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Unlocking Climate Finance for Low-Carbon Construction and Affordable Housing in Africa:

A Tanzania Case Study on Low-Carbon Concrete Blocks



About Grupo Sofonias and Ecosur Network

Connecting sustainable construction, affordable housing and climate solutions with real world implementation conditions.

Grupo Sofonias is a Swiss non-profit international development organisation working on sustainable habitat, low-carbon construction, social and affordable housing, disaster risk reduction and climate resilience.

Through **Ecosur Network**, it connects organisations, technical centres, universities, communities and professionals working on locally appropriate construction and sustainable development solutions.

The organisation combines applied technical work with field implementation. Its role is to help partners assess, adapt and demonstrate solutions under real-world conditions, generating the technical, market and social evidence required for wider adoption.



What we do

Low-carbon construction

Feasibility and market studies for low-carbon cement, LC3, low-carbon blocks, local materials and resource-efficient construction systems.

Affordable and resilient housing

Support to housing and construction projects that connect affordability, technical quality, climate resilience and local production capacity.

Climate finance readiness

GHG/MRV approaches, evidence generation, impact measurement, market and affordability analysis, and project preparation for scale-up.

How we work

Grupo Sofonias works with communities, municipalities, local organisations, NGOs, universities, producers, public institutions and companies. Its approach is to understand local needs, identify suitable pilot environments, support technology adaptation, organise training and demonstrations, collect user and market feedback, and build partnerships for wider adoption.



This makes the organisation a practical bridge between research, technology and implementation. It can complement universities, technology developers, companies and public actors by linking technical performance with affordability, user acceptance, local production systems, institutional support and replication pathways.

Our added value

Connecting technical innovation with the real conditions required for adoption: local needs, affordability, user acceptance, stakeholder coordination, training, market conditions and implementation pathways.

About the Authors

Unlocking Climate Finance for Low-Carbon Construction and Affordable Housing in Africa



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Javier Gil Elías is an international consultant and programme coordinator with more than 15 years of experience in development cooperation, humanitarian action, disaster risk reduction, housing recovery and sustainable construction. His recent work focuses on climate resilience, low-carbon construction materials, LC3 cement, carbon footprinting, emissions reduction and climate-finance-related project preparation.

For this study, he coordinated the research process, developed the climate finance and project preparation framework, analysed barriers to scale, and structured the Tanzania case study and pilot roadmap.



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Francis Benavides is an architect from the EcoSur Network, contributing experience in sustainable habitat, housing, participatory construction processes and locally appropriate building solutions. Her work connects architectural practice with community needs, local construction systems, resilience and practical implementation

For this study, she contributed the housing and construction perspective, helping connect low-carbon materials with affordability, local building practices, community relevance and implementation feasibility.

Why we prepared this study

This study was prepared in response to a practical gap in low-carbon construction: many promising materials and building solutions exist, but they often remain between technical innovation and scalable implementation.

The study focuses on the “missing middle” between promising materials and financeable projects. This missing middle includes evidence generation, technical validation, certification, MRV, capacity building, market engagement and risk reduction. The Tanzania case study on low-carbon concrete blocks is used to examine how such preparation could be structured in a real housing and construction context.

The objective is to help identify a practical pathway through which low-carbon construction materials can become trusted, measurable, regulation-ready and financeable for affordable housing and climate action.

Funding and Institutional Support

This study was financed by **Grupo Sofonias** as part of its ongoing work on sustainable habitat, low-carbon construction, climate resilience and affordable housing.

Grupo Sofonias supported the research to strengthen its understanding of the technical, institutional and financial conditions required to move low-carbon construction solutions from pilot stage to wider adoption. The study reflects the organisation’s broader commitment to locally appropriate construction solutions, sustainable housing and the practical connection between climate action, housing affordability and local material production.

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Unlocking Climate Finance for Low-Carbon Construction and Affordable Housing in Africa: A Tanzania Case Study on Low-Carbon Concrete Blocks

INTRODUCTION

Africa's rapid population growth and urbanization are creating an urgent need for affordable, resilient, and sustainable housing. The challenge goes beyond building more homes; it also involves ensuring affordability, quality, access to services, resilience, and low environmental impact. As cities expand, demand for construction materials such as cement, steel, and concrete will rise, raising a critical question: whether future development will follow high-carbon pathways or adopt lower-carbon, locally appropriate alternatives.

Decisions made today regarding materials, standards, financing, and design will shape emissions, costs, and resilience for decades. Low-carbon construction materials, including low-clinker cement, recycled materials, compressed earth blocks, and other circular solutions, offer significant potential to reduce emissions while supporting affordable housing.

