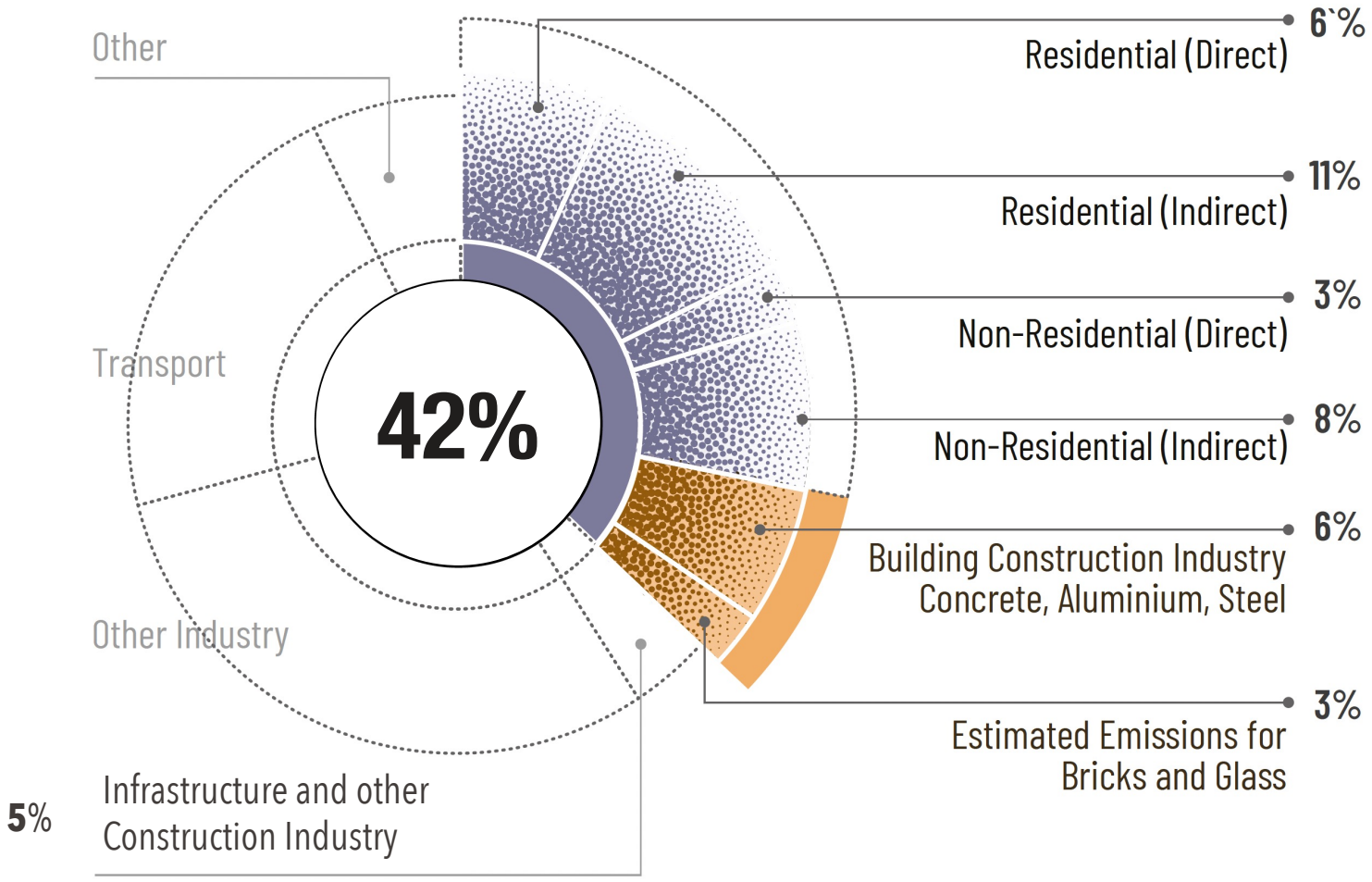
Decarbonising Construction in the Informal Sector in Africa

Advanced Cementitious Materials,

MSE 420, Lecture 11

Dr. Rue Munemo

Context: Why Decarbonisation in Construction Matters



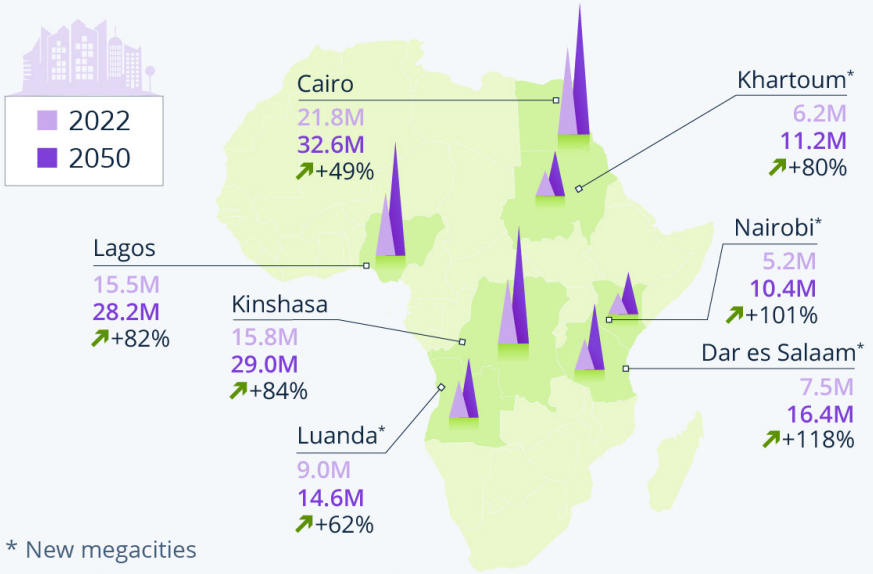
- The built environment is a major emitter through materials, energy, and logistics.
- Decarbonisation requires rethinking *materials*, not just energy efficiency.

*Source: United Nations Environment Programme, & Global Alliance for Buildings and Construction (2025). Global Status Report for Buildings and Construction 2024/2025.

