IDOS German Institute of Development and Sustainability

IDOS POLICY BRIEF 33/2026



Green Economy on Point.

Green Construction: Scaling the Use of Low-Carbon Building Materials in Africa

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Summary

- **Africa's building boom is an opportunity to build green from the start.** Africa will add about one billion people and double its urban population by 2050. Most of the buildings it needs do not yet exist, so today's choices will influence emissions for decades.
- **Strong policies do not guarantee market adoption.** Rwanda is a good example: its green building policy framework is among Africa's most advanced, yet low-carbon building materials such as interlocking stabilised soil blocks (ISSBs) and adobe blocks are little used in urban areas.
- **Three key barriers hold back uptake:** stigma and negative perceptions that link local earth- and bio-based materials to poverty; a "missing middle" of medium-sized firms that could connect larger and small firms, thereby helping smaller firms to scale; and green financial products that exist on paper but rarely reach micro, small and medium-sized enterprises (MSMEs).
- **Phasing in involves trade-offs.** Local earth- and bio-based materials can lower costs and embodied carbon, increase thermal comfort and create local jobs. Yet they also require constant quality assurance, are not well suited to high-density buildings and risk being stigmatised further if confined to low-income housing.
- **Five recommendations follow:** align and operationalise policies; build confidence through research, testing and demonstration; use public procurement and supplier development programmes to grow the missing middle; open green finance to MSMEs; and close priority skills gaps.

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Why low-carbon building materials matter

The buildings and construction sector is a major contributor to global climate change. It accounts for around 37 per cent of global CO_2 emissions, 28 per cent of energy use and nearly half of all material extraction (UNEP [United Nations Environment Programme], 2026). On current trends, its emissions will keep rising: by 2050, the sector alone could use up the remaining 1.5°C carbon budget (Li et al., 2025). The Global North is largely built and locked into high-carbon building stock, so it now focuses its efforts on reducing buildings' operational carbon, mainly through energy savings. In the fast-growing Global South, most buildings are yet to be built. Regions of the Global South can avoid a carbon lock-in by cutting embodied carbon with low-carbon materials from the start.

Africa is where this growth will concentrate:

- **Population:** the continent's population is projected to grow from 1.5 billion in 2024 to about 2.4 billion in 2050, accounting for 62 per cent of global population growth (PRB [Population Reference Bureau], 2024, 2026).
- **Urbanisation:** the urban population will likely double, reaching 1.4 billion by 2050, and urban areas will absorb an estimated 80 per cent of Africa's demographic growth (OECD [Organisation for Economic Co-operation and Development] et al., 2025).
- **Construction:** an estimated 80 per cent of Africa's 2050 building stock is yet to be built, and cement demand could rise by 230 per cent (WorldGBC [World Green Building Council], 2026; RMI [Rocky Mountain Institute], 2025).

For African countries, the challenge lies in meeting their climate, housing and development needs simultaneously. Rwanda, for example, has one of Africa's most advanced green building policy frameworks, yet uptake of low carbon materials in towns and cities is still low. While Rwanda serves as an empirical example here (Table 1), many of the findings, structural challenges and opportunities apply to other countries in Africa as well.

Table 1: Case study: Rwanda in numbers

Population	14.6 million (2025) → 22.1 million (2050) (RoR, 2020; UNFPA, 2026)
Housing needs	~150,000 units a year up to 2050; 310,000 more in Kigali by 2032 (RHA, n.d.; MININFRA, 2019)
Construction sector	8.7% of GDP (NISR, 2025); 11% growth (NISR, 2026); few medium-sized firms (NISR, 2024)
Climate targets	Up to 53% below business as usual emissions by 2035 (RoR, 2025); carbon neutral by 2050 (MoE, 2023)
Policy framework	Building Code, GBMCS, 2019; Technical Guidelines for Adobe Block Construction in Rwanda, 2022; Sustainable Public Procurement Policy, 2024; Rwanda Green Taxonomy, 2024; Rwanda Green Fund, 2012; Ireme Invest, 2022

GBMCS, Green Building Minimum Compliance System; GDP, gross domestic product; MININFRA, Ministry of Infrastructure; MoE, Ministry of Environment; NISR, National Institute of Statistics of Rwanda; RHA, Rwanda Housing Authority; RoR, Republic of Rwanda; UNFPA, United Nations Population Fund.

Source: Authors

Why uptake of local earth- and bio-based materials remains low: insights from Rwanda

Conventional building materials, such as standard cement, concrete, steel, aluminium and fired bricks, are widely trusted due to their compressive strength but carry high embodied carbon. Earth- and bio-based alternatives, such as clay, soil, timber, bamboo and fibres, can cut embodied carbon, improve thermal comfort and lower costs, especially when produced and used locally. However, they often face stigma related to poverty and rurality.

