,5
SSB + cement block	1,889	22,5	9,2	6
double SSB	**1,78**	**22,3**	**11**	**8,5**



RAIN WATER COLLECTION AND USE

SMALL AUTONOMOUS TANKS FOR SANITARY BLOCKS

- Automonous tanks are primarily filled by rainwater
- During dry season, urban water network / elevated tank water feeds the tanks
- Water storage for 83 WC flushes

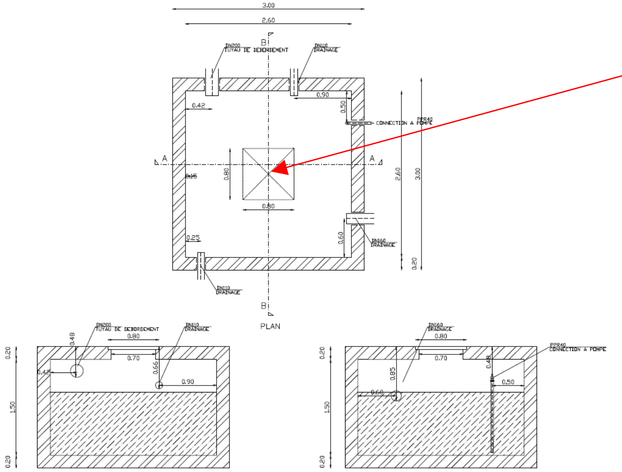


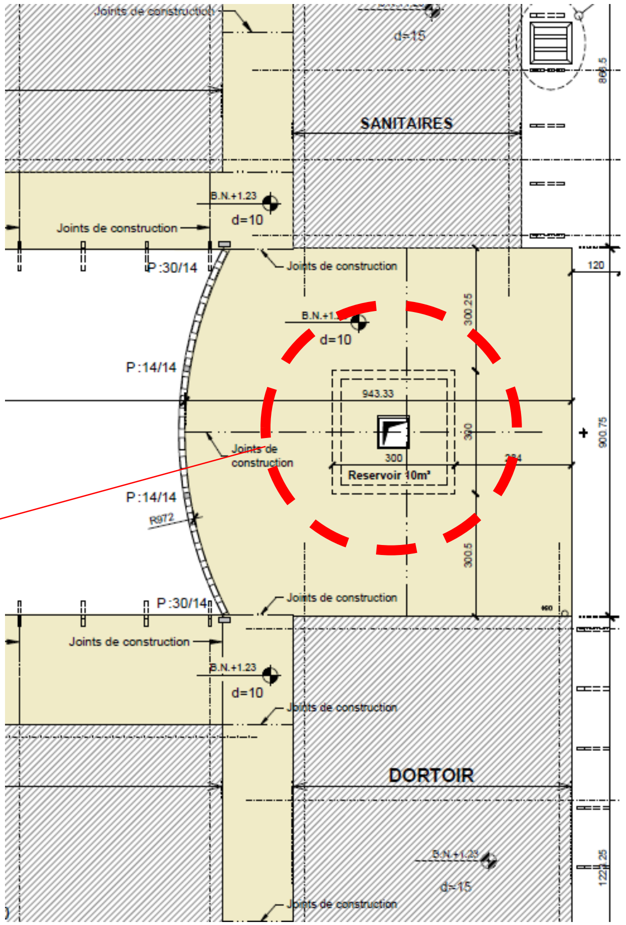
SANITAIRES

10m³ RAIN WATER COLLECTING TANK UNDER THE TERRACE

- Increase of autonomy during rainy seasons.
- Reduce the need for water trucking

10 m3 tank





ICRC

NEW ICRC NAIROBI REGIONAL DELEGATION

AN HOLISTIC APPROACH TO SUSTAINABLE DESIGN TO
- *REDUCE OPERATIONAL AND MAINTENANCE COSTS*
- *REDUCE THE DELEGATION CARBON FOOTPRINT*

ICRC

SUSTAINABILITY STRATEGIES

AN INTEGRATED PROCESS TO ACHIEVE **SYNERGIES** ACROSS DISCIPLINES

- LEED Certification
- Site Management
- Water Use Efficiency and Water Treatment
- Energy Use Efficiency
- Natural Ventilation
- Influencing user behaviour
- Sustainable Building Fittings

ICRC

SITE MANAGEMENT

Ground Water Recharge

- Percolation of water back into the ground by a pond and soak pits
- Soak-pits will be located on the lowest part of the site

Preservation of the site: tree management

- A initial study carried out to preserve as many as possible
- 450 trees on site originally
- 150 trees will be cut (old, dead, risk of falling, construction

Storage and recycling during construction

- Recycling of old materials
- Proper storage of materials on site

Close to transit services

- The site was chosen after several drive tests with public and private transport

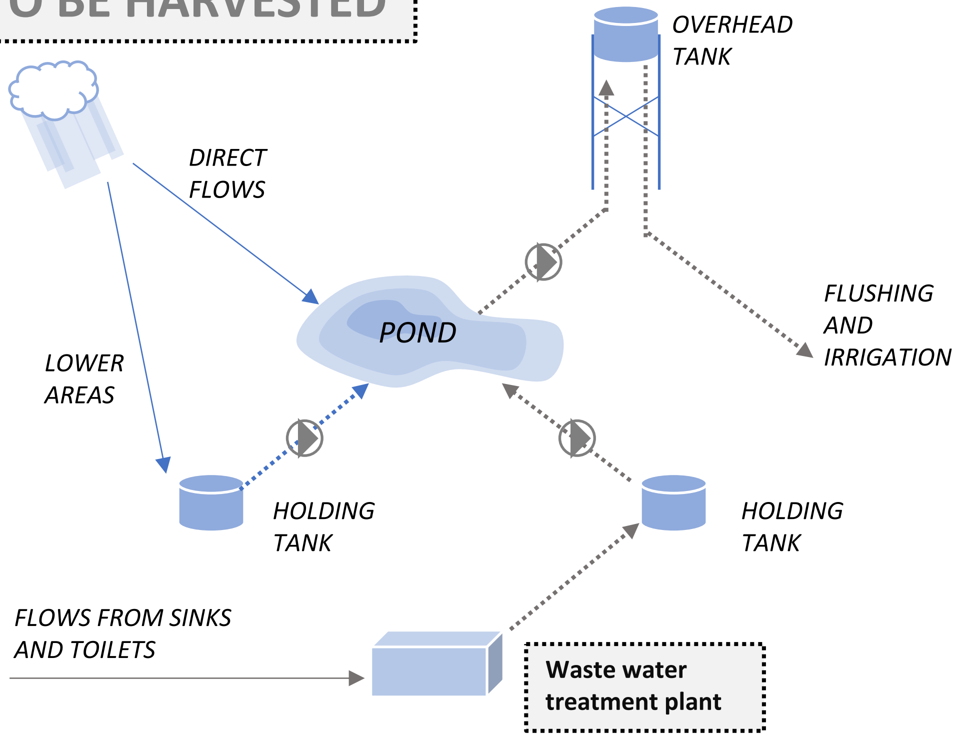
TREE PLAN: **300/450 TREES** WILL BE PRESERVED

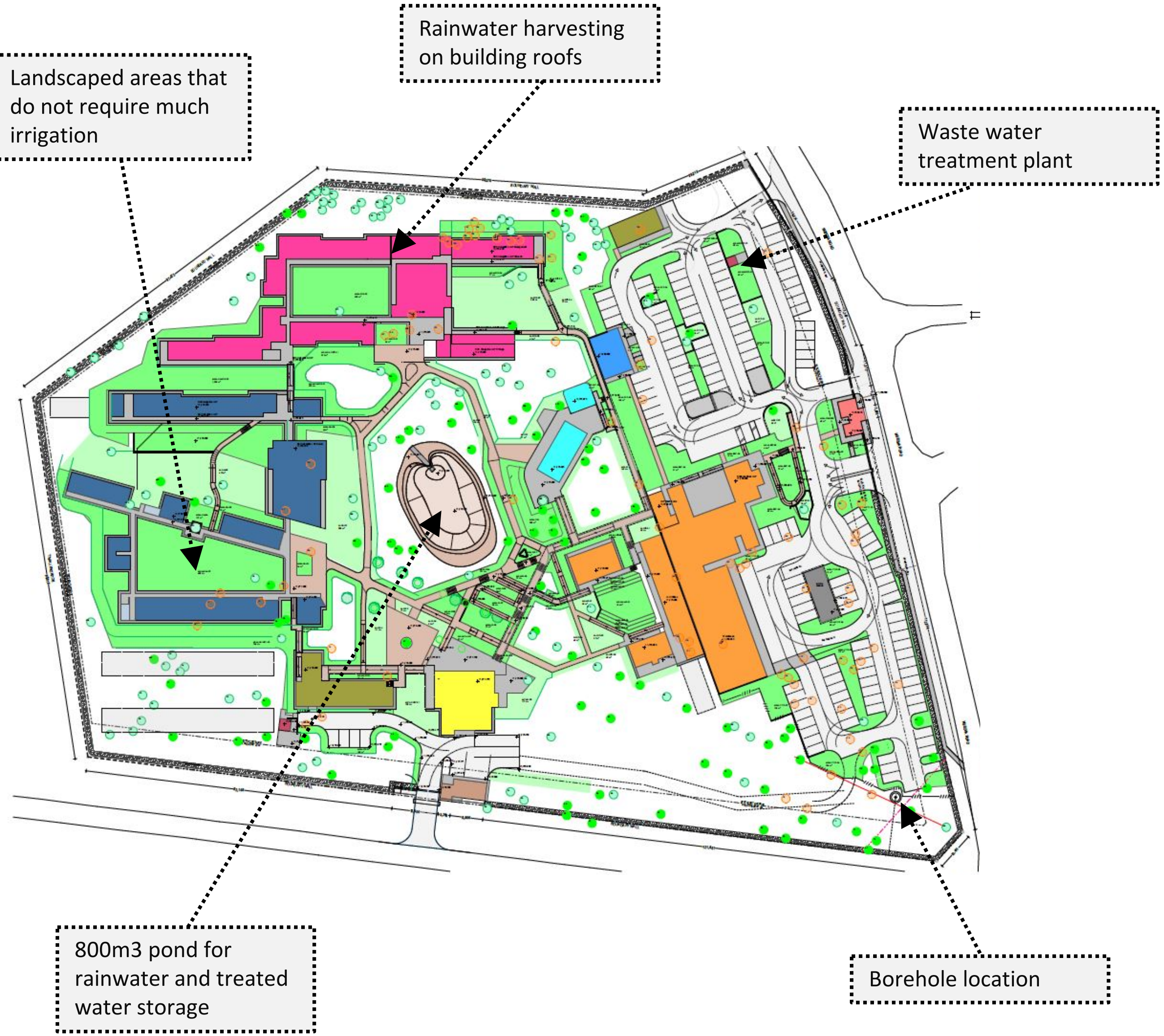
Location of soak-pits in the lowest part of the site