However, many promising low-carbon technologies remain limited to pilot projects due to a lack of evidence, certification, market validation, financing structures, and institutional confidence. This creates a "missing middle" between innovation and implementation. While technical solutions exist and climate finance institutions seek impactful projects, many opportunities are not yet sufficiently prepared to become financeable and scalable.

This report examines how climate finance can help bridge that gap by supporting the preparation and adoption of low-carbon construction materials and climate-smart affordable housing solutions in Africa, with a particular focus on Tanzania. The report argues that scaling low-carbon construction is not only a technological challenge but also a financial, regulatory, market, and project-preparation challenge.

To address this issue, the report proposes the **Sofonias Climate Construction Accelerator (SCCA)** as a platform to generate the evidence, partnerships, and financing pathways needed to move low-carbon construction from pilot projects to large-scale implementation. The study analyzes the African housing context, identifies barriers to adoption, explores financing mechanisms, and presents a Tanzania case study on low-carbon concrete blocks.

Climate finance should support not only the implementation of already bankable projects but also the preparatory activities that make projects bankable, including technical validation, certification, monitoring systems, capacity building, market engagement, and risk reduction. With the right preparation ecosystem, low-carbon construction solutions can become scalable tools for both affordable housing and climate action.

The main finding is that climate finance should not only support implementation once projects are already bankable. It should also support the preparation work that makes low-carbon construction solutions bankable in the first place.

2. RESEARCH METHODOLOGY

This study adopts a **qualitative and exploratory research design** to investigate how climate finance can support the adoption of low-carbon construction materials and climate-smart affordable housing in Africa. Rather than measuring adoption statistically, the research focuses on understanding barriers, stakeholder perceptions, evidence requirements, financing pathways, and institutional challenges. The approach combines three main sources of evidence: **literature and document review, stakeholder interviews, and a Tanzania case study**.

The **literature review** draws on reports, policy documents, technical studies, and case studies from organizations such as UN-Habitat, the World Bank, IFC, AfDB, and the Global Alliance for Buildings and Construction. These sources were selected based on their relevance to climate finance, low-carbon construction, affordable housing, and project preparation. The review identifies common barriers, financing challenges, and implementation requirements while linking fields that are often studied separately, including housing, climate finance, sustainable construction, and carbon markets.

To complement the literature, the research conducted more than **20 semi-structured interviews** with climate finance experts, housing practitioners, construction specialists, certification professionals, and stakeholders relevant to Tanzania. These interviews explored topics such as adoption barriers, technical validation, affordability, standards, certification, market acceptance, financing mechanisms, MRV systems, and project preparation needs. The findings were analysed through thematic analysis to identify recurring patterns, financing gaps, risks, and evidence requirements.

An **online consultation through LinkedIn** was initially designed to collect additional practitioner perspectives. However, engagement was limited and did not provide sufficient qualitative data. As a result, the online consultation is treated as a methodological limitation rather than a significant evidence source. The experience suggests that social media platforms are more useful for networking and outreach than for generating robust research data.

Tanzania was selected as the main case study because it combines rapid urbanization, growing housing demand, climate vulnerability, supportive climate policies, and strong demand for cement-based construction materials. The case study examines housing needs, construction practices, low-carbon material opportunities, regulatory conditions, and climate finance readiness, using low-carbon concrete blocks as an illustrative example. Tanzania serves as an exploratory context rather than a comprehensive national assessment.

The research data were analysed using **thematic analysis and triangulation**, comparing findings from literature, interviews, and the case study. Key themes included financial, regulatory, market, technical, and measurement barriers, as well as climate finance mechanisms, risk reduction strategies, and project preparation needs. The goal was to develop a practical framework linking barriers, evidence requirements, financing solutions, and project readiness.

The study acknowledges some **limitations**. The findings are qualitative and not statistically representative of Africa as a whole. Interview participants were selected purposively, which may introduce bias, and the literature reflects the priorities of the organizations that produced it. Furthermore, the Tanzania case study remains exploratory; no physical pilot, laboratory testing, life-cycle assessment, or detailed financial modelling was conducted. Consequently, the research does not validate a specific low-carbon construction solution but instead identifies the evidence, partnerships, and preparatory work needed to move promising innovations toward implementation and climate finance readiness.

3.MARKET CONTEXT

Africa faces a severe and growing housing crisis driven by rapid population growth, urbanization, and expanding household formation. The continent requires an estimated **100 million additional housing units**, but the challenge extends beyond quantity to include affordability, quality, infrastructure, access to services, and climate resilience. As urban populations continue to grow, pressure on housing, land, infrastructure, and public services is intensifying.

