An example of application in Mozambique
I KNOW THE MULTI-HAZARDS
NOW WHAT?
Actions by steps
Understanding how to deal with multi-hazards if they occur
RANKING METHOD
Which hazards occur the most in Mozambique?
1° FLOOD
2° STORM
3° DISEASE
NO!
Where are we now?
SELECT THE INPUTS OF EACH HAZARD MATRIX
An exemple on the Flood Matrix
The selected INPUTS define the problems or the site caracteristics studied previously
The combination of more simbols give us which outcomes meet the problems selected in the Inputs
FOLLOW THE
LINES OF THE
SELECTED
INPUTS
INPUTS
OUTCOMES
Elevated Static Building
OUTCOMES [14] Amphibious Building
1
LOOK AT EACH HAZARD MATRIX
Starting from: FLOOD; STORM; to DISEASE.
What is an Hazard Matrix?
It refers to those solutions and techniques resilient to the hazard in question
and How are they organized?
INPUTS (problems)
OUTCOMES (needs)
OUTPUTS (solutions)
2
3
FIND THE OUTCOMES OF EACH HAZARD MATRIX
What is that?
The outcomes define the needs or activities that guide the design process
OUTCOMES
The outcomes are defined by SIMBOLS
etc...
or NUMBERS IN SQUARE PARENTHESES
[1] [2] [3] etc...
STOP HERE!
DON'T LOOK AT THE OUTPUTS OF THE SINGLE HAZARD MATRIX, WE NEED TO COMPARE THE MULTI-HAZARD OUTPUTS
SO!
What is it?
it is a useful methodology to compare the possible solutions (INPUTS) of each hazard matrix in case I have multi hazards
GRAPHIC TRASLATION For the overlap of the hazard matrix
In the overlap each hazard matrix has its own 2d plan (one sheet)
Each plain is defined by two axes: OUTCOMES and OUTPUTS which are the set of all items (outcomes and outputs) contained in each hazard matrix
OUTPUTS
The outputs are defined by COLORS (to apply to simbols)
etc...
or NUMBERS IN ROUND BRACKET
(1) (2) (3) etc...
Outcomes
Outputs
the OUTPUTS axis is divided into 14 macro-groups of architectonical elements and in turn the macro-groups are divided into groups of architectural features that can be adopted as a possible solution
the OUTCOMES axis is divided into 6 groups of needs or actions
BUT, DID YOU SEE THE DIAGONAL MATERIAL LINE?
The line identifies the compatibility between the combination of materials for the roof with those of the foundations and walls. The second objective is to redirect the research for material compatibility with the characteristics of the materials
The dark green line finds compatibility. The diagonal helps the reading sendo to identify the characteristics of the materials
4a
USE THE 2° METHOD: SOLUTIONS COMPARED
HOW DO WE USE IT?
4b
MAKE A 3d SPACE
Overlap the 2d spaces of each hazard in DECREASING order
How do I know which hazard is at the top? look at the 1° method: ranking method
But, Why do we do this? because the solutions of the flood matrix have priority over the other matrices
4c
UNDERLINES on each 2d plain the OUTCOMES previously found in each hazard matrix
FOLLOW the OUTCOMES LINES→FIND the SOLUTION
4d
AN EXAMPLE PLEASE!!
WHAT NOW?
4e
The solutions of the floods hazards have the priority on the solutions of the storm hazard , such as storms solutions have the priority on the disease hazard
SO! LET'S MAKE THE LISTS OF SOLUTIONS FOR EACH HAZARDS
1° FLOOD
[19]
[14]
Toilet
foundation
roof
overhang
shape
Outcomes
climate needs
Type of building
Outputs
(28)
(35)
PRIORITY
2° STORM
[17]
[15]
(27)
(41)
3° DISEASE
[3]
Type of disease
(3)
(27) (28)
(35) (41)
[3] Water Borne Disease
[14] Amphious building
[15] Pile Building
[17] Maximize ventilation
[19] Maximize Solar radiation
(3) Disaster-resilient toilet
(27) Static foundation: Sub-floor void
(28) Kinetic foundation: Buoyancy
(35) Decrease overhang
(41) Hipped Roof Shape
4f
WHICH SOLUTIONS DO WE NEED TO COMPARE?
The solutions with the same shape (the same outcomes)
So, let's compare the outcomes of the flood with the outcomes of the storm the best solution is the the simbol linked to the flood hazard, instead of the storm, that's because the solutions of floods hazard have the priority
the solutions can be implemented by the use of manuals. For example for Mozambique we applied manuals such as "Construir como s ventos" or " Recostruindo melhor". This manuals were developed by INGC in collaboration with international associations
REPEAT THIS PROCESS WITH THE OTHERS SOLUTIONS
4g
PUT THE COMPARED SOLUTIONS IN THE 1° LIST OF POSSIBLE SOLUTIONS
Toilet
Foundation
Roof: overhang
Roof: shape
SHOW THEM THAT
Tell them which best solutions you have found
INVOLVE THE COMMUNITY
THEY ARE NOT OKAY
5
TRY TO UNDERSTAND THE COMMUNITY IF THE SOLUTIONS FITS WITH THEIR CAPACITIES
What are the capacities?
-monetary;
-technical knowledges;
- material;
etc...
Direct application of the 1° list of possible solutions
THEY ARE OKAY
IMPLEMENTATION OF SOLUTIONS
of each architectural element and characteristics (macro -groups) with the community capacities
6
7 MAKE THE FINAL LIST OF POSSIBLE SOLUTIONS
! NOW WE KNOW HOW TO ACT IF WE NEED TO DEAL WITH MULTI-HAZARD !
In the previous steps, the education matrix is not considered as it does not need to compare the solutions with those of the hazards
Look at the education matrix to find the OUTPUTS starting from the IMPUTS. After that add the solutions to the Final List of Possible solutions
AND THE EDUCATION MATRIX ?