In Africa, for example, adobe blocks (sun-dried earth bricks) and interlocking stabilising soil

blocks or ISSBs (soil blocks compressed with a small share of cement or lime and laid largely without mortar) could be viable alternatives to conventional materials. ISSBs, in particular, can achieve sufficient compressive strength for two-storey buildings and outperform concrete blocks on thermal comfort (Bredenoord & Kulshreshtha, 2023; Hashemi et al., 2015). For centuries, Africans have built with local earth-based materials; many African households still do. Yet they increasingly aspire to build with fired bricks and concrete. Larger low-carbon buildings, which could serve as demonstration buildings, remain rare outside state- or donor-funded projects.

Our research – two surveys of a total of 850 firms, 88 semi-structured interviews and two focus group discussions in Rwanda – points to three key barriers that currently limit the uptake of these low-carbon building materials:

- **Perceptions:** Many people see earth- and bio-based materials as less reliable and durable than conventional ones. Adobe blocks, known in Rwanda as “rukarakara” (the improved version is a standardised earth brick; see RHA, 2022), face a particularly strong stigma, associated primarily with poverty and rural life and seen as inferior to “modern” (often imported) materials such as fired bricks and concrete. Many Rwandans do not know what makes the improved version different and equate it with the traditional bricks. ISSBs face similar doubts and biases, but are far less well known. The government tried to introduce them into the domestic market in the 2000s without success, and little has changed since. Firms also report that aesthetics and status signalling often matter more to clients than sustainability. Moreover, they report that clients equate “green/sustainable” with “expensive” and that some practitioners charge a green premium without delivering green features. This is particularly damaging because cost is the main factor in clients’ choice of building materials, and local earth- and bio-based materials are often cheaper than conventional ones. Few awareness campaigns and demonstration projects exist to change these perceptions. In addition, limited local research and testing capacity keep the sector reliant on imported standards and materials.
- **The missing middle:** Medium-sized firms play a vital role in linking larger firms – which tend to lead in terms of innovation, technologies and skills – to smaller firms. In Rwanda, medium-sized firms are scarce, and the construction sector is polarised: a few large firms dominate government contracts, while most firms are informal micro and small enterprises. Public procurement and a lack of supplier development programmes are not yet pushing large firms to work with micro, small and medium-sized enterprises (MSMEs) in a stable, developmental way. Without these links, smaller firms struggle to learn, upgrade and grow. This hurts the green building market: many firms already use (partly) green practices but cannot scale up. For example, producing ISSBs of consistent quality requires specific equipment such as manual or hydraulic presses, soil testing and quality control. These investments are beyond most micro and small firms’ capabilities. Large contractors could afford them but have little incentive to switch: the GBMCS sets sustainability standards for new large public and commercial buildings, but neither public tenders nor private clients usually ask for specific building materials such as ISSBs. In addition, stakeholders describe Rwandan firms as reactive rather than proactive: they wait for clearer government guidance and incentives before investing in new materials and technologies. The transition from micro to small and medium-sized firms is also often where skills gaps become most constraining. While technical expertise is essential for adopting new materials and technologies, strong managerial and soft skills are equally vital to sustaining firm growth.
- **Financial issues and incentives:** MSMEs need access to (green) finance to adopt greener building practices and grow. Over the past 15 years, Rwanda has mobilised sub-

stantial international green finance, notably through the Rwanda Green Fund, developed its first domestic green financial products and embedded them in a comprehensive policy framework. Yet it still faces an estimated USD 6.2 billion funding gap to meet its commitments under the Paris Agreement from 2020 to 2030 (MINECOFIN [Ministry of Finance and Economic Planning], 2024). At the same time, stakeholders repeatedly noted that existing funds are not being fully used. Ireme Invest, for example, which is run through the Development Bank of Rwanda (BRD), was initially capitalised with USD 104 million to support e-mobility, green buildings and circular economy projects (AfDB [African Development Bank], 2025), but MSMEs struggle to access such funds. Many operate informally and lack the financial records and collateral (typically land or buildings) that banks require. They also face high interest rates (up to 18 per cent p.a. according to our interviews), lengthy due diligence processes, short repayment periods, complex application procedures, and limited staff and expertise to write bankable proposals. Commercial banks, in turn, cite non-harmonised definitions of green buildings and policies, firms' inability to meet eligibility criteria, their own limited liquidity and access to concessional capital from development finance institutions, and little evidence on the value of green assets. Microfinance institutions such as savings and credit cooperatives (SACCOs) are closer to MSMEs, but rarely offer financial products for green buildings and their loans are often too small. The result is a reinforcing cycle: green investments remain unproven and undervalued, which makes green buildings harder to finance and limits their uptake.

Phasing in local materials: weighing the trade-offs

Phasing in local earth- and bio-based materials such as improved rukarakara or ISSBs can be challenging. The benefits are largest in low-rise public buildings and affordable housing; the risks grow where quality control is weak or density is high.

