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# **Research, resources and client requirements:** how can we achieve more widespread adoption of Interlocking Stabilised Soil Blocks (ISSB)?

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# Introduction to Interlocking Stabilised Soil Blocks (ISSB)

= Sub-soil + sand + 7wt.% cement

- Compressed in a manual machine.
- Cured not fired.

HYT Uganda

- Trains youths to make the ISSB and construct, improving livelihoods.
- Currently, most projects in refugee settlements.

# Applications of ISSB

Straight ISSB

→ School buildings, housing, perimeter walls

Curved ISSB

→ Rainwater harvesting tanks

In HYT's work:

- Climate Action (#13),
- Sustainable Cities and Communities (#11),
- Decent Work and Economic Growth (#8),
- Industry, Innovation and Infrastructure (#9)
- Clean Water and Sanitation (#6) and
- Quality Education (#4).

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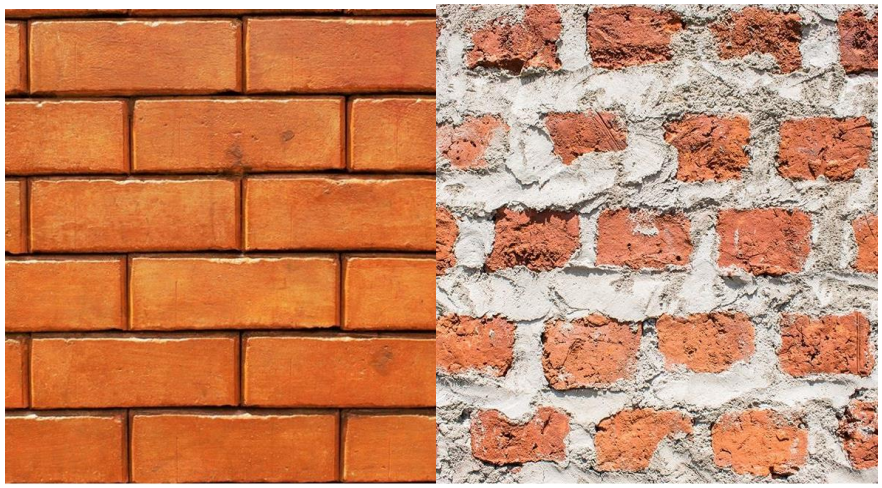
# Technical and environmental performance

Benefits of ISSB in Uganda:

- lower cost and cement use compared to concrete
- no need for firing, hence no deforestation (unlike fired bricks)
- on-site sourcing of soil



| Parameter | ISSB | Fired Brick [a] | Concrete Block [b] |
|---|---|---|---|
| Embodied Energy ($MJ/m^2$) | 130 | 1,067 | 141 |

a Embodied energy of fired bricks: The case of Uganda and Tanzania. (Hashemi and Cruickshank, 2015)
b Energy and carbon embodied in straw and clay wall blocks produced locally in the Andean Patagonia. (González, 2014)

# Opportunities for product improvement

1. Reduce cement use via use of agri-ash (i.e. rice husk ash)

2. On-site testing of quality and securing consistent supplies of agri-ash

3. Reducing/replacing natural sand with other materials

# Reduce cement use via use of agri-ash

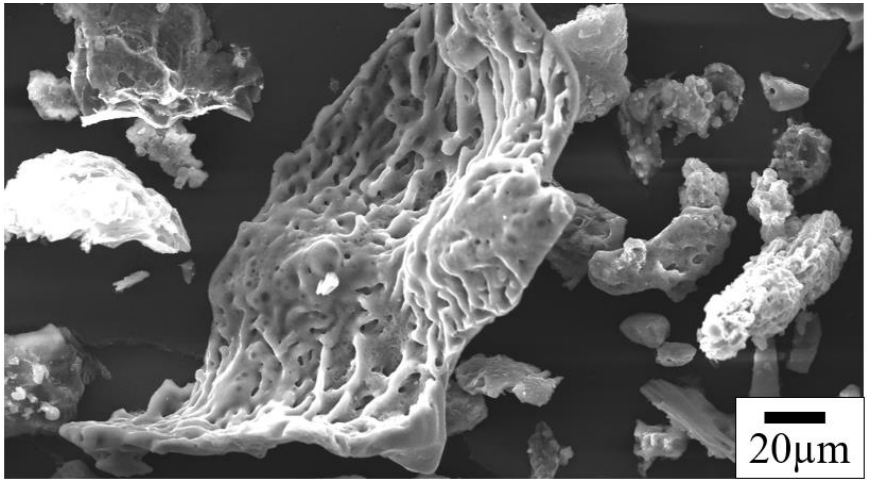
Reduce cement use to:

→ Reduce cost

→ Reduce embodied carbon

Research questions around use of **rice husk ash** (RHA) in ISSB:

- How does RHA affect optimum moisture content for compaction?
- What is optimum % replacement of RHA?
- Could we use also use other agri-ashes (e.g. cassava peel ash)?



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# On-site testing of quality and securing consistent supplies of agri-ash

**Resource** challenges/questions:

- How best to test quality of RHA with limited facilities?
- How to manage variable composition of ash supply? (e.g. proportion of bran burnt)
- How best to source ash when practice of incineration not yet widespread in Uganda?

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# Reducing/replacing natural sand with other materials

Sand is necessary to achieve optimal particle grading in ISSB.

Sand extraction causing ecological harm in some regions of Uganda.

**Sand** questions/challenges:

- Can the amount of sand required be reduced whilst maintaining overall performance?
- Can more sustainable alternatives be used? (e.g. recycled materials or byproducts?)

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# Non-technical challenges and opportunities for improvement

1. Convincing clients

2. Empowering architects

3. Governmental and organisational policy

4. Sustainable livelihoods

# Convincing clients

- Continued involvement needed to support client confidence.
- Tendering processes can be prescriptive – not open to novel materials.
- For NGOs – need buy-in from head office AND local office.


# Empowering architects

Architects have key role in specifying materials, BUT…

…lacking knowledge and experience to design with novel materials.

Beneficial to have:

1. More about novel materials in university curriculums
2. More peer learning from project experience
3. Involvement throughout the design and construction process (not just design only)

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# Governmental and organisational policy

- Larger clients/funders (e.g. big NGOs) have limited understanding of environmental impacts of construction materials.
- NGOs' policy should be to include environmental considerations in tenders.
- Government should ban deforestation for brick kilns.


# Sustainable livelihoods

Many people have been trained to make ISSB, BUT…

… without wider demand for ISSB buildings, they do not use these specific skills.

Small NGOs (e.g. HYT Uganda) are limited in the scale of projects they can deliver.

# Conclusions

1. ISSB have good sustainability performance in Uganda.

2. There are opportunities to improve cost and embodied carbon of ISSB

   We are open to suggestions/collaborations!

3. There are opportunities to overcome barriers to adoption for novel materials.

   We are interested in learning from those who have successfully brought novel products into commercial construction industry.

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# Thank you and questions

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