Context: Cities, Urbanisation and Agglomeration

Africa's Next Megacities

Population growth of the first 7 cities in Africa to reach the megacity mark of 10 million people by 2050



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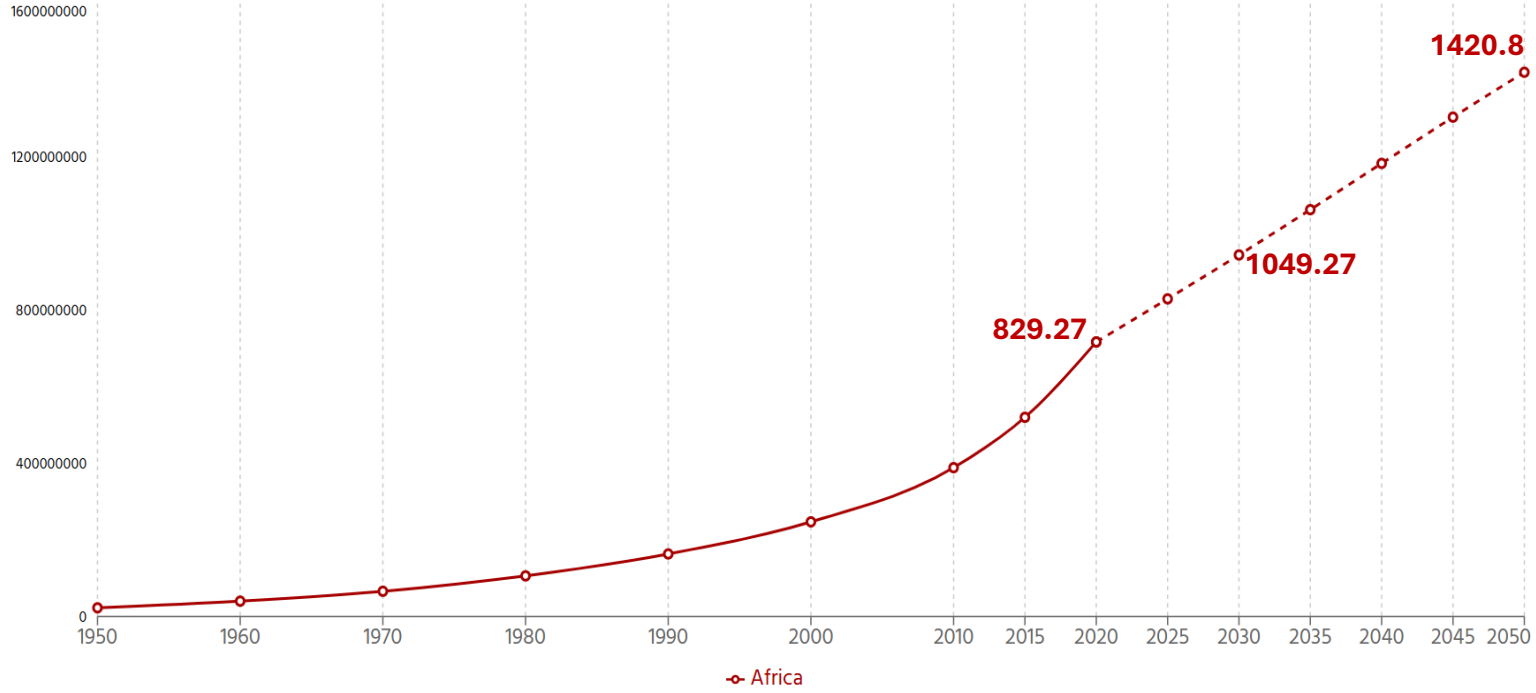
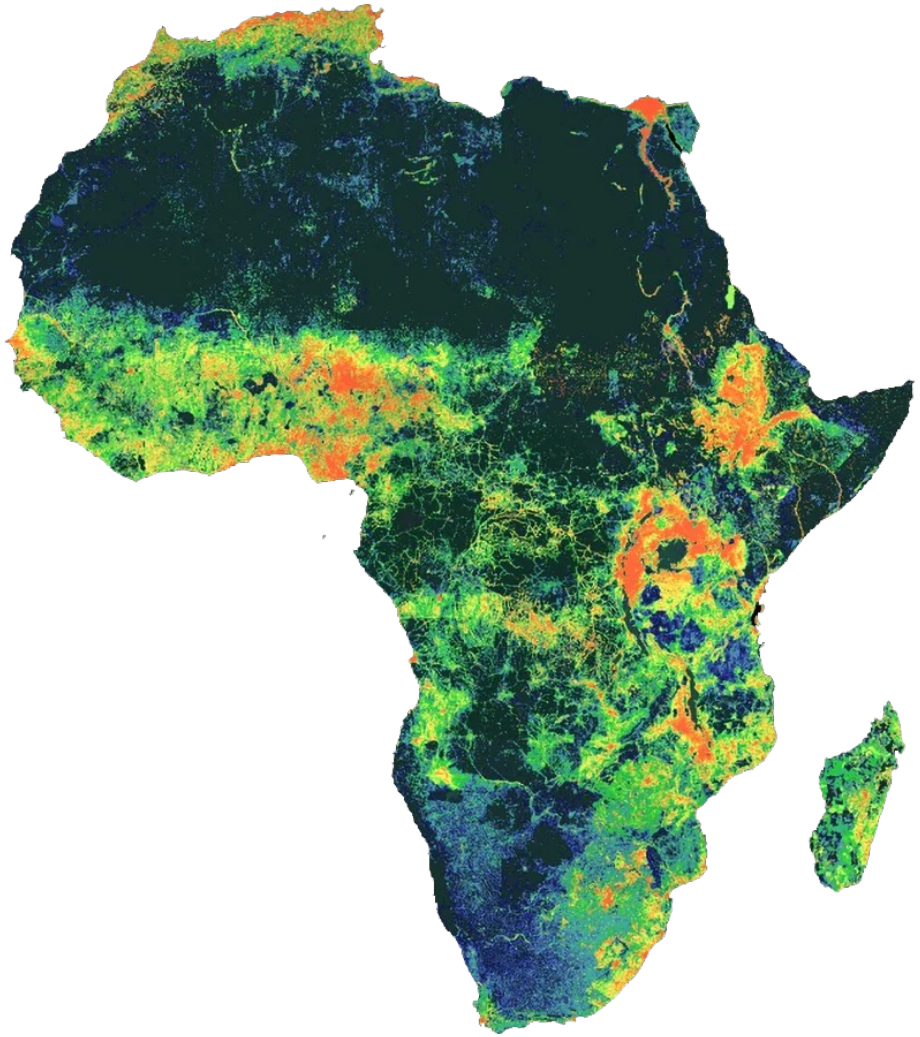
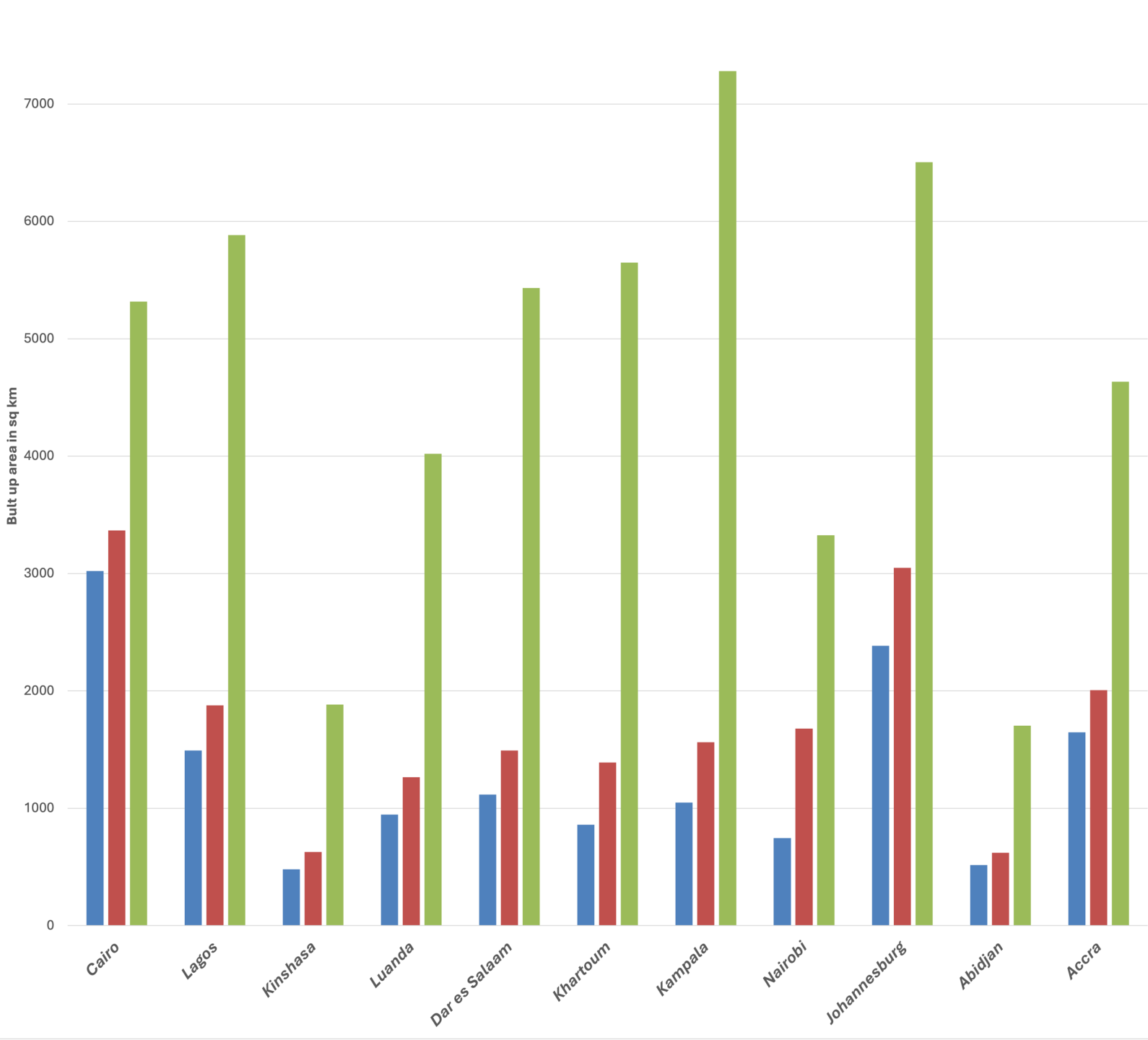
Urban Population in millions