ICRC

WATER USE EFFICIENCY AND WATER TREATMENT

95% OF RAINFALL TO BE HARVESTED





Borehole

- Tapping into a natural water source supplements main water

Water efficient fittings

- Water saving taps and flush toilets

ICRC

ENERGY USE EFFICIENCY

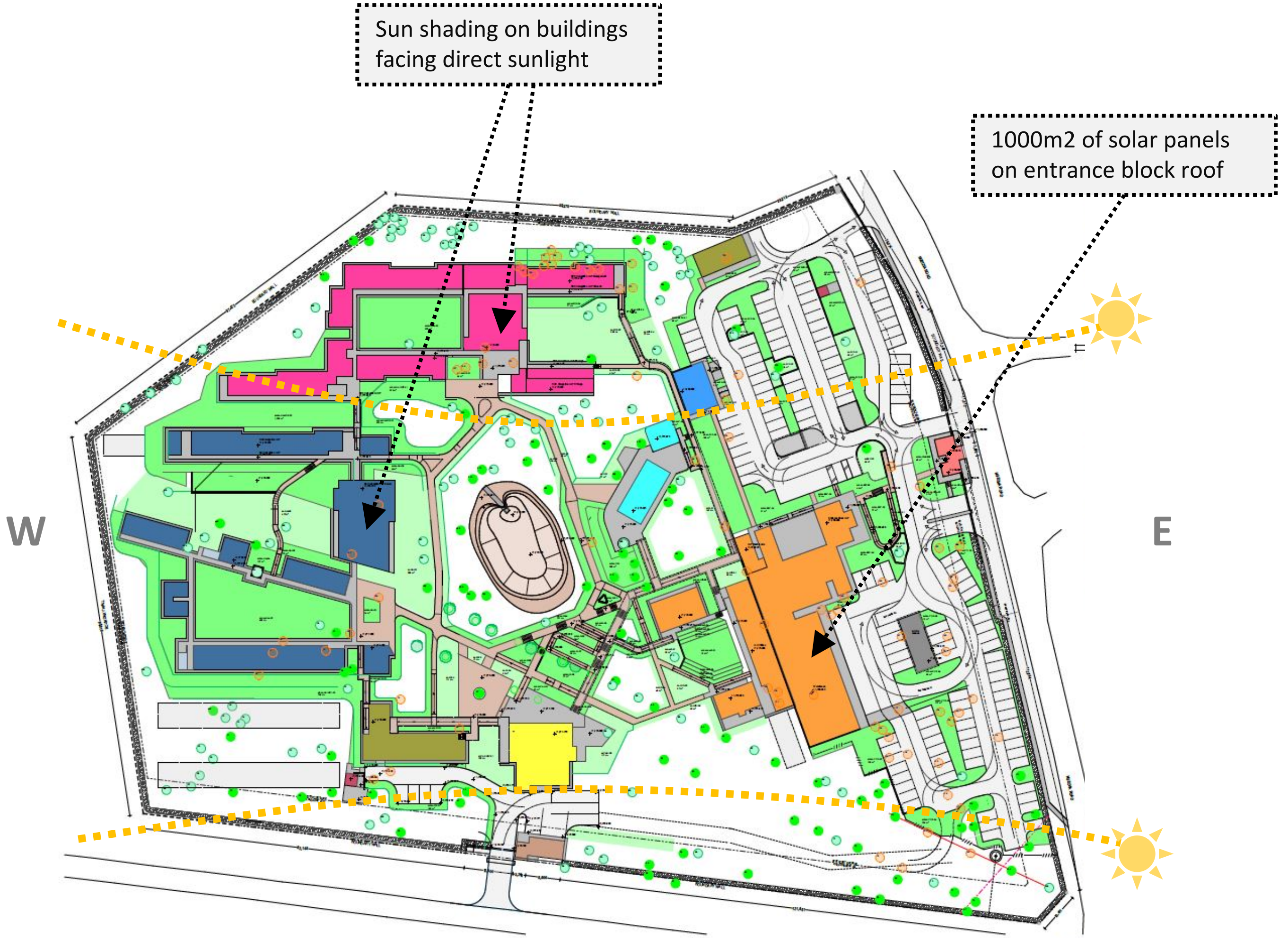
Solar PV for 120kW:
- 20% to 24% energy savings

Indoor daylight quality:
- Reduced need for artificial lighting

Heat island reduction
- Reflective materials and paints on the roofs and walls

Energy efficient fittings:
- LED lamps: overall LPD max. 0,8 watts/sqft
- Daylighting sensors for all lighting within 15 ft of windows
- Occupancy sensors

Passive measures for indoor temperature quality
- Cold seasons: avoid the heat scape.
    - Stone walls retain indoor heat and insulate against outside cold.
    - Thermal windows.
- Hot seasons:
    - E-W orientation reduces area exposed to direct sunlight
    - Sun-shading