HAZARDS ICON

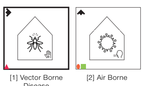
OUTCOMES AND OUTPUTS

FLOOD STORM EARTHQUAKE DISEASE

An exemple of application in Mozambique

OUTCOMES

TYPE OF DISEASE


[1] Vector Borne Disease
[2] Air Borne
[3] Water Borne

EARTHQUAKE EFFECT


[4] Tsunami
[5] Landsline
[6] Soil liquidification

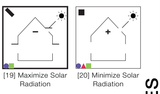
TYPE OF BUILDING

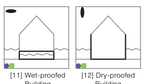

[7] Ground motion
[8] Earthen Building
[9] Stone Building
[10] Masonry Building

VENTILATION, WIND

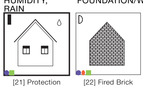

[17] Maximize Ventilation
[18] Minimize Ventilation

SOLAR RADIATION, SUN


[19] Maximize Solar Radiation
[20] Minimize Solar Radiation


[11] Wet-proofed Building
[12] Dry-proofed Building
[13] Elevated Static Building
[14] Amphibious Building
[15] Pile Building
[16] Floating Building

HUMIDITY, RAIN


[21] Protection

FOUNDATION/WALL MATERIALS

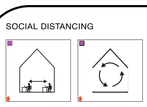
[22] Fired Brick
[23] Concrete/Concrete Brick
[24] Mud Brick
[25] Adobe Brick
[26] Wood and Mud

ROOF MATERIALS


[27] Steel (iron sheet)
[28] Timber (Wood)
[29] Bamboo

OUTCOMES

SOCIAL DISTANCING


(1) Desk-Chair spacing
(2) Open and adapted space

TOILET

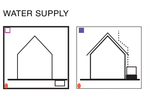

(3) Disaster-resilient toilet
(4) Waste Management

HAND WASHING FACILITIES


(5) Location close to the Toilet
(6) Materials


(7) Accessibility to everyone

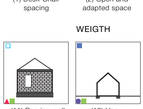
WATER SUPPLY


(8) Ground catchment System
(9) Rain Water catchment system

STRUCTURAL SYSTEM

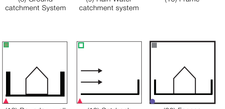

(10) Frame

WEIGTH


(11) Bearing wall
(12) Heavy
(13) Ligth

STRUCTURAL PROTECTION


(14) Screening Doors
(15) Screening eaves
(16) Screening Window
(17) Screening Nets


(18) Boundary wall
(19) Set-back
(20) Fences

FOUNDATION

STATIC

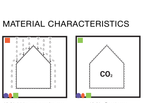

(21) Two store building
(22) Pile Foundation
(23) Strip wall
(24) Mat
(25) Base Isolation
(26) Basement (h>1m)


(27) Sub-floor void (h:>1m)

KINETIC


(28) Buoyancy

MATERIAL CHARACTERISTICS


(29) Water-resistance
(30) Carbon Footprint

FLOOR

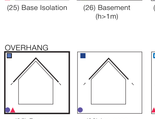

(31) Maintenance
(32) Raising

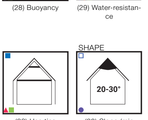
ROOF

CEILING HEIGHT

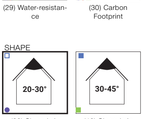
(33) Higher
(34) Lower

OVERHANG


(35) Decrease
(36) Increase
(37) max 500 mm


(38) Use ties

SHAPE



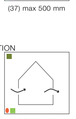
(39) Slope (min 20°-30°)
(40) Slope (min 22-30°/45°)

WEIGHT

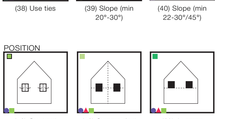

(41) Hipped
(42) Pyramidal
(43) Conical
(44) Light
(45) Heavy

OPENINGS

TYPE OF VENTILATION


(46) Mechanical ventilation
(47) Natural ventilation

POSITION


(48) Outward opening
(49) Symmetrical
(50) At same heights

REINFORCEMENT

HORIZONTAL


(51) Upper
(52) Adjacent
(53) At different heights
(54) Element of protection
(55) Shading Elements
(56) Ring Beams
(57) Collar bands
(58) Mooring system

VERTICAL


(59) wire mesh
(60) Wood post


(61) Steel bar
(62) Super-structure
(63) Sub-structure

OUTPUTS

EDUCATION ICON

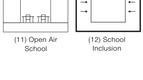
OUTPUTS

QUALITY IN EDUCATION


(1) Safe Site Location
(2) Hazards Matrix
(3) Technological Matrix
(4) Water, Sanitation, Hygiene Facilities
(5) Boundary Wall
(6) Dormitory on site
(7) Temporary Learning Space
(8) Flexible Learning Environment
(9) Mobile School
(10) Permanent School

ACCESS AND EQUITY IN EDUCATION


(11) Open Air School
(12) School Inclusion
(13) Scool Segregation
(14) School Integration
(15) Providing Girl Education
(16) Education for Rural-Urban
(17) Education for IDP and Refugees
(18) Education for Disabled
(19) Built for all Level
(20) School Proximity


(21) Appropriate School Dimension

OUTPUTS