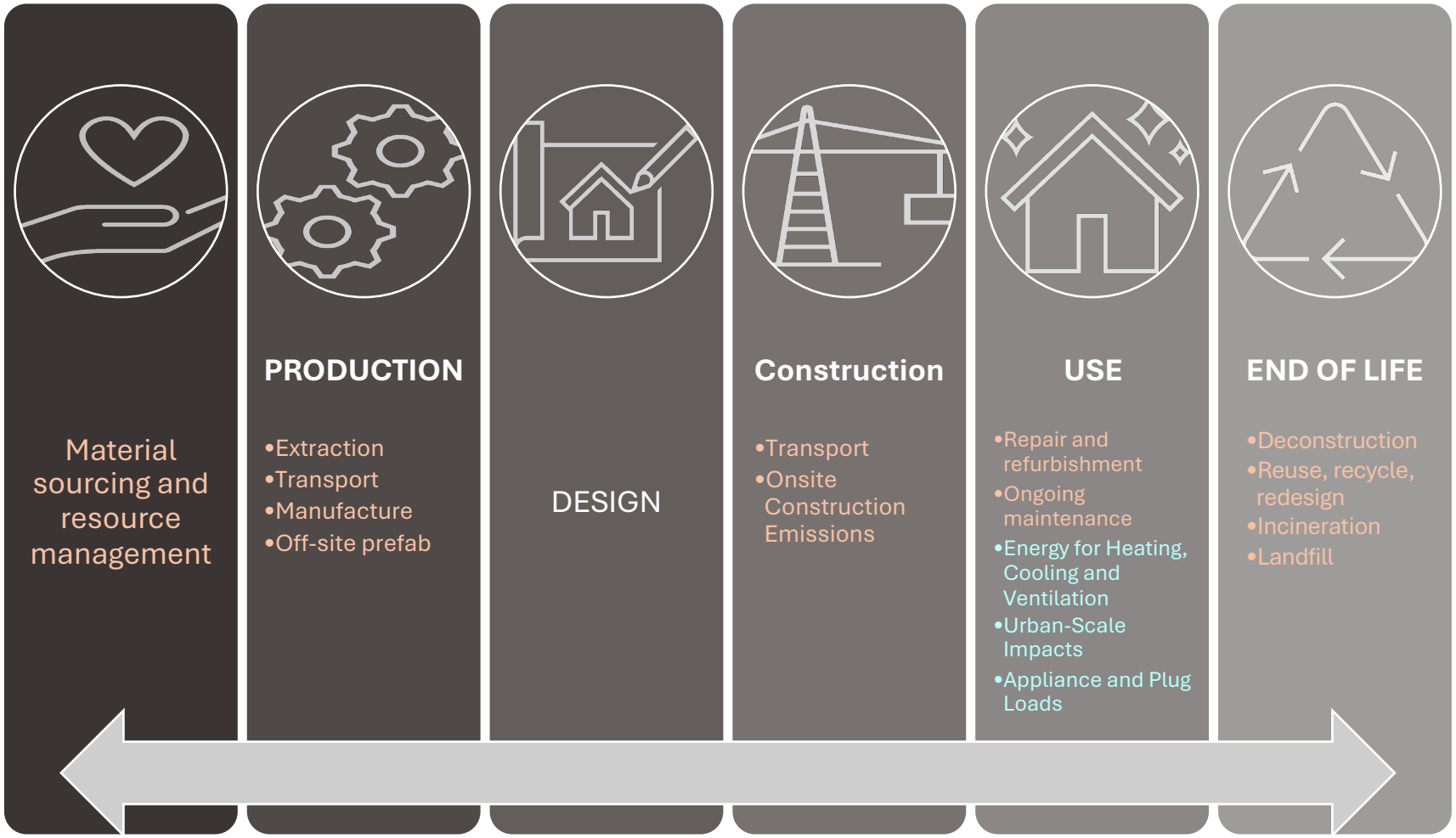
Built up areas

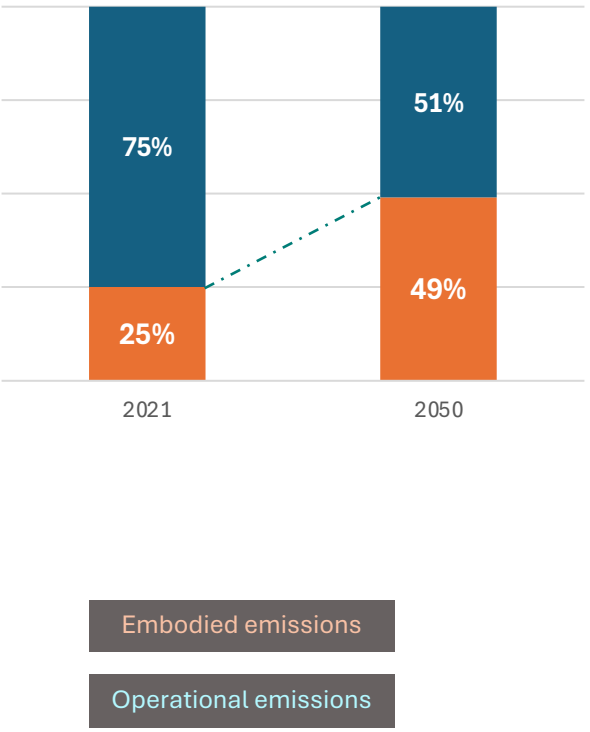


Source: OECD et al. (2025), Africa's Urbanisation Dynamics 2025: Planning for Urban Expansion



The Challenge: Systemic Barriers in Material Transitions





The Challenge: Systemic Barriers in Material Transitions

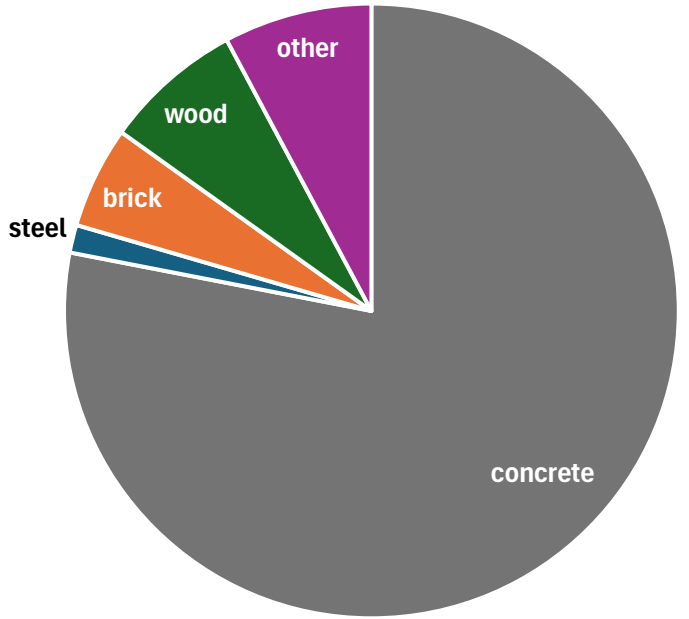
Concrete dominates construction because it is cheap, widely available, simple to produce, and durable.

In low- and middle-income countries (LMICs), barriers include:

- Limited access to low-carbon tech
- Weak standardisation frameworks
- Cost and market constraints
- Local material and skill variability

Contextualisation is key to *scalability and impact*.