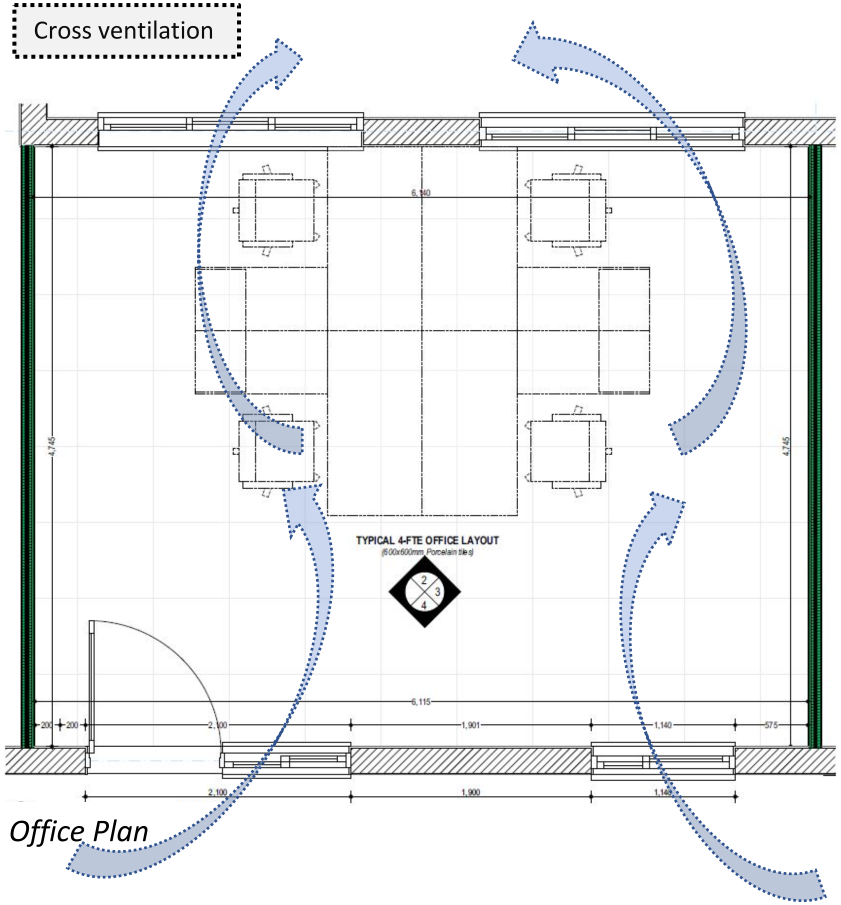


ENERGY SAVINGS OF THE DESIGN VS. BASELINE CASE = 38,25%

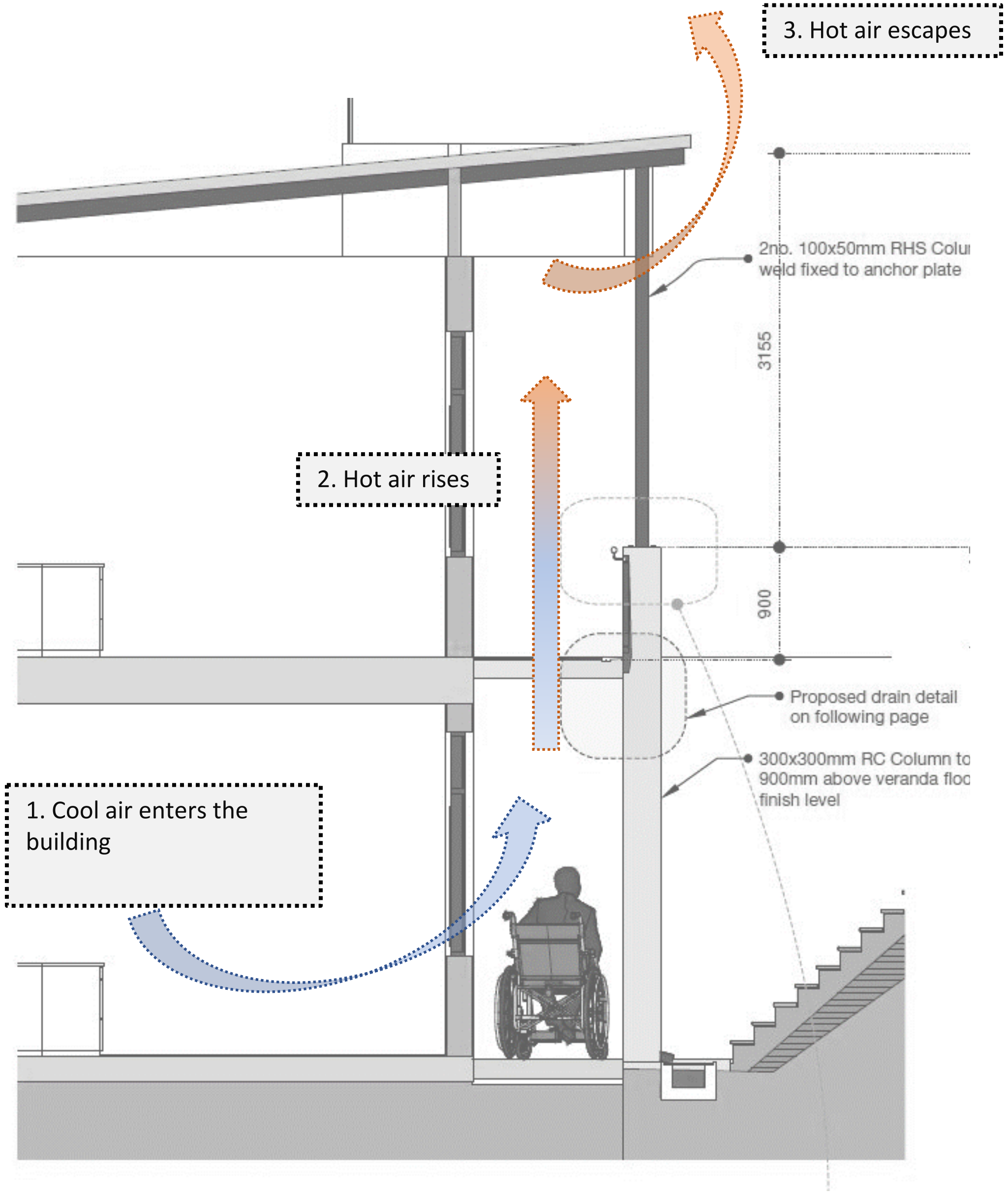
ICRC

NATURAL VENTILATION

- All offices have been designed to have cross ventilation
- Use of openings at the top and bottom of buildings to create a stack effect



Office Plan



Building Section – Stack Effect

ICRC

INFLUENCING THE USER BEHAVIOUR

- Encourage car sharing and electric vehicles to reduce carbon emissions.

SUSTAINABLE BUILDING FITTINGS

- Water saving taps
- Energy saving bulbs
- Carbon Dioxide Sensors
- Reflective Glass for windows
- Locally available construction materials

BUILDING MONITORING SYSTEM

- Meters for water and power

THANK YOU!

CREDITS TO ALL WATHAB TEAMS AND CONSULTANTS INVOLVED IN THE DEVELOPMENT OF THESE PROJECTS

ICRC

Presenter

LAMA GHARAIBEH, NORWEGIAN REFUGEE COUNCIL (NRC), JORDAN

Lama Gharaibeh works on supporting the Syrian Refugee Crisis in Jordan under the Renewable Energy and Energy Efficiency programs, developing solutions to refugees and host communities by linking the energy aspects on the multi programs activities in Shelter, Education, Youth and livelihood, and advocating for the humanitarian sector to take a role in adapting energy response in the programs and operations. Currently Lama is the Renewable Energy Technical Officer in NRC Jordan Office and Chair of Greening the Orange Task Force.