East Africa reflects many of these continental trends. Countries such as Tanzania, Kenya, Uganda, Rwanda, and Ethiopia are experiencing rapid urban growth and increasing demand for affordable housing and infrastructure. However, formal housing supply often cannot keep pace with demand, resulting in informal settlements, overcrowding, and widespread self-construction. This creates a significant gap between housing needs and affordable housing delivery.

The expansion of housing demand is closely linked to **construction sector growth**. Construction plays a critical role in economic development, employment creation, and infrastructure provision, but it is also a major consumer of carbon-intensive materials such as cement, concrete, and steel. Therefore, the sector represents both a challenge and an opportunity: while it contributes to greenhouse gas emissions, it also offers a pathway to deliver sustainable, resilient, and affordable housing if lower-carbon solutions are adopted.

Growing housing and infrastructure needs are increasing demand for **construction materials and supply chains**, particularly cement-based products. Efficient, reliable, and locally produced materials can improve affordability, create jobs, and support economic development. Regional initiatives such as the African Continental Free Trade Area may strengthen local and regional value chains for construction materials, including low-carbon alternatives. However, supply chains face barriers such as limited financing, weak certification systems, lack of technical support, and uncertainty surrounding new materials.

The market environment is also influenced by climate commitments and policy frameworks. Many African countries are seeking to align housing and infrastructure development with climate mitigation and adaptation goals under the Paris Agreement. Tanzania provides an important example because its climate policies emphasize resilient settlements, infrastructure, finance, technology transfer, and monitoring systems. These priorities create opportunities to connect low-carbon construction with climate finance and sustainable development objectives.

Low-carbon construction offers benefits for both **mitigation and adaptation**. Lower-carbon materials can reduce embodied emissions, while climate-smart housing can improve resilience to floods, heat, storms, and other climate risks. However, climate finance requires credible evidence of impact, technical validation, measurable outcomes, and implementation capacity. As a result, project preparation remains essential to transform innovative ideas into financeable projects.

Overall, Africa's housing demand, urbanization, construction growth, material supply chains, and climate commitments are deeply interconnected. The continent faces a choice between expanding through conventional high-carbon construction methods or adopting lower-carbon, climate-smart alternatives. The chapter concludes that numerous low-carbon construction solutions already exist, including low-clinker cement, LC3, supplementary cementitious materials, compressed earth blocks, alternative masonry systems, recycled materials, and circular construction approaches. However, their large-scale adoption depends on technical validation, standards, certification, market confidence, affordability, and access to climate finance.

4 .THE LOW -CARBON CONSTRUCTION OPPORTUNITY

The transition to low-carbon construction does not rely on a single technology but on a range of material and construction strategies aimed at reducing embodied carbon, improving resource efficiency, and supporting circular economy objectives. These include **low-clinker cements, LC3 (Limestone Calcined Clay Cement), supplementary cementitious materials (SCMs)**, compressed earth blocks, alternative masonry systems, and recycled or circular construction materials. Their suitability for affordable housing depends not only on carbon reduction potential but also on affordability, technical performance, local availability, standards compliance, and market acceptance.

One of the most promising approaches is the use of **low-clinker cement**, which reduces the proportion of carbon-intensive clinker in cement by replacing it with alternative materials such as calcined clay, limestone, pozzolans, slag, or fly ash. Since clinker production is the main source of cement-related emissions, lowering clinker content can significantly reduce the embodied carbon of concrete, mortar, and blocks while maintaining their performance.

A particularly important solution is **LC3**, which combines clinker, calcined clay, and limestone. LC3 is attractive for emerging markets because its raw materials are often widely available, making it suitable for regions where cement demand is growing rapidly. However, its feasibility depends on local resource availability, production capacity, quality control, standards approval, and technical validation.

For Africa, LC3 and other low-clinker cement systems are relevant for three reasons:



Housing and infrastructure demand are expected to increase substantially, which will increase the consumption of cement-based materials.



Many affordable housing systems rely on concrete blocks, mortar and cement-based components that are already familiar to local builders.



If suitable raw materials are locally available, low-clinker cement could support both emissions reduction and local value creation.

Supplementary cementitious materials (SCMs) provide another important pathway. These materials partially replace clinker while maintaining or improving technical performance. SCMs can include fly ash, slag, natural pozzolans, calcined clays, volcanic materials, limestone, and certain agricultural residues. Their main environmental benefit comes from reducing clinker use, but their adoption depends on local availability, technical suitability, reliable supply chains, and rigorous testing to ensure strength, durability, and long-term performance.