Global construction material use by mass

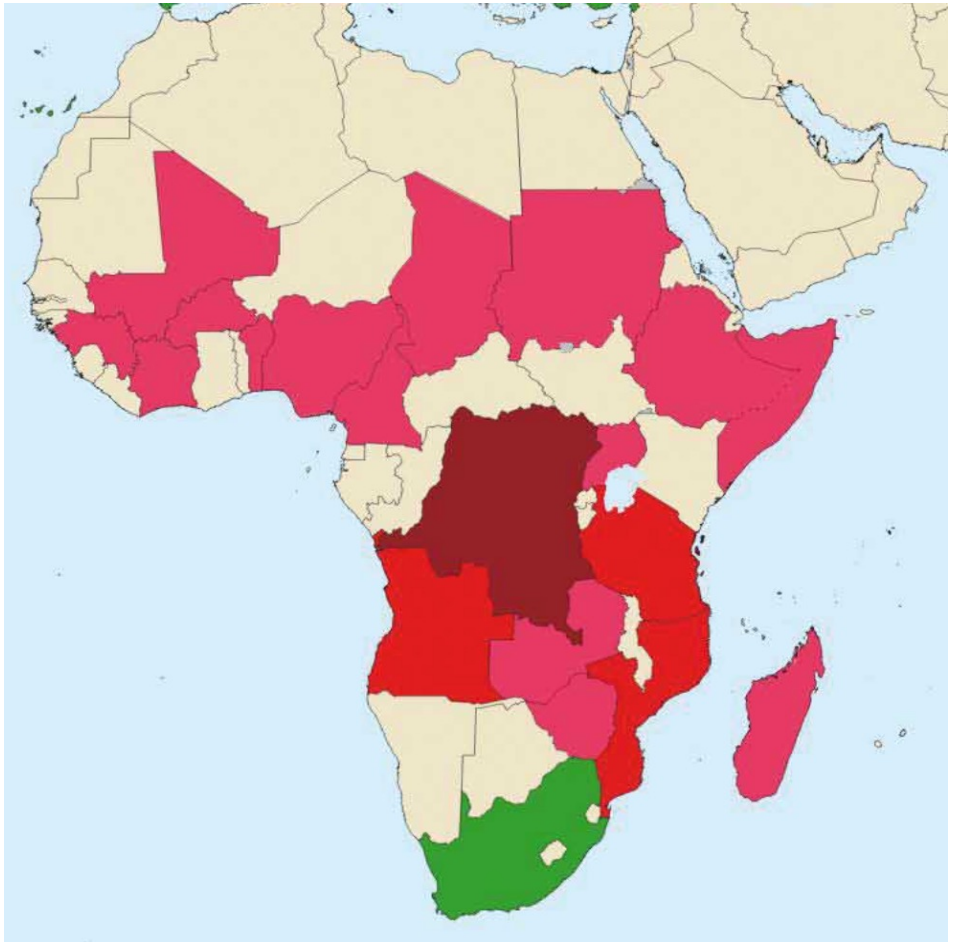


Source: Kane et al. (2025). Greenhouse gas emissions of global construction material production.

The Challenge: Systemic Barriers in Material Transitions

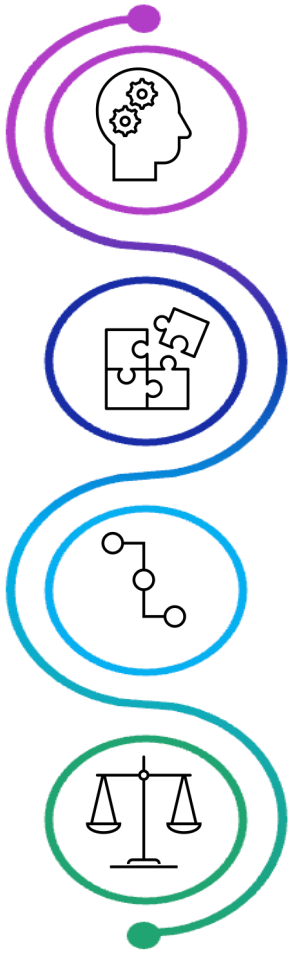
Africa forest cover map

Net forest gain/loss



*Source: FAO (2024), Global Forest Resources Assessment 2024,

The Approach: A Systems-Based, Contextual Innovation Framework



Material innovation

Contextual adaptation

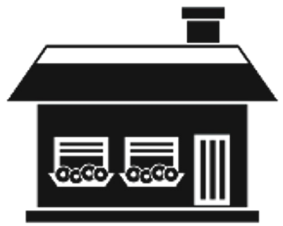
Value-chain integration

Policy alignment

- Focus on what the material is, rather than what it is not.
- Ensures innovations are technically viable *and* locally relevant
- Align all stakeholders for maximum impact