NRC Jordan Energy Responce

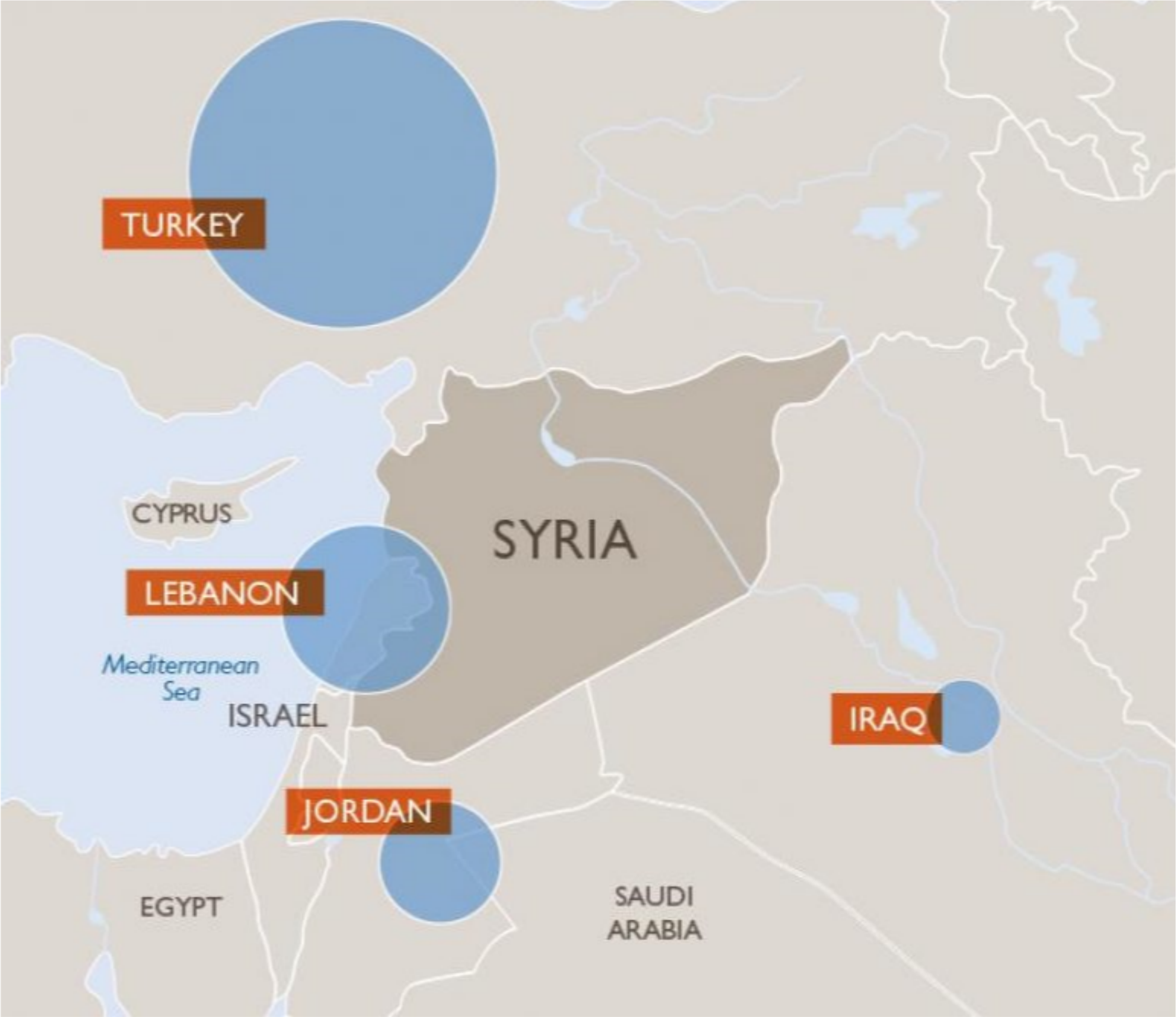
February 2020

NORWEGIAN
REFUGEE COUNCIL

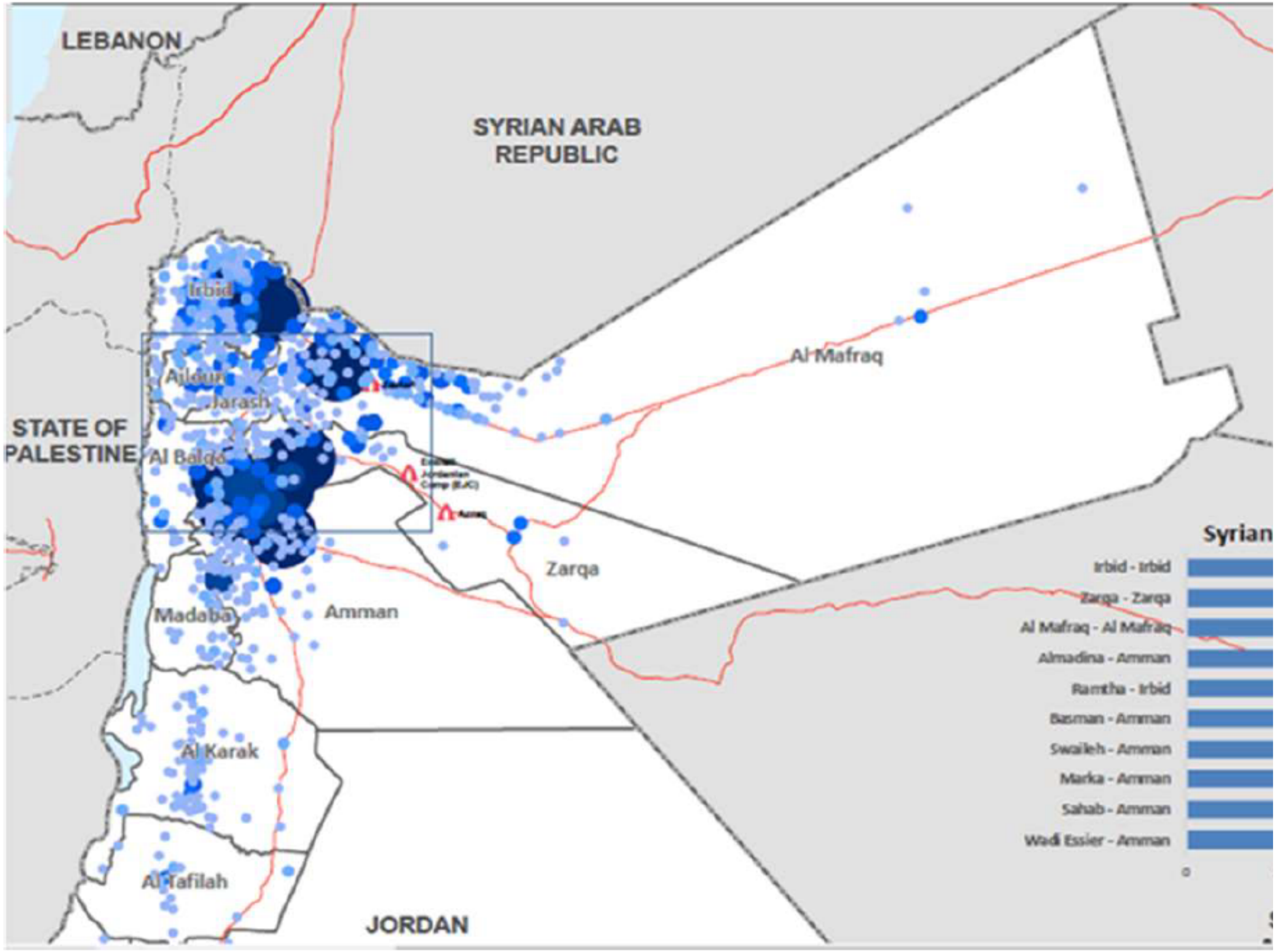
The Norwegian Refugee Council is an independent humanitarian organisation helping people forced to flee.

Syrian Refugee Influx in Jordan

- Around **650,000 refugees** were registered and reside in Jordan.
- The majority are coming from the Southern Areas of Syria (Dara'a).
- **80%** of refugees reside outside of camps, in **rural and urban areas**.
- With two third living in urban centers, mostly in **the northern governorates** and Amman (capital).

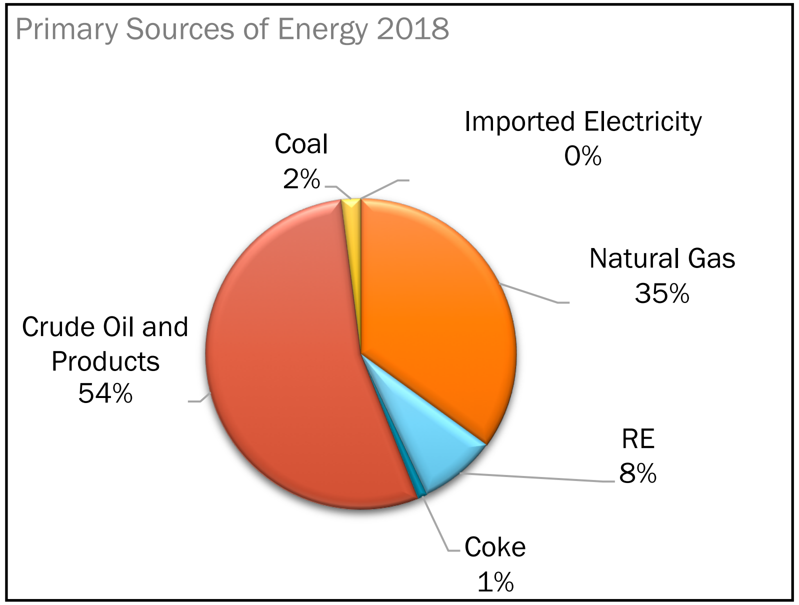


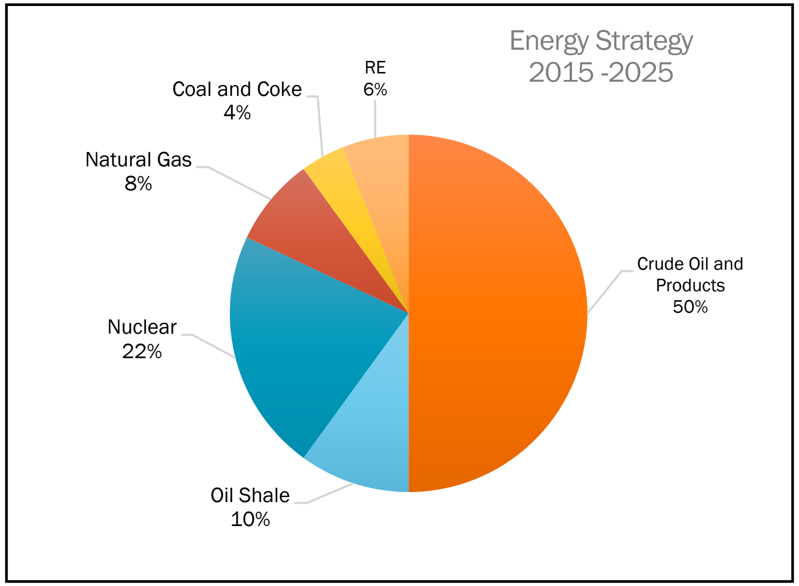
- Registered refugees have access to **public services as health and Education** in host communities.
- Impact on host communities much more difficult to **quantify and understand.**
- Spread-out population makes outreach **extremely challenging** and put **extra pressure** on the existed infrastructure;
- **Existing public infrastructure** not designed to cope with the sudden increase in population.



Energy Situation in Jordan

- **99.9%** of Jordan is connected to the national electricity grid.
- The country **imports 92%** of its Energy requirements in 2018 compared 94% to the year before.
- Jordan has a very progressive strategy to promote **Renewable Energy** and **Energy Efficiency**.
- Heavily **subsidized** sector reaching **80%** for low-income households energy bill.





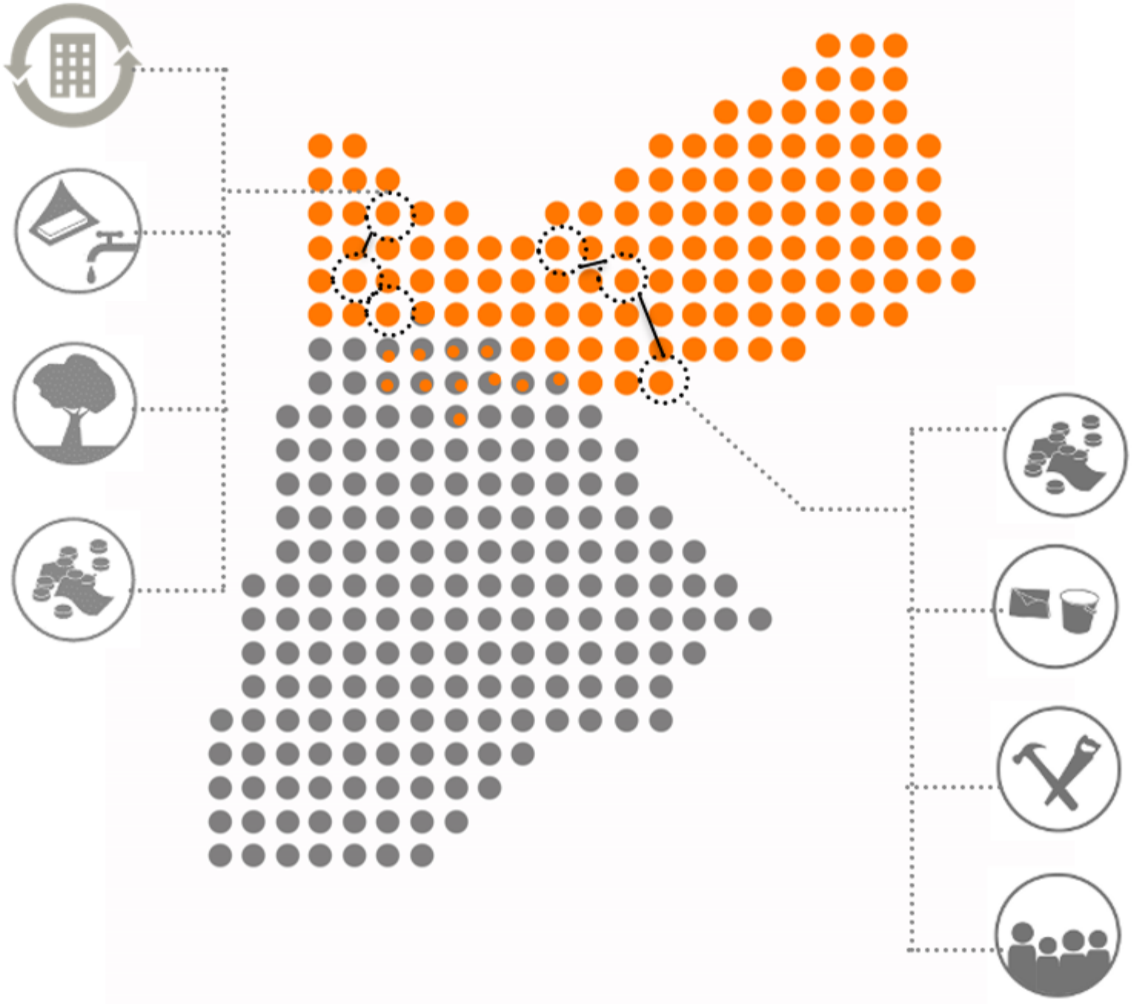
NRC Response to the Syrian Crisis in Jordan

