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Workshop on

Energy in **L**ow **I**ncome **T**ropical
Housing,

ELITH

**Comparison As A Strategy
For Low EE Construction**



Context

- ❖ Widespread apathy and misconceptions around sustainability
(Green Wash)
- ❖ ELITH project engages built environment professionals at different levels,
- ❖ Themes:
Development and **R**esilience.

Resource Efficiency: Firewood

Domestic Wood Usage

- ❖ 3/4 of households in Uganda use firewood for cooking
- ❖ 1/5 five households, 21% use charcoal.
- ❖ Biomass fuels constitute the main fuel for cooking for 96% of households.

Sourcing wood;

- ❖ 72% got it from the Bush/Forest,
- ❖ 16% got it from own plantations,
- ❖ 13% bought from the market.
- ❖ Firewood from the bush/forest has implications on environment protection.

(UBOS 2014)





popular Species

Sesbania sesban, desired by 85%

Eucalyptus spp., with 83%,

Calliandra calothyrsus (73%),

Ricinus communis (68%),

Ficus natalensis (63%) and

Mangifera indica (58%)

- ❖ 9 Tonnes per kiln
- ❖ Losing Indigenous species
- ❖ Rushing Eucalyptus plantation
- ❖ Rain or Strong wind 40% losses

Good combustion characteristics (*produce quality fire with hot flame, produce less smoke and burn for a longer period*)



Housing NEED

Vs

Construction Practice

Who is **B**uilding **U**ganda ?

- ❖ Homeowner
- ❖ Building technician
- ❖ Local artisan
- ❖ Engineer
- ❖ Architect

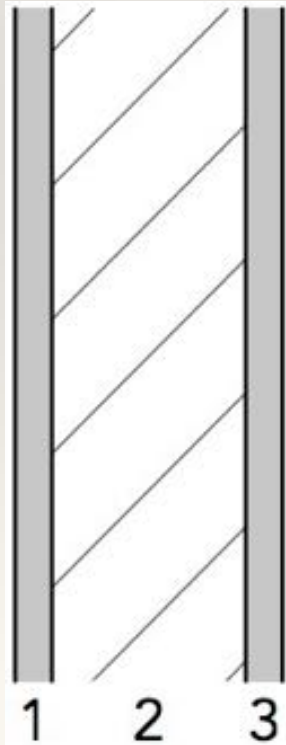


Other associated waste



Fired Clay Brick

Layer	Element	t (m)	Volume	EE - MJ
1	Plaster	0.025	0.025	97.2
2	Fired Clay Brick	0.120	0.105	1,620.36
3	Plaster	0.025	0.025	97.2
4	Cement Mortar	0.120	0.070	167.61



- ♦ Traditional
- ♦ Popular
- ♦ Revised Alternative

Brick Wall = 1,982.37 MJ
 Concrete Wall = 547.43 MJ
 ISSB Wall = 299.40 MJ

The Inventory for Carbon and Energy (ICE) tool provides a summarised database for Embodied Energy and Carbon Coefficients estimated from UK industrial fuel consumption data; listed below are a few materials from the tool that one can use to test wall thickness and material choices to estimate walling choice Energy values.

Material	EE - MJ/kg	Estimated from UK industrial fuel consumption data
BRICK		
Fired Clay Brick	6.43	** Computed by ELITH team in Uganda by measuring fuel at different kilns in Nkozi area
General (Common Brick)	3.00	
Limestone	0.85	
EXAMPLE: Single Brick	6.9 MJ per brick	Assuming 2.3KG per brick
MORTAR		
Mortar (1:4)	1.11	
Mortar (1:6)	0.85	
Mortar (1:1:6 Cement:Lime:Sand mix)	1.11	
Mortar (1:2:9 Cement:Lime:Sand mix)	1.03	
ISSB		
Cement stabilised soil @ 5%	0.68	Assumed 5% cement content
Cement stabilised soil @ 8%	0.83	Assumed 8% cement content
CONCRETE BLOCK		
Block - 8 MPa Compressive Strength	0.59	Estimated from the concrete block mix proportions, plus an allowance for concrete block curing, plant operations and transport of materials to factory gate.
Block - 10 MPa	0.67	
Block - 12 MPa	0.72	
Block - 13 MPa	0.83	
PLASTER		
	1.8	
PAINT		
Waterborne Paint	59.00	