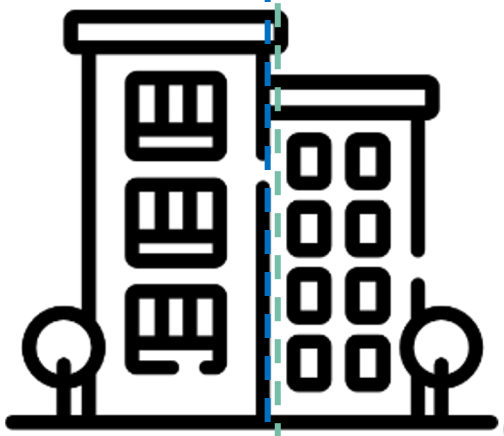
Overview of the Construction Market

Informal Sector



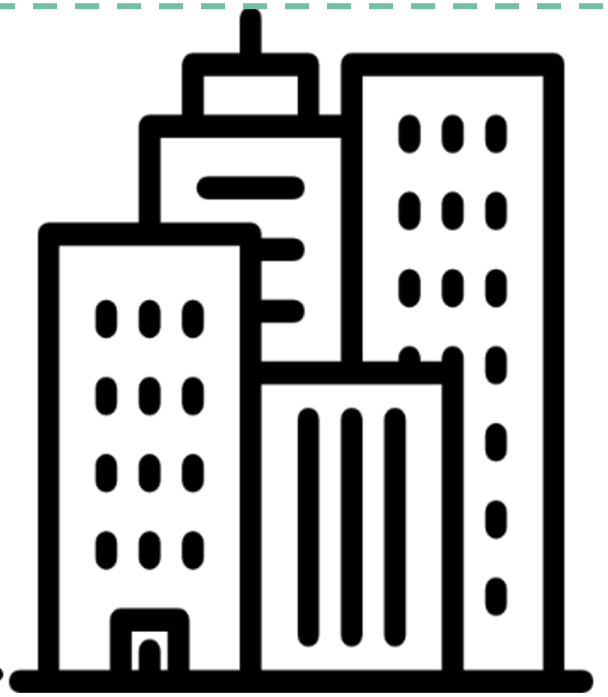
Single floor house

Double floor house

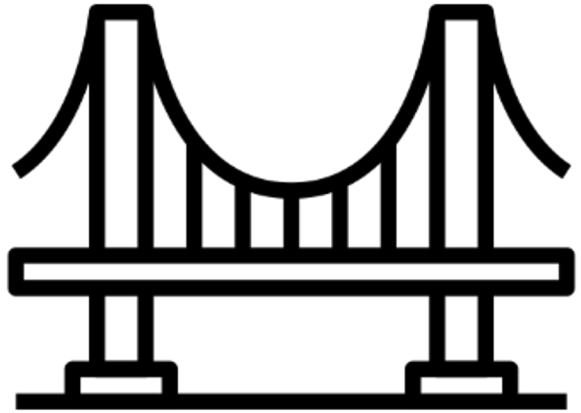


Multi storey apartment

Formal Sector



Office Building

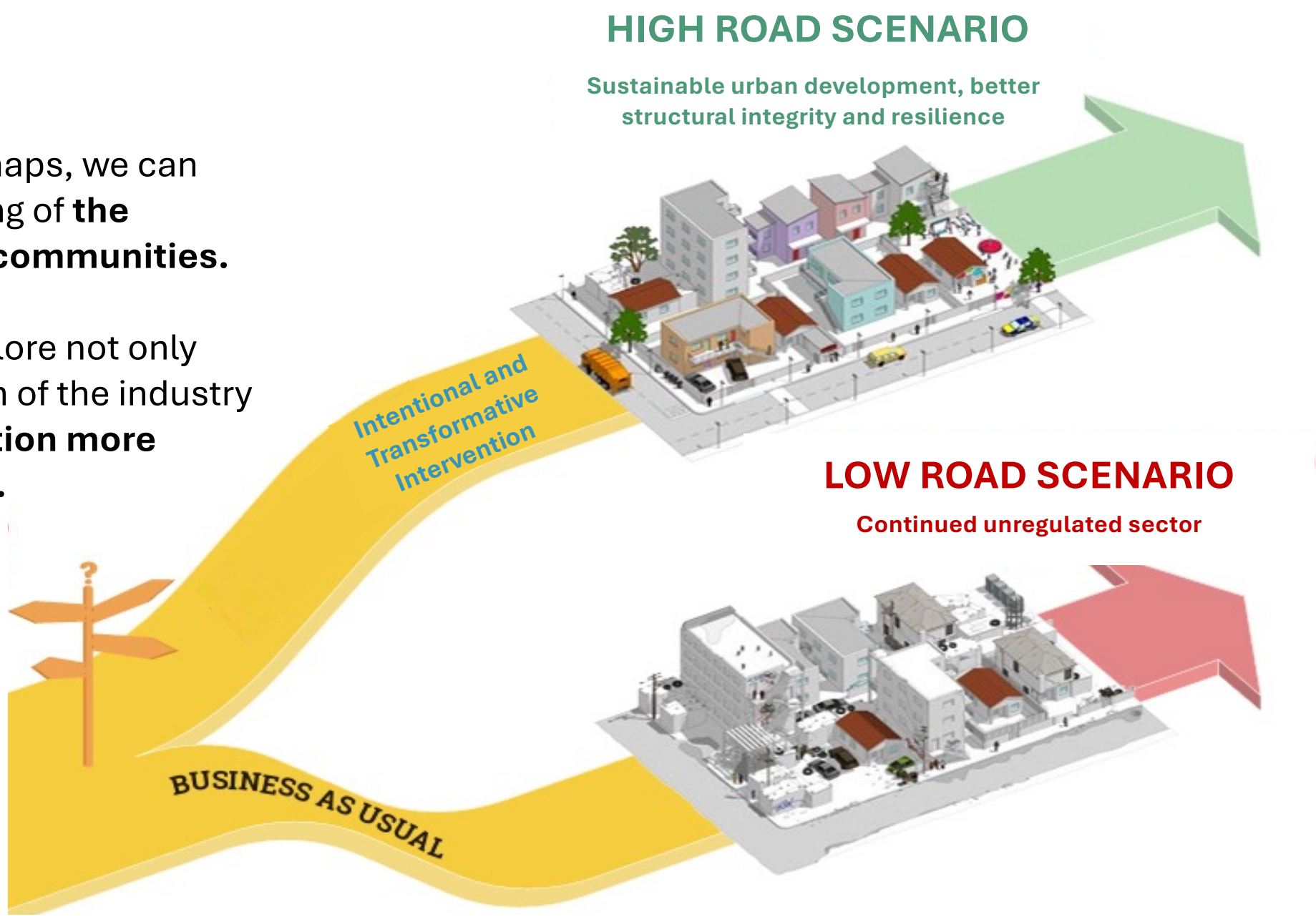


Infrastructure