Flexible housing assistance/ Flex Model

WASH upgrades and water connection

Renewable energy/ RE4R

Emergency shelter assistance /C4R



Cash distribution

Non Food Items distribution (NFIs)/ limited

Maintenance & shelter repair

Cash for Work/ IBV Program

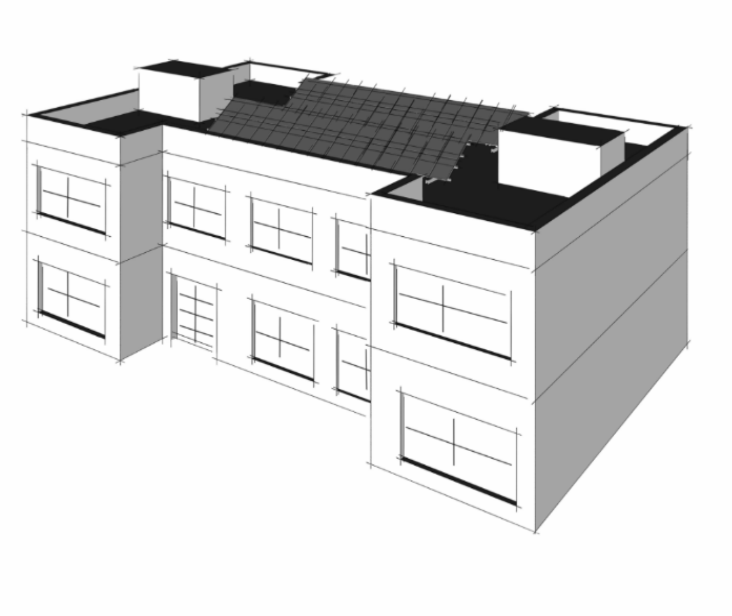
URBAN/HOST

CAMPS

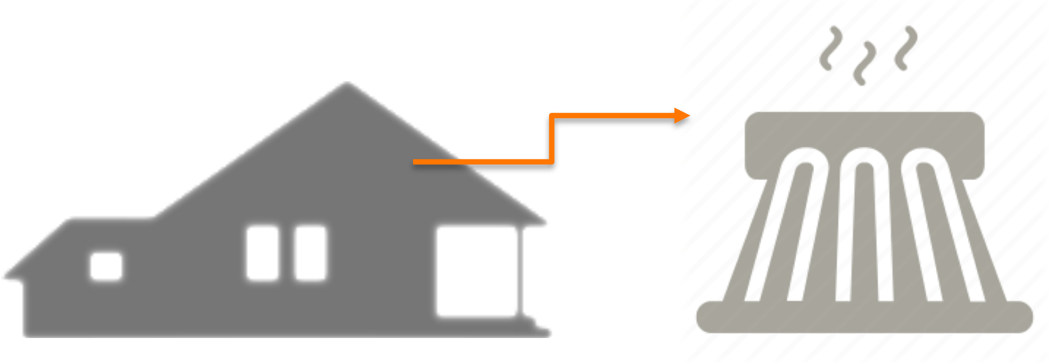
NRC Energy Response in Urban Contexts in Jordan

- NRC Jordan **piloted an Energy project** in 2015, funded by the EU.
- Only covered **Education** and **Shelter** with Access to clean energy only.

Delivered Energy

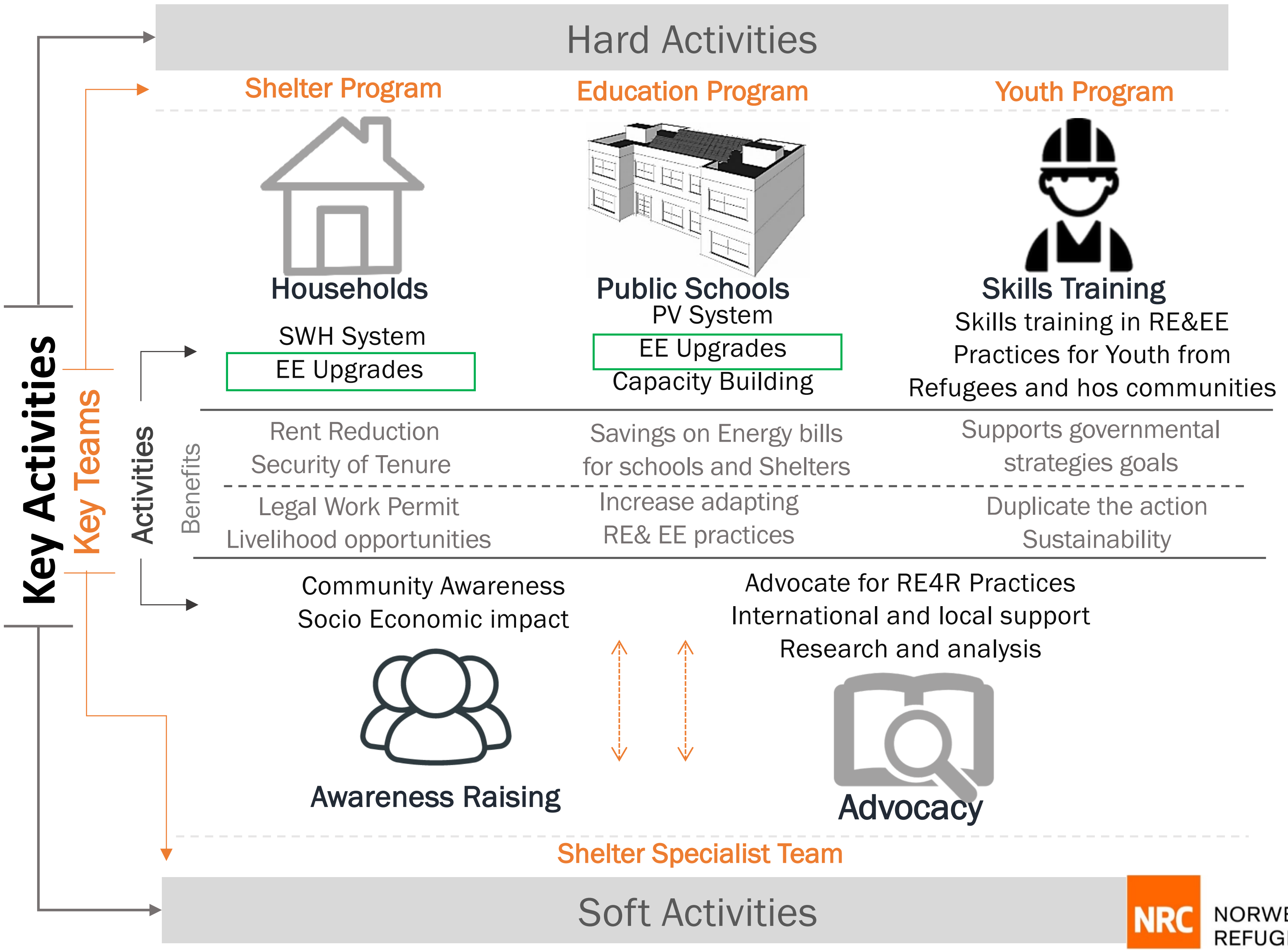


- Install PV system to 23 public schools.
- Covered (70-90)% of electricity monthly demand.
- Awareness raising sessions to students.



- Install Solar Water Heating (SWH) system to 160 Shelters.
- Rent reduction negotiation, signing 12 months lease agreement.
- Handover to the Landlord.
- Savings on energy bill – 30%.