Problem 1: Finding Suitable Materials



Mortarless Wall Construction

Report Covering Experiments Conducted on 02-14/09/13 Mark Le Conte, Hannah Price, Prabhjit Riat and Eliot Shore

University of Warwick



Supporting Opinion Leaders

“Multi-Pronged approach”

Demonstration Projects

- ❖ ACTogether
- ❖ HYT (Haileybury Youth Trust)

Community discourse on aspirations and perceptions.

- ❖ Subsidising Interventions via larger developers
- ❖ (Umuganda / CRS Developer - -> Low Cost)
- ❖ Philanthropy





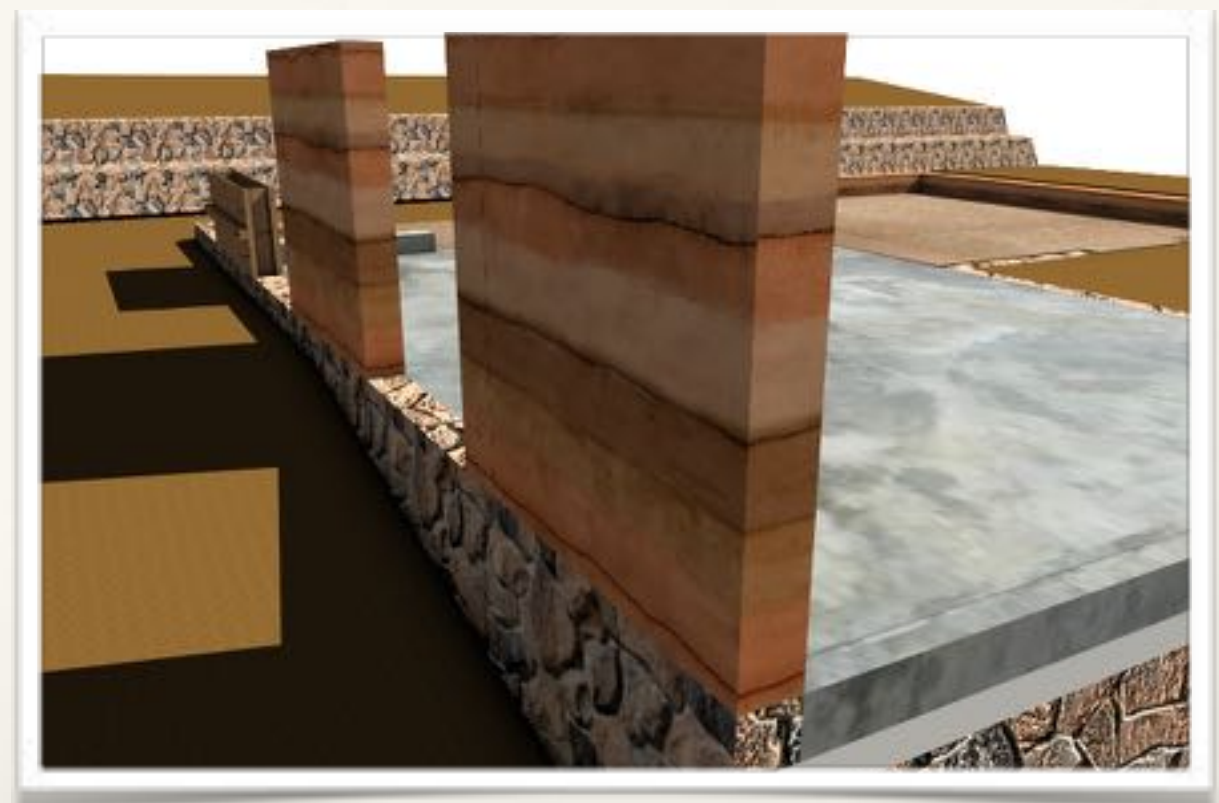