Engineered construction

- With the aid of the roadmaps, we can gain a clear understanding of **the specific needs of local communities.**

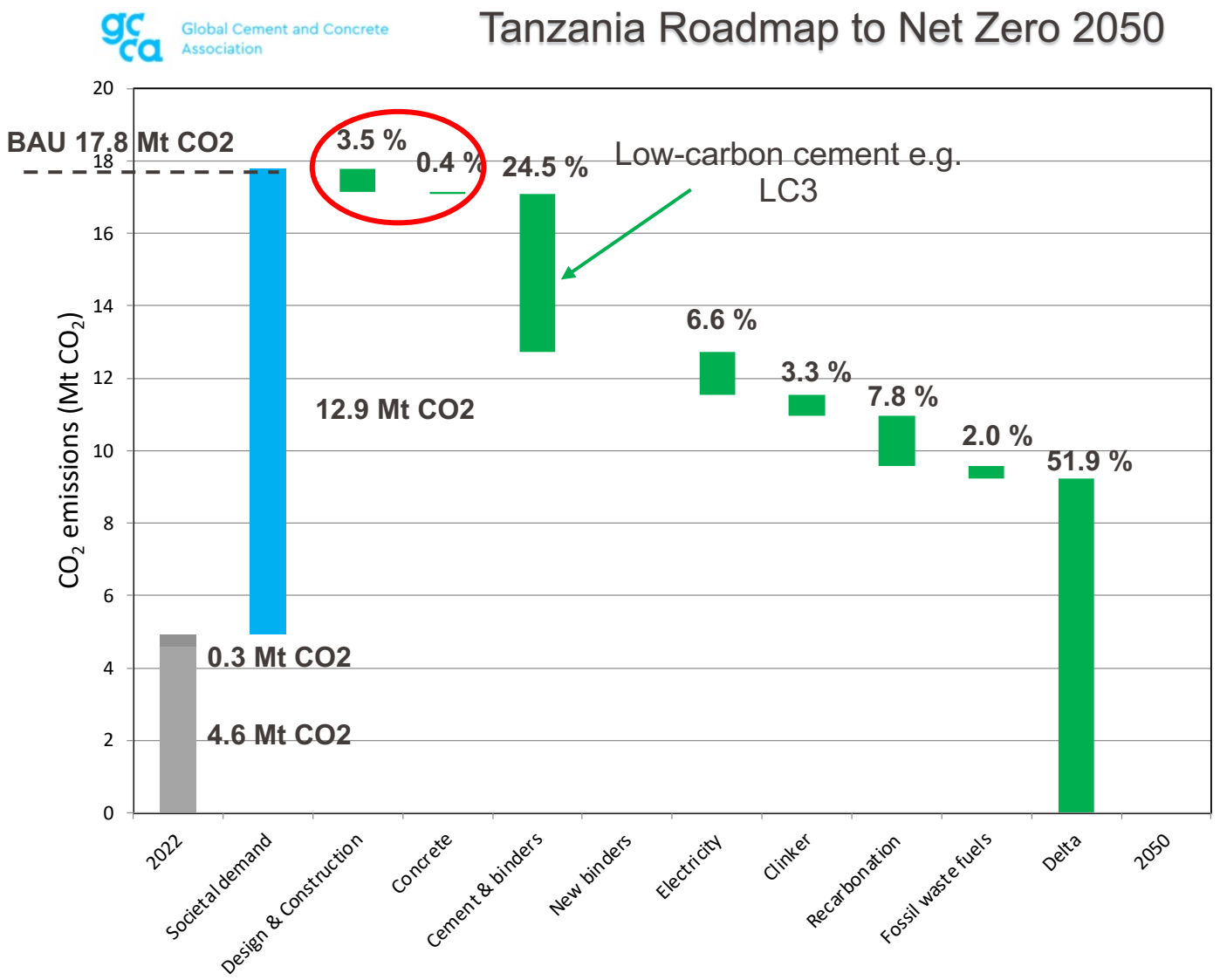
- The interventions we explore not only drive the decarbonisation of the industry but also **make construction more affordable and resilient.**