NRC - Energy Response in Host Communities
RE4R – Jordan



Enhance adaptation of Energy Efficiency methods to Shelters and Public schools

Adapting the **one room approach**; targeting the space mostly common used by the family

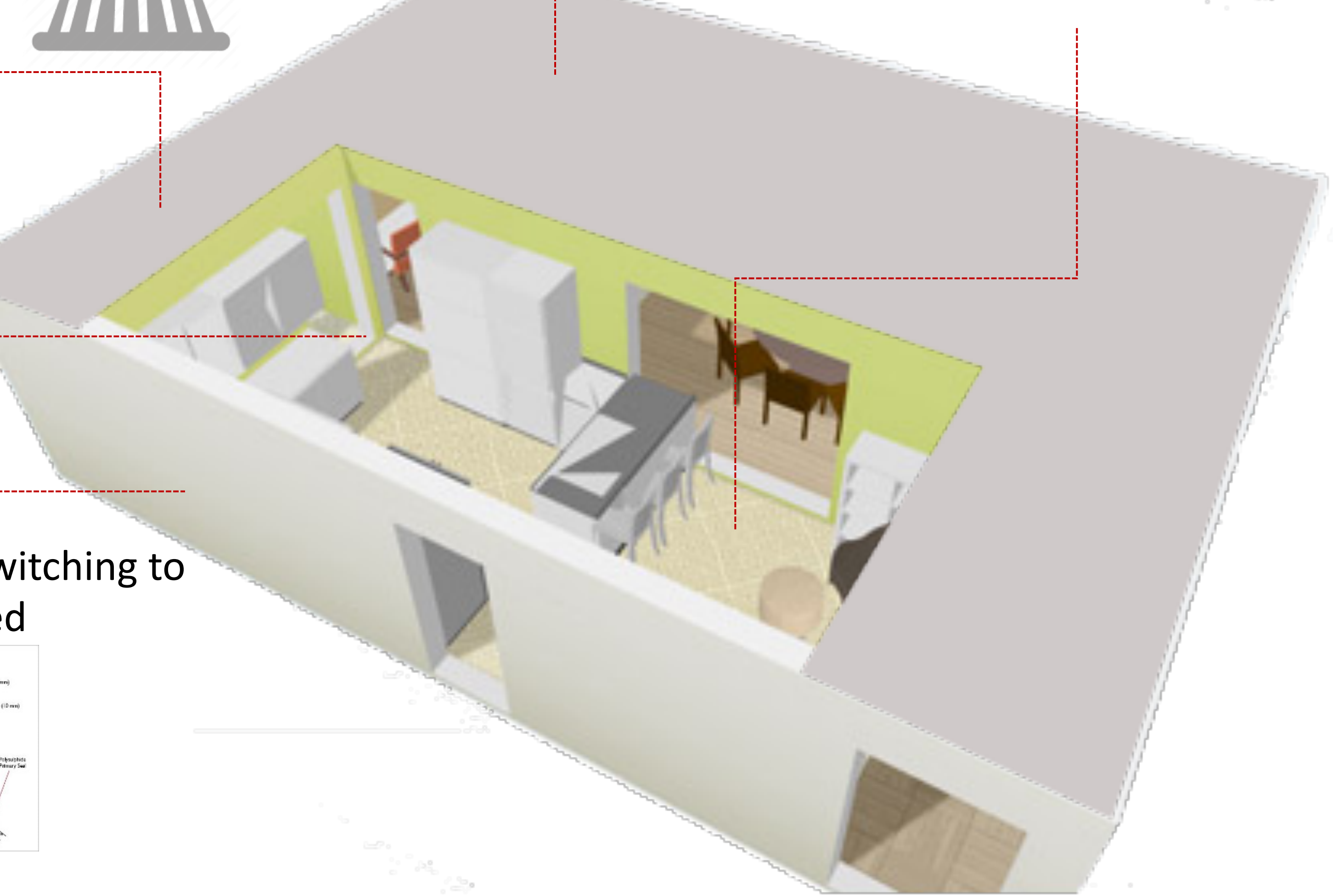
Why to adopt EE ?

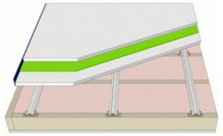
- Activities to control heat loss and heat gain.
- Safer and Healthier.
- Savings (Rent, Electricity and fuels).
- Improved living conditions.

SWH systems on roof tops

Volume control; install extra ceiling and/or partition

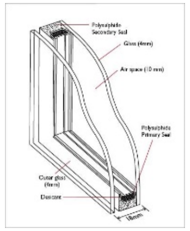
Building envelope; walls and roofs





Efficient Lightening

Openings; switching to double glazed



Basic Activities

- Building envelope; walls and roofs
- Efficient Lightening
- Openings; switching to double glazed
- SWH systems on roof tops

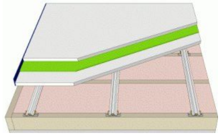
Enhance adaptation of Energy Efficiency methods to Shelters and Public schools

Why to adopt EE ?

- Activities to control heat loss and heat gain.
- Safer and Healthier.
- Savings (Electricity and fuels).
- Improved learning environment for students and teachers.

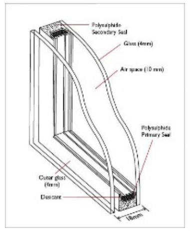
PV systems on roof top

Building envelope; walls and roofs

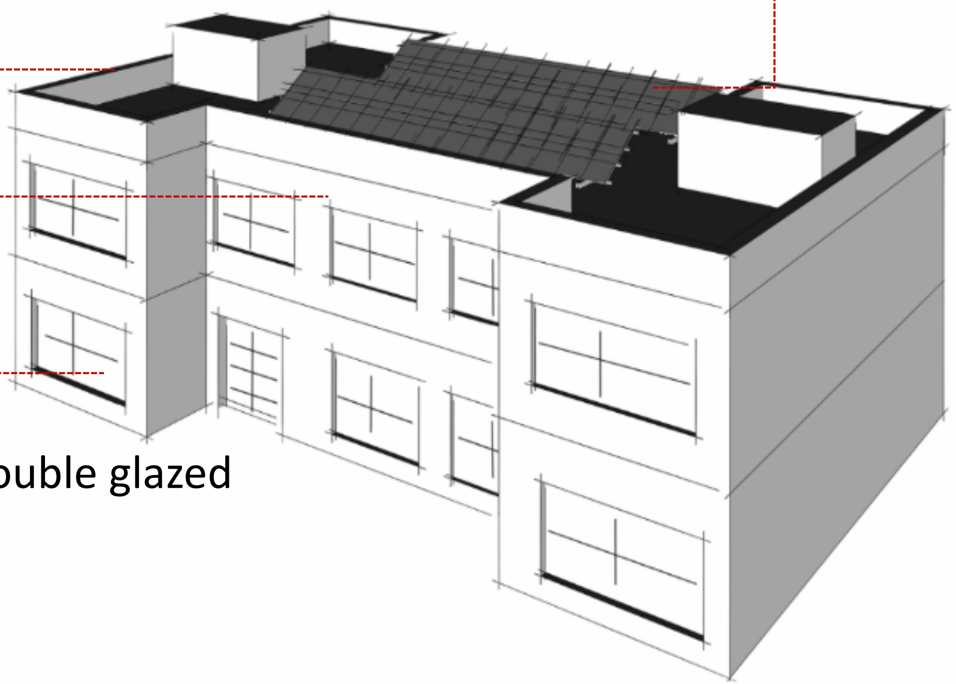


Efficient Lightening

Openings; switching to double glazed



Openings maintenance



Basic Activities

- Building Envelope; External walls insulation
- Openings; switching to double glazed
- Efficient Lightening
- PV systems on roof top

Challenges

- Lack of funding for the energy sector in general, Jordan Response Plan (JRP) received zero funding in 2019.

- Lack of interest from donors to fund Energy projects in general; not recognized as a priority.

- Lack of humanitarian experience in building energy related projects.

NRC

NORWEGIAN
REFUGEE COUNCIL

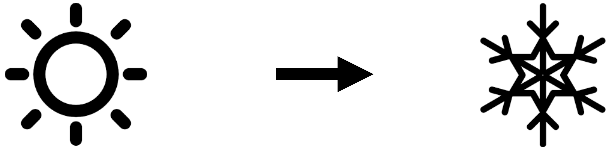
Presenter

MARPE TANAKA, MSF SWEDEN INNOVATION UNIT

Marpe works as Innovation Lead at the MSF Sweden Innovation Unit (SIU). He has academic degrees in industrial design as well as development studies from Lund University, Sweden. After running his own companies and working as a field logistician for MSF he was involved in the starting up and development of the SIU since its inception in 2012. His work within the unit includes everything from outlining strategies, setting up partnerships, method development to starting up and coordinating cases dealing with everything from sustainable energy solutions to health care activities. He is passionate about humanitarian problem solving and innovations that are based on human-centred approaches.