Engaging young people in the discussion



Nairobi Skills Centre: Eng. students from Augsburg, JKUAT & UMU



Rwinkwavu Residence for PIH: MASS design group

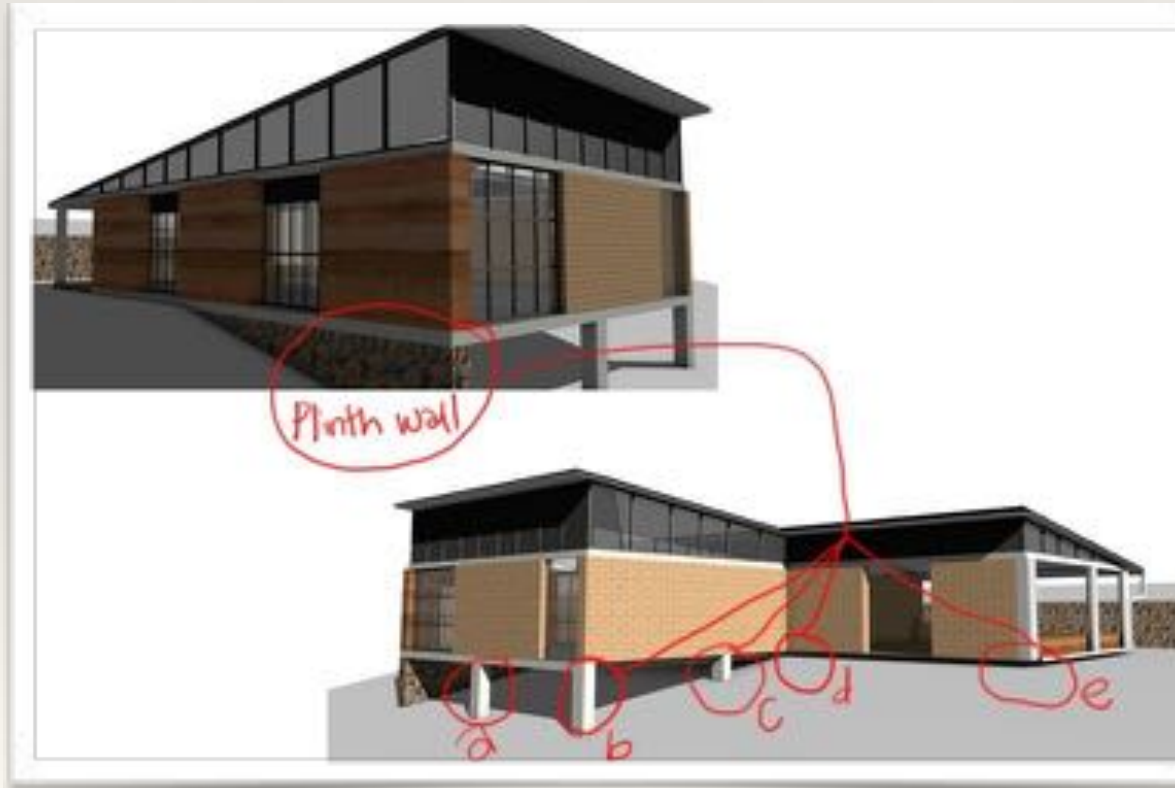


UMU student lead **Design Build**

- ❖ Stone Plinth
- ❖ Compressed Earth Blocks
- ❖ Rammed Earth walls
- ❖ Dialogue with community opinion leaders

Funded under the JENGA project

Joint Development of Courses for Energy Efficient and Sustainable Housing in Africa





**We are in
this together**

Thank you