Targeting Informal Construction for Climate Impact in Africa

Case Study: Tanzania

- The cement and concrete industry roadmap is an implementation blueprint towards net zero.
- Levers can be interpreted to make interim actions while building capacity



Building sustainably from the ground up

Small scale enterprises

Small-to-Medium enterprises

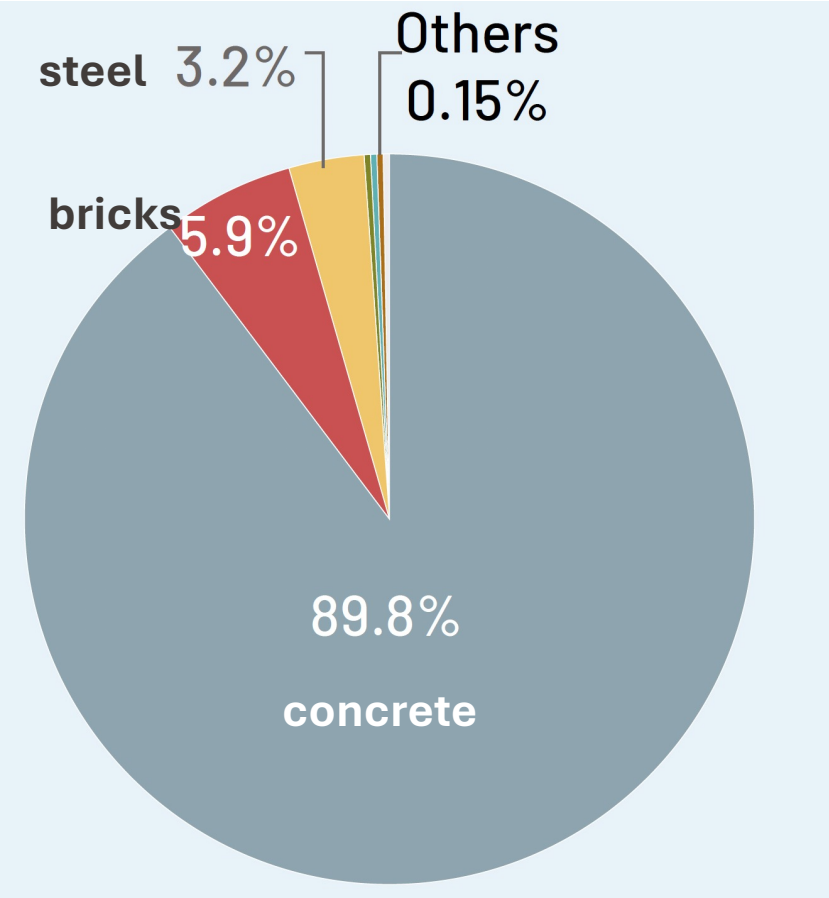
Medium scale enterprises

At each step,

- Higher quality blocks
- Less material wasted
- Greater efficiency

Case Study: Ghana

- The World Bank estimates only 33% of the country's housing need is delivered annually.