“Using the sun to power air condition”

Case study: Solar air condition



Marpe Tanaka, Innovation Lead - MSF Sweden Innovation Unit (SIU)

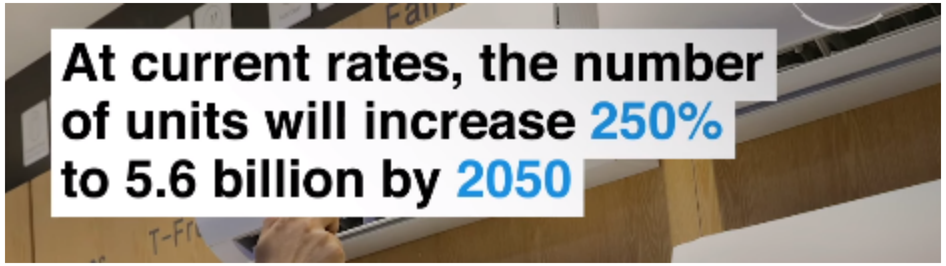

OCB Energy Vision


Energy Sensitization


Fuel consumption

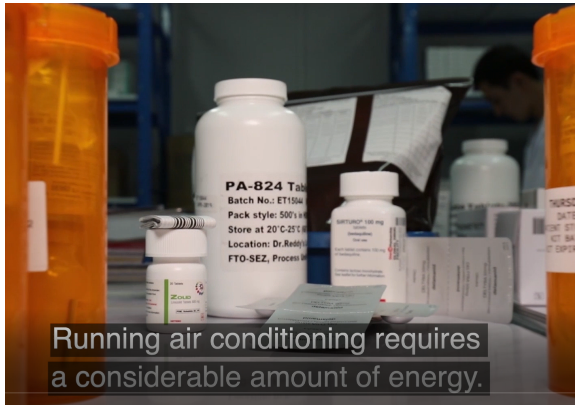

Sustainable off-grid oxygen concentration with
direct solar power (SOX)

Source: World Economic Forum



Background

Increased need and usage of aircon in MSF operations



Photos: MSF

30-50%

3M€/year

CO_2 = 200 standard gasoline vehicles (production and life cycle)

6ooo tons/year

Objective

To identify potential solar aircon solutions that could be used in MSF operations with the aim to **reduce costs**, make operations **more autonomous** as well as reduce the **carbon footprint** of our projects and MSF in general.

Methodology

What is our need?	What exists?	Where is there a match?	Pilot and test	Build evidence and disseminate

Photo: MSF

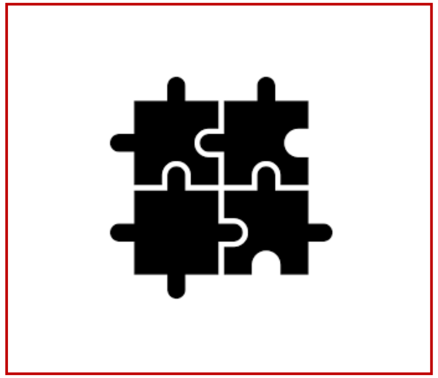
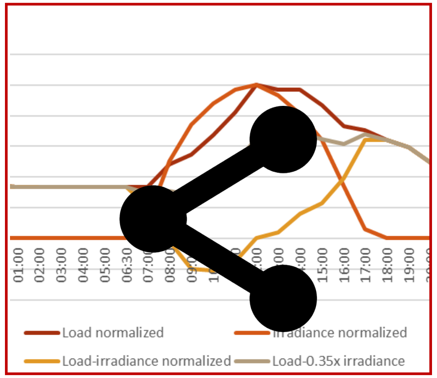


Photo: Per Erik Eriksson



What is our need?

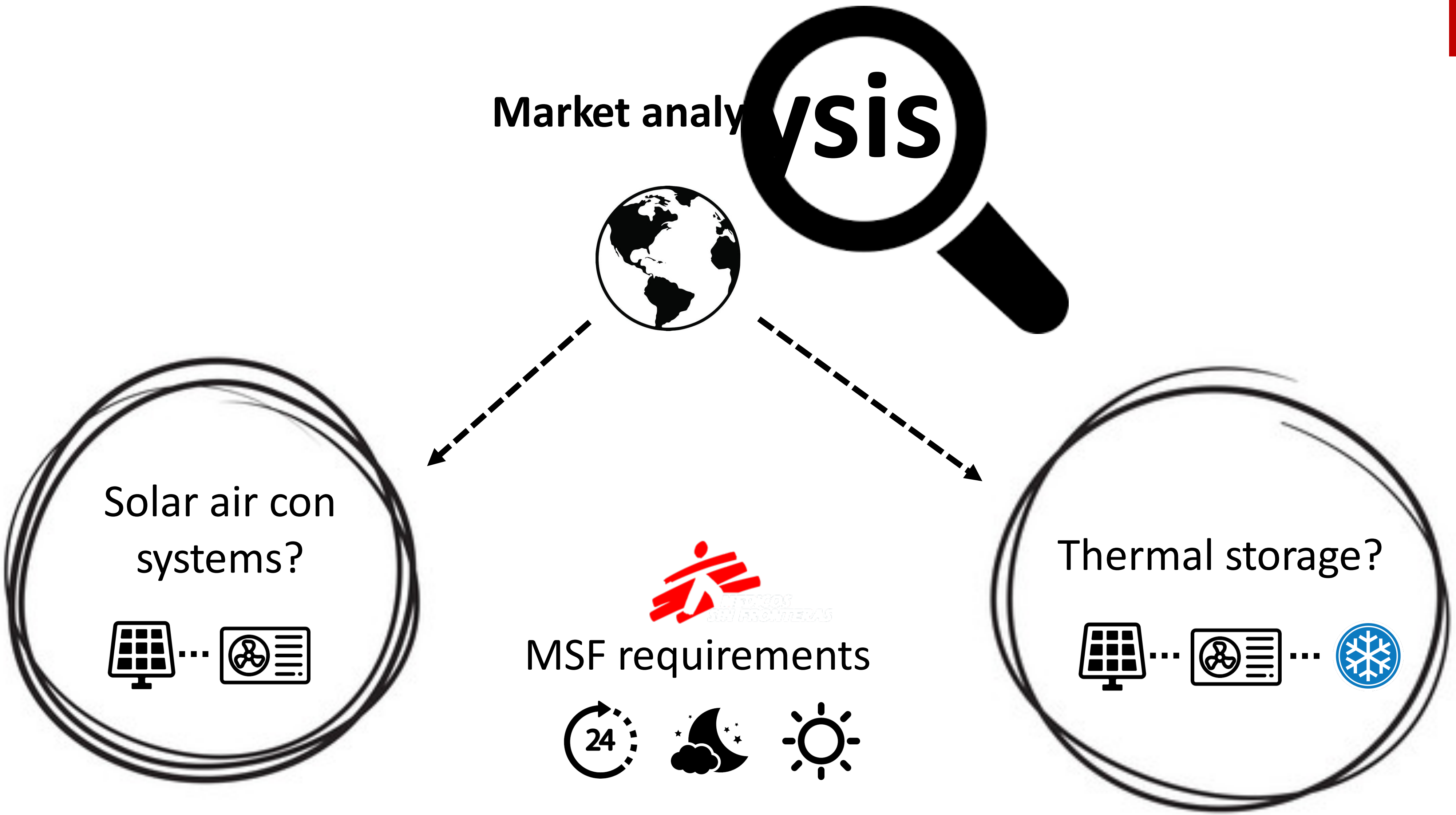
Photos: MSF

Laboratories, OT, ICU Pharmacy, etc.

Residences

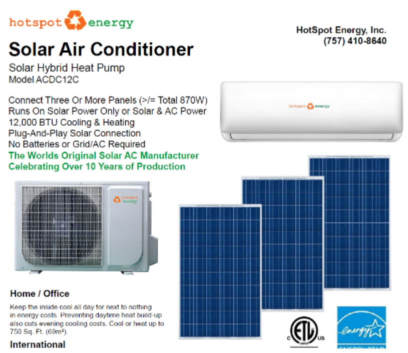
Consultation, medical wards, offices

What exists?


Market analysis
Solar air con systems?
MSF requirements
24
Thermal storage?

MSF SWEDEN INNOVATION UNIT

Where is there a match?