Table 2: Trade-offs of phasing in ISSBs and improved rukarakara

Benefits	Risks
Cost	
Lower production costs for improved rukarakara and ISSBs than for conventional alternatives; on-site production also saves transport costs	Relatively high upfront cost of equipment (e.g. presses for ISSBs); additional costs for research, local testing and standardisation
Climate and environment	
Lower embodied carbon; no firewood for kilns; less reliance on imported cement and clinker	ISSBs still use some cement; soil extraction needs land-use rules
Performance	
High thermal comfort; adequate compressive strength for two-storey buildings (ISSBs)	Quality depends on soil, mix and curing – and on workers' skills; bricks must withstand heavy rainfall and moisture and must meet seismic requirements in the Western Province
Jobs and value chains	
Labour-intensive, decentralised production suited to MSMEs and local employment	Fired-brick and block producers lose market share; workers need retraining
Urban form	
Suits single- and two-storey housing in secondary cities and peri-urban areas	Limited fit with the multi-storey density that land-scarce Kigali needs
Social acceptance	
Visible public use can turn local materials into a modern choice	If confined to low-income housing, stigma may deepen rather than fade

Source: Authors

The trade-offs presented in Table 2 suggest that the order in which local earth- and bio-based materials are introduced matters as much as the decision to promote them. A phased approach would begin where benefits are greatest and risks easiest to manage, such as schools, health centres, district offices and affordable housing. Each phase should be backed by standards, testing and training. Using local materials not only in low-income housing but also in public buildings and mid-market housing would help counter the perception that they are "for the poor". Requirements can then be tightened as quality and supply chains mature.

Recommendations

- **Align policy instruments and initiatives and set clear steps for operationalising them.** Harmonise definitions, green criteria, thresholds and priorities across the Building Code, the GBMCS, the Rwanda Green Taxonomy, procurement rules, standards and curricula. Operationalise them, for example by extending GBMCS requirements progressively: phase them in for medium-sized residential and commercial buildings, strengthen them for large public and commercial buildings where thresholds are low, and set realistic requirements for small residential and commercial buildings and for temporary and minor structures. Operationalise GBMCS incentives with clear criteria, timelines and verification, for example a fast-tracked permit review for qualifying green projects.
- **Build confidence through testing, standards and visible demonstration.** Strengthen research, testing and standards for ISSBs, improved rukarakara and other local, earth- and bio-based, and recycled materials. Launch a nationwide demonstration programme across price points – public buildings and mid-market as well as low-income housing – and publish data on cost, comfort, maintenance and durability of materials.
- **Use public procurement and supplier development programmes to grow the missing middle.** Include simple green tender provisions, green contract conditions and MSME work packages in major public contracts. Require or reward large contractors for subcontracting, training and knowledge transfer to MSMEs through supplier development programmes. Assess a dedicated green MSME fund co-financed by firms winning public tenders, and monitor compliance to prevent rent capture.
- **Make green finance reach MSMEs.** Improve access to existing funding channels before creating new ones: streamlined pre-assessment, longer repayment periods, partial guarantees and collateral that covers moveable assets (e.g. equipment), contracts and receivables. Support SACCOs with guidance and risk-sharing, use cooperatives such as the Cooperative for the Promotion of Construction Materials Traders (COPCOM) for bulk purchasing, and publish simple Taxonomy guidance for MSMEs.
- **Close priority skills gaps as part of a package.** Offer modular, project-linked training by material and trade: ISSB production and construction for masons, ISSB design for architects and engineers. Strengthen management skills in small and growing firms, expand recognition of prior learning, and promote health and safety to retain trained workers.

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We gratefully acknowledge the collaborative work carried out with the University of Rwanda and Equilibria Ltd, particularly the contributions of Dr Aime Tsinda, Peter Katanisa and Dr Mycline Umuhoza. This Policy Brief summarises policy-relevant findings from the IDOS Postgraduate Programme (PGP) project on "Pathways to a Greener, More Productive Firm Landscape in Rwanda's Built Environment" (2026).

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The German Institute of Development and Sustainability (IDOS) is institutionally financed by the BMZ, based on a resolution of the German Bundestag, and the state of North Rhine-Westphalia (NRW) as a member of the Johannes-Rau-Forschungsgemeinschaft (JRF).

Suggested citation:
Dutta, M., Never, B., & Stöcker, A. (2026). *Green construction: scaling the use of low-carbon building materials in Africa* (IDOS Policy Brief 33/2026). IDOS. https://doi.org/10.23661/ipb33.2026

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IDOS Policy Brief / German Institute of Development and Sustainability (IDOS) gGmbH

ISSN (Print) 2751-4455
ISSN (Online) 2751-4463

DOI: https://doi.org/10.23661/ipb33.2026

© German Institute of Development and Sustainability (IDOS) gGmbH
Tulpenfeld 6, 53113 Bonn
Email: publications@idos-research.de
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