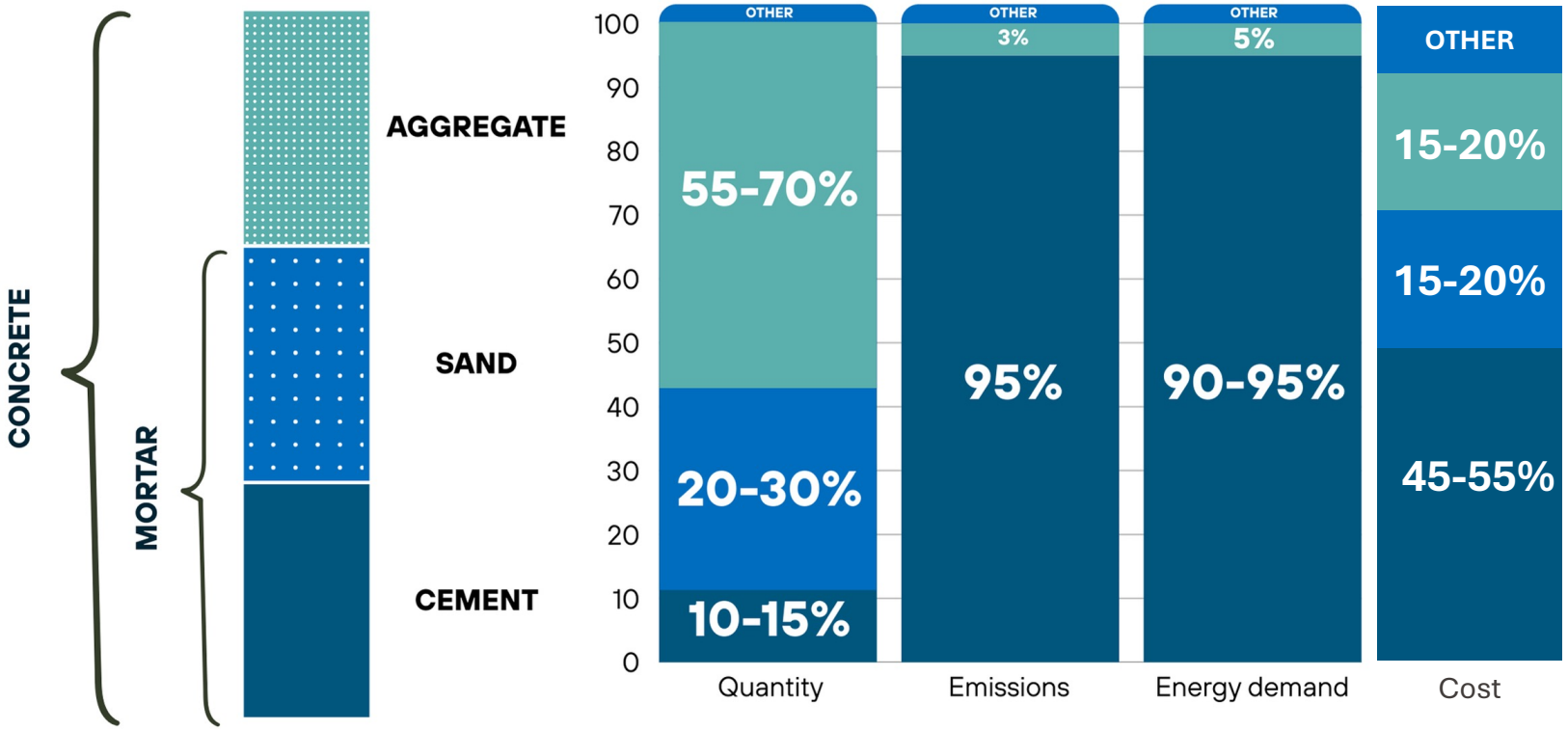


Source: CAHF, 2023

Limitations

- Heavy reliance on imported materials → high costs, currency risk.
- Expensive cement & steel due to energy costs, imported clinker and market monopoly.
- Inconsistent local production and variable quality of blocks, bricks, and roofing.
- Financing is limited

Limitations



Although cement constitutes a relatively small portion of concrete by volume, it accounts for the majority of cost, emissions and energy demand

What can be done to tackle cement-driven cost and supply challenges?

Case Study: Ghana

CBI Ghana's Supacem LC3 – Low-Carbon Cement for Ghana

- Cuts clinker and transport emissions using locally available materials.
- Performs similarly to conventional cement, enabling rapid market adoption

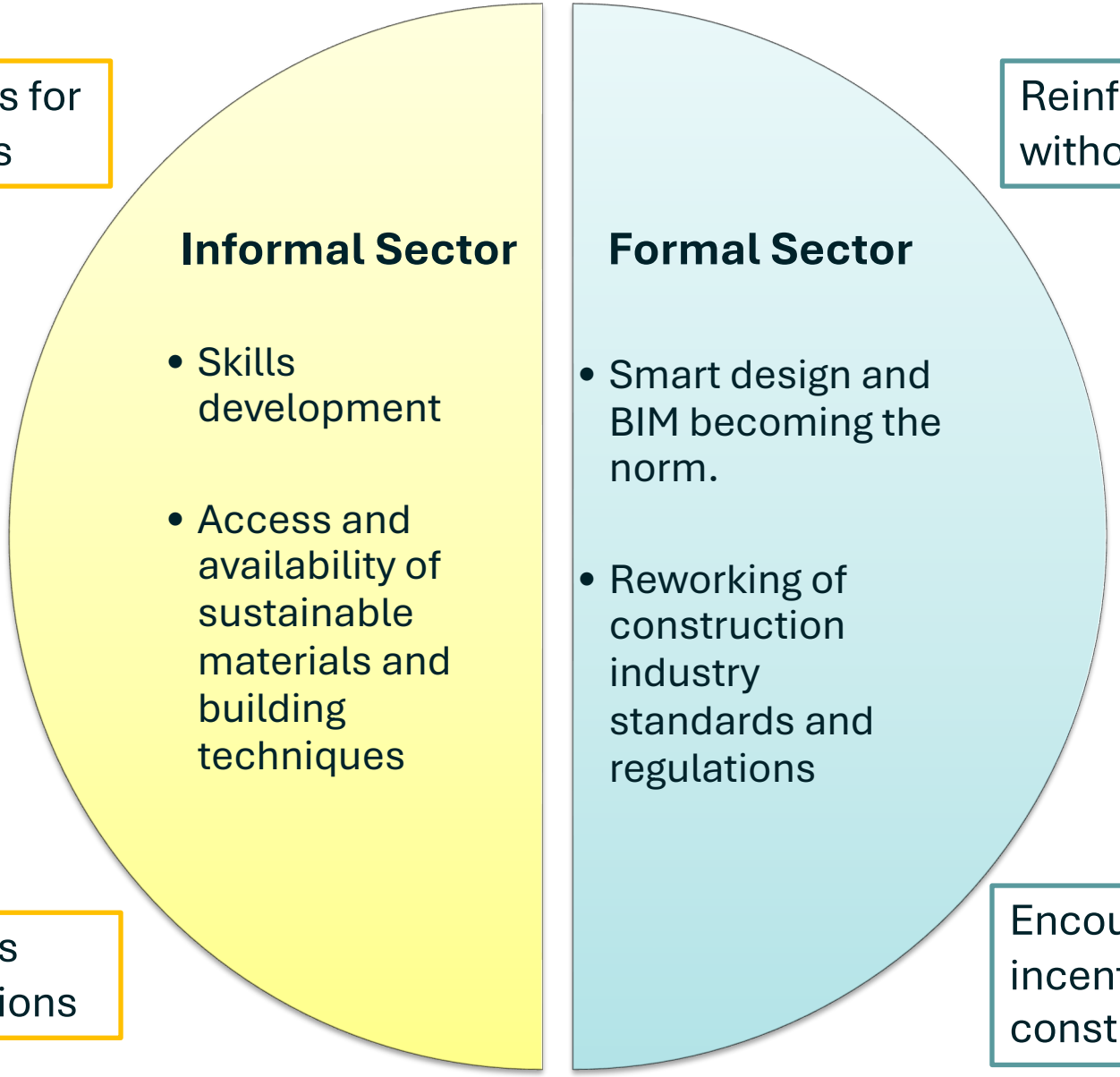
Sustainability is local before it is global.

Key Strategies and Actions to Net Zero

Provide training opportunities for small builders, block-makers

Provide support to local technicians and designers currently investigating local materials

Develop sample house plans with material recommendations



Reinforce efficient design without overdesigning.

Advocate for low carbon cement and concrete as well as contextual sustainability friendly reforms

Encourage governments to incentivise sustainable construction


EPFL
Thank you