Compressed earth blocks and alternative masonry systems represent another pathway for reducing the environmental impact of housing construction. These systems can include compressed earth blocks, stabilized soil blocks, interlocking blocks, unfired bricks, stone masonry, bamboo or timber-based systems where appropriate, and other locally adapted walling solutions.

These solutions can lower emissions by reducing dependence on energy-intensive materials and utilizing local resources. They may improve affordability and create local employment opportunities, but their adoption often faces challenges related to technical performance, moisture resistance, quality control, building regulations, and public perception.

Another important category is **recycled and circular construction materials**. These include recycled aggregates, construction and demolition waste, reused bricks, recycled plastics, recycled steel, and other waste-derived materials. Circular construction seeks to minimize resource extraction, reduce waste, extend material lifecycles, and improve resource efficiency. Such approaches can lower emissions, reduce costs, support local recycling industries, and create employment opportunities. However, challenges remain regarding material quality, supply chain reliability, standards compliance, traceability, and market confidence.

Successful adoption of low-carbon construction solutions depends not only on their environmental performance but also on their technology readiness. Readiness should be assessed across five dimensions:

Technical readiness – performance, durability, and safety.

Market readiness – acceptance by builders, developers, and users.

Supply readiness – availability of materials, production capacity, and quality control.

Regulatory readiness – compliance with standards, codes, and certification requirements.

Finance readiness – ability to demonstrate costs, risks, and measurable climate benefits.

Among the solutions reviewed, **low-carbon concrete blocks** are identified as the most practical candidate for an initial pilot project because they are already familiar to the market, can be produced locally, are easy to compare against conventional blocks, and can generate measurable emissions data. Other solutions, such as compressed earth blocks and recycled materials, also offer significant potential but generally require more work on standards, supply chains, quality assurance, and market acceptance.

Many low-carbon construction technologies already exist, but their large-scale deployment depends on evidence generation, technical validation, certification, market confidence, and financing mechanisms. Technology readiness must therefore be closely linked to project preparation in order to move innovations from technical feasibility to widespread market adoption.

5. BARRIERS TO SCALE

Although several low-carbon construction solutions already exist, including low-clinker cement, SCMs, alternative masonry systems, and circular materials, their adoption remains limited due to a combination of financial, regulatory, market, technical, and impact measurement barriers. These barriers are interconnected and explain why many promising technologies remain confined to pilot projects rather than achieving large-scale market adoption.

5.1 Financial Barriers

Financial constraints are among the most significant obstacles. Low-carbon materials often require substantial upfront investment for testing, certification, technical validation, market studies, pilot projects, and emissions measurement before they become attractive to investors. Small producers and developers frequently lack the resources to cover these costs, while affordable housing projects operate with narrow margins and highly price-sensitive consumers.

Perceived risk is another major challenge. Developers, financiers, and public agencies may be reluctant to support unfamiliar materials due to uncertainty about performance, durability, regulatory approval, and market acceptance. Limited access to credit, high interest rates, short loan maturities, collateral requirements, and currency risks further restrict investment. As a result, a “missing middle” emerges between early-stage innovation and commercial finance, leaving project preparation activities underfunded.

5.2 Regulatory Barriers

Regulatory frameworks often struggle to accommodate innovative construction materials. New low-carbon products may face unclear approval processes, insufficient standards, limited certification options, and procurement systems designed around conventional materials.

While standards are essential for safety and reliability, overly prescriptive regulations can hinder innovation. Certification systems can help build market confidence and facilitate access to green finance, but they may be expensive, complex, or inaccessible to smaller producers. In addition, climate-finance-related certification increasingly requires robust monitoring, reporting, and verification systems, creating additional compliance burdens.

5.3 Market Barriers

Even technically sound and legally approved materials may fail if the market does not trust or understand them. Construction is inherently conservative, and developers, contractors, and buyers tend to prefer familiar materials with proven track records.

Affordable housing markets are particularly sensitive because households often associate alternative materials with lower quality or informality. Market adoption therefore depends on demonstrating affordability, durability, comfort, safety, and reliability, not just environmental benefits. Furthermore, supply and demand are often trapped in a coordination problem: suppliers hesitate to invest without demand, while buyers hesitate without proven supply.

Building trust requires demonstration projects, technical data, certification, user feedback, cost comparisons, and risk-sharing mechanisms.

5.4 Technical Barriers

Low-carbon materials must meet strict performance requirements related to durability, safety, strength, and long-term reliability. However, local experience with these materials is often limited. Producers, contractors, designers, regulators, and financiers may lack the knowledge necessary to manufacture, specify, assess, or finance new products.

Technical barriers include insufficient testing facilities, limited quality-control systems, lack of standardized procedures, and inadequate training. Without local expertise and capacity-building programs, even technically promising solutions may perform inconsistently and fail to gain market confidence.

