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# Opportunities and risks of material innovation in a developing construction industry

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## Learning Objectives

- Employ lessons learned from the case studies to innovate with materials in practice across different geographical contexts.
- Understand the challenges from scaling up high impact work
- Approach embodied carbon calculations for atypical materials.
- Understand the importance of engaging early with new or fragile supply chains and designing to their limitations.

## Description

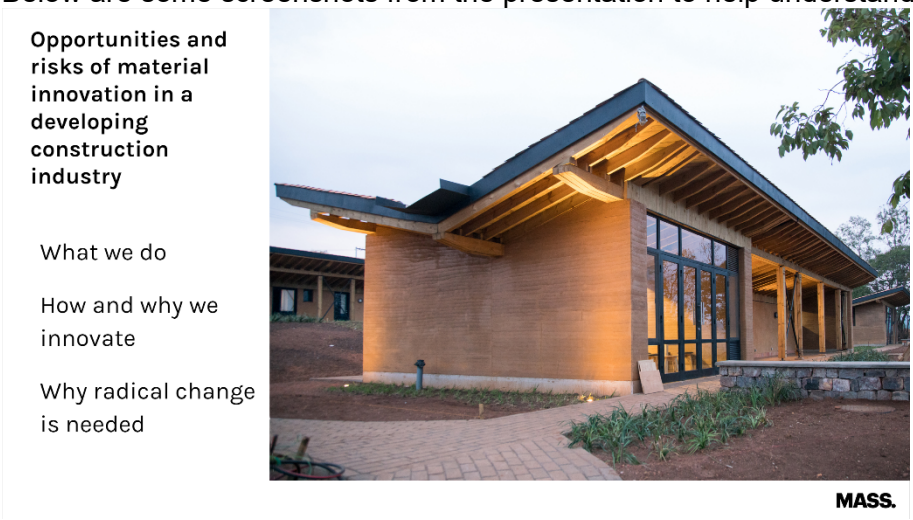
In many parts of the world, fragile supply chains, lack of standardization, and limited training in construction best practices are barriers to using locally sourced sustainable engineering materials. MASS Design Group has pushed the boundaries of design and construction in East Africa through the use of such materials and have created opportunities to strengthen the construction industry to deliver innovative and sustainable projects. This session will present the Rwanda Institute for Conservation Agriculture as a case study into local fabrication techniques on a large scale. We will discuss the challenges and lessons learnt through this process and why it is important to keep pushing business and material innovation.

## Speaker(s)

James Kitchin is an Associate Engineer for MASS Design Group based in the Kigali office since 2017. He joined on a short term Engineering Without Borders UK fellowship with the aim of building capacity and with his addition the team grew to three structural engineers. James has led a number of projects including phases of the Rwanda Institute for Conservation Agriculture and more recently The Ellen DeGeneres Campus of the Dian Fossey Gorilla Fund. James has also led research on potential locally fabricated structural materials and techniques including earth, bamboo, and lightweight concrete. Prior to joining MASS, James was an engineer and project manager at AECOM in Cambridge, UK, working on domestic and international projects from refurbishments of cultural institutions to steel gridshell station canopies. James graduated in 2014 with a first class master’s degree in Civil Engineering from the University of Sheffield, winning the Scott Wilson Project of the Year award.

Jean Paul “Nelson” Habintwari joined MASS Design Group in 2017 as an Engineer based in the Rwanda office. He led the office’s complete transition from AutoCAD to Revit and provides workshops on many pieces of software, including Dynamo. The engineering team started using Revit in 2017 and Nelson set up and maintains the discipline’s drawing standards. Since joining MASS Nelson has focused on the structural design and drawing of the Rwanda Institute for Conservation Agriculture and more recently The Ellen DeGeneres Campus of the Dian Fossey Gorilla Fund. His experience in the construction industry over the last decade includes design, construction, and supervision in a number of East African countries.

Below are some screenshots from the presentation to help understand what to expect.




**Design brief**

Sustainable

Replicable

Seismically designed

MASS.

**Challenges and lessons learnt in design and construction using earth**

MASS.

**CSEB production**

MASS.

## Cost

**Adobe**
$7/m$^3$

**Concrete block**
$165/m$^3$

**Fired brick**
$110/m$^3$

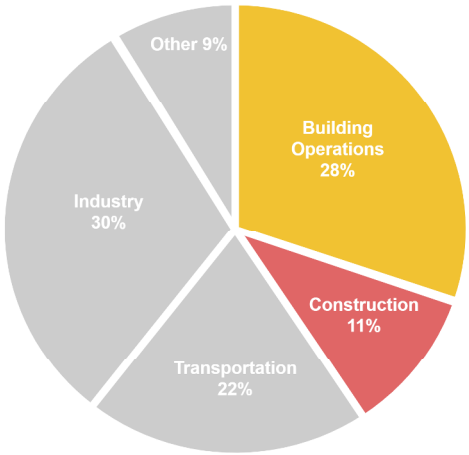
MASS.

## The Ellen DeGeneres Campus of the Dian Fossey Gorilla Fund

MASS.

## Construction GHG

39% of Global Greenhouse Gas Emissions




Source: UN Environment, Global Status Report 2017

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