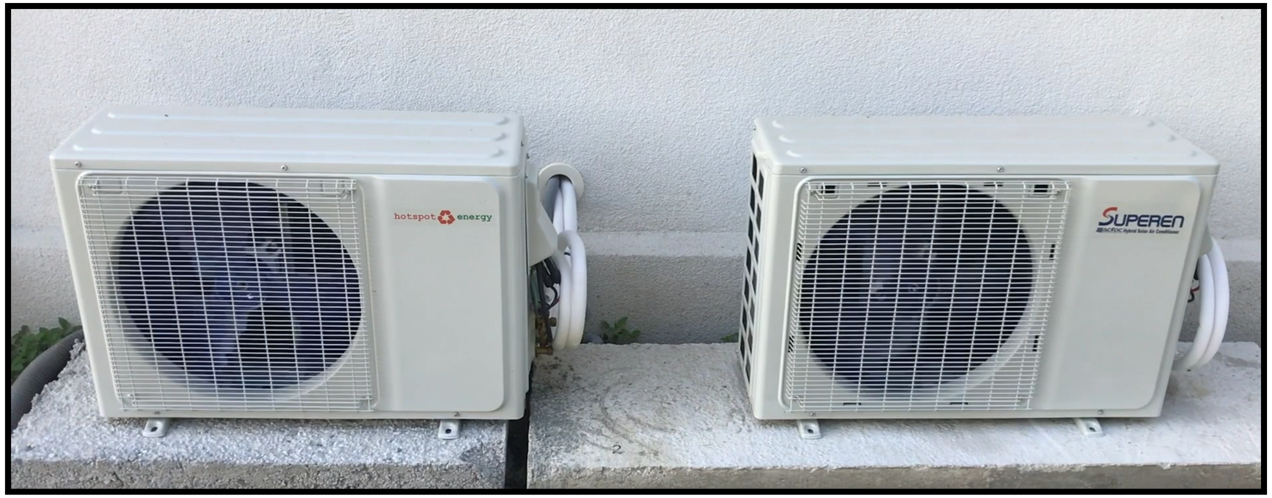


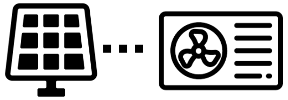
Photo: Per Erik Eriksson

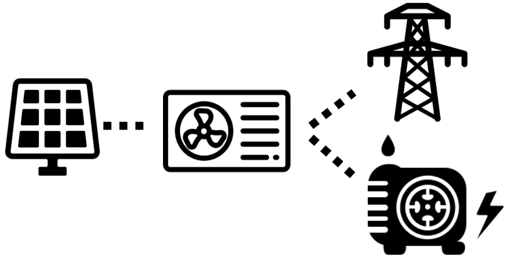
MSF SWEDEN INNOVATION UNIT

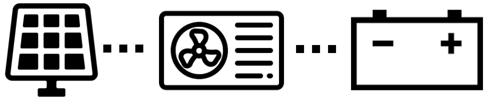
Pilot and test

Drouillard Hospital, Haiti

Photos: Per Erik Eriksson





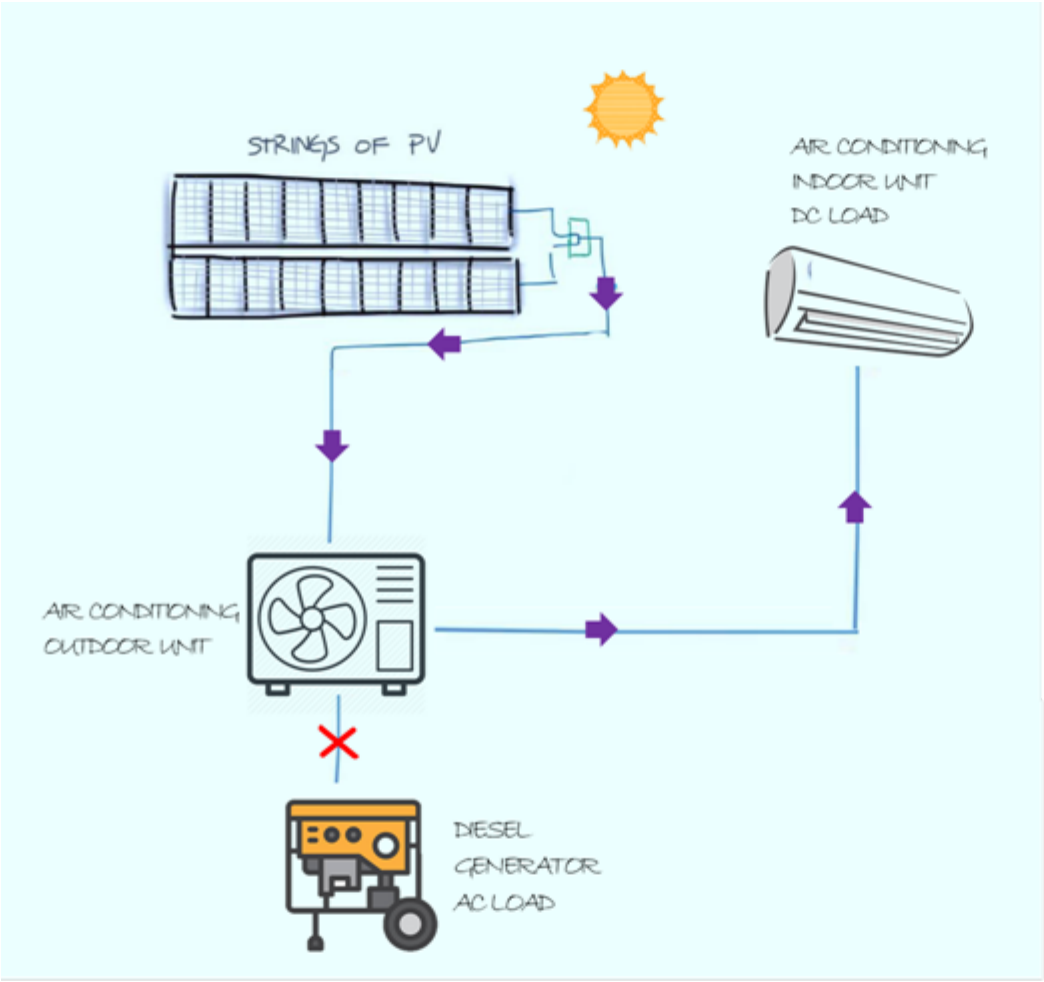


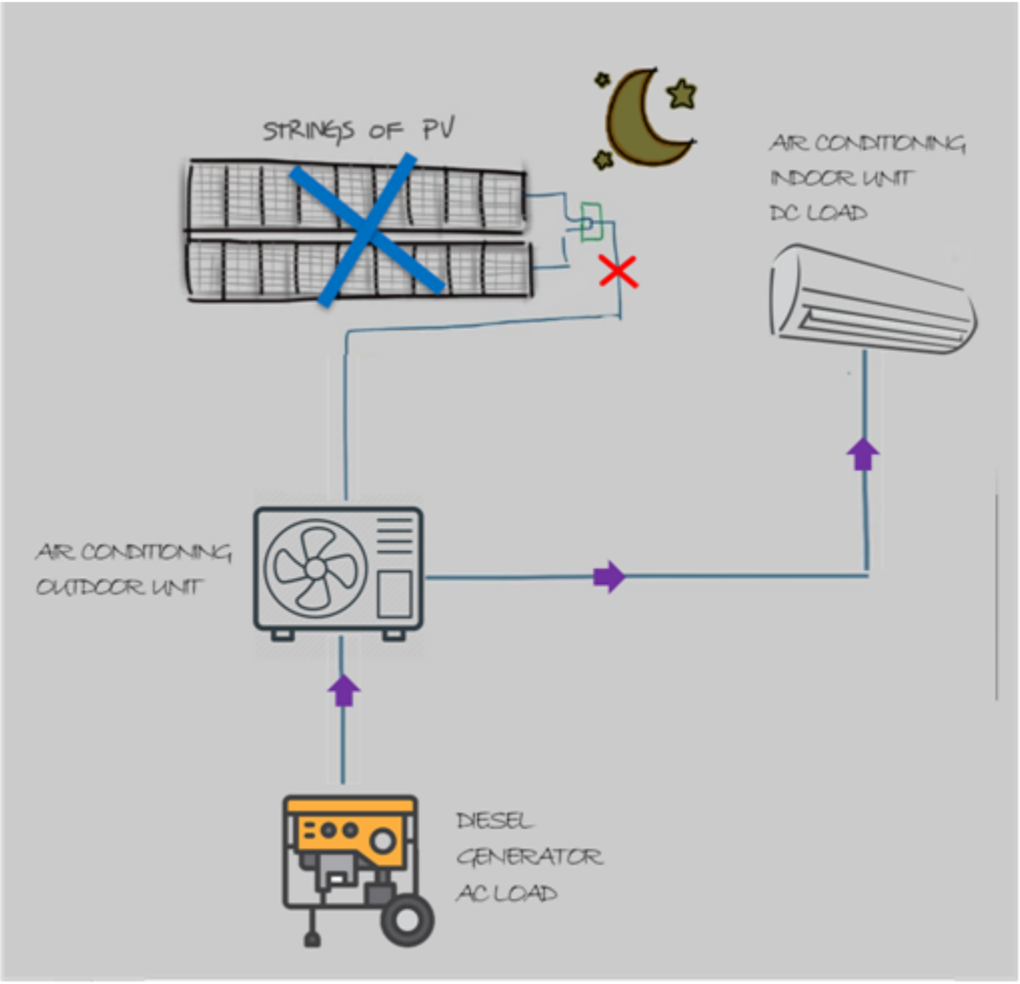
MEDECINS SANS FRONTIERES
LÄKARE UTAN GRÄNSER

MSF SWEDEN INNOVATION UNIT

Pilot and test

System design: Hybrid





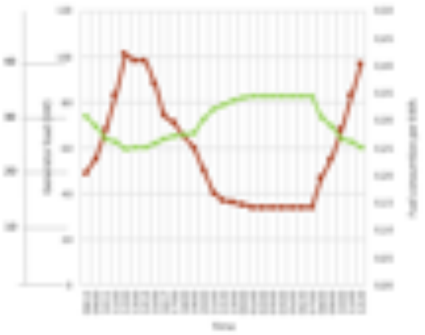
MEDECINS SANS FRONTIERES
LÄKARE UTAN GRÄNSER

MSF SWEDEN INNOVATION UNIT

Build evidence and disseminate







Photos: Per Erik Eriksson

Results

€	☑	Reduce costs
	☑	More autonomous
CO_2	☑	Reduce carbon footprint
?	☐	Mission accomplished

Current status

- Current installations in **Haiti up and running**
- More than **60 units ordered** or locally purchased (Malawi, South Sudan, Bangladesh, etc.) during 2019
- Installation and **qualitative input** from the 60 + units that will be installed during 2020
- **In depth analysis** of Haiti systems - Solar aircon systems (direct PV/hybrid) and generator driven for benchmark (effect, loads, temperatures, etc.)
- Develop a **modelling tool** that can easily provide field staff info on RoI and expected CO2 reduction to facilitate decision making when to order solar aircon units (based on diesel prize, temperature, usage area, sun radiation, etc.)
- **Research paper** on the solar aircon finding for external dissemination/scaling
- **Thermal storage?**

- Q&A -

Thank you

- Feedback: info@energypedia.info
- Webinar documentation/Additional Resources: https://energypedia.info/wiki/Webinar_Series:_Sustainable_Energy_in_Humanitarian_Settings#tab=6th_Webinar
- Stay tuned for our upcoming webinars!

ICRC energypedia unitar United Nations Institute for Training and Research