Successful adoption requires an entire technical ecosystem involving laboratories, standards institutions, training centers, producers, contractors, and housing agencies.

5.5 Impact Measurement Barriers

A major challenge for low-carbon construction is demonstrating measurable climate impact. Climate finance increasingly requires evidence that emissions reductions are real, verifiable, and comparable to conventional alternatives.

This requires tools such as **Life Cycle Assessment (LCA)** and **Monitoring, Reporting, and Verification (MRV)** systems. However, collecting reliable data can be difficult in emerging markets where producers often lack digital records, local emissions factors, technical expertise, and monitoring capacity.

A low-carbon concrete block, for example, must be compared against a conventional baseline to quantify avoided emissions. Although the principle appears simple, credible calculations require accurate data, clear boundaries, transparent assumptions, and independent verification. Developing such systems can be costly and complex, particularly for small and medium-sized producers.

As a result, promising materials may fail to access climate finance because their environmental benefits have not been sufficiently measured or documented.

5.6 Summary: Why solutions do not scale

The analysis in this chapter shows that the limited adoption of low-carbon construction solutions cannot be explained by technology alone. Many low-carbon materials and construction approaches already exist, and some have demonstrated strong technical and environmental potential. However, technical potential does not automatically translate into market adoption, financiality or scale.

Low-carbon construction solutions face a combination of financial, regulatory, market, technical and impact measurement barriers.



Financial barriers:

- Upfront costs
- Limited access to credit
- Perception of higher risk.



Regulatory barriers:

- Unclear standards
- Limited certification pathways
- Uncertainty around approval processes



Market barriers:

- Low acceptance
- Limited trust and reluctance among developers
- Builders, users and financiers to adopt unfamiliar materials



Technical barriers:

- Gaps in knowledge
- Training
- Testing capacity
- Quality control



Impact measurement barriers:

- Difficulty of applying life-cycle assessment
- Designing practical MRV systems
- Calculating avoided emissions in a credible way.

These barriers are interconnected. A lack of technical evidence increases perceived financial risk. Weak certification reduces market confidence. Limited standards make public procurement more difficult. Poor impact measurement reduces access to climate finance. Limited training can lead to poor implementation, which then damages trust in the material. For this reason, the problem is not only that low-carbon materials need to be invented or improved. The wider system needed to validate, finance, regulate, produce, measure and adopt them is often not yet in place.

This creates a gap between innovation and scale. Early-stage research and pilots may show that a material works, but commercial financiers often require stronger evidence before investing. At the same time, local producers and affordable housing developers may lack the resources to generate that evidence themselves. This produces a project preparation gap: the stage between technical potential and investment readiness is often underfunded.

The key conclusion is that low-carbon construction does not scale only through technology development. It scales when technology is supported by evidence, standards, finance, training, market confidence and credible impact measurement. In other words, low-carbon construction solutions need to become finance-ready, regulation-ready and market-ready.

This finding is central to the rest of the research. If the main barrier is not only technological, then the response cannot be limited to promoting individual materials. It must also focus on project preparation, risk reduction, evidence generation, certification, demand creation and financing mechanisms. The next chapter therefore examines how climate finance and related instruments could help bridge the gap between low-carbon construction innovation and scalable implementation.

6. STAKEHOLDER PERSPECTIVES

The stakeholder consultations confirmed that the main challenge in scaling low-carbon construction is not technological, but rather related to finance, standards, trust, certification, technical capacity, market demand, and impact measurement. Stakeholders consistently emphasized that low-carbon materials must prove their value not only in laboratories but also in real construction markets.

6.1 Overview of participants

The consultation included climate finance experts, housing developers, construction material producers, technical and certification specialists, public-sector representatives, development organizations, and sustainability practitioners. Their diverse perspectives highlighted that successful adoption requires coordination among producers, developers, regulators, financiers, buyers, and public institutions.

6.2 Financiers' perspectives

Financiers stressed that low-carbon materials must become investable projects, not just environmentally attractive technologies. They require evidence of technical performance, cost competitiveness, demand, implementation capacity, and measurable climate impact. Risk was a major concern, particularly regarding quality, durability, regulation, supply reliability, and market acceptance.

A key finding was the need for project preparation finance. Many innovations require funding for testing, certification, pilots, feasibility studies, market validation, and MRV systems before they can attract commercial or climate finance. As a result, many promising solutions remain trapped between innovation and investment readiness.

6.3 Developers' perspectives

Developers focused primarily on cost, risk, demand, and buyer acceptance. Affordable housing projects operate under strict financial constraints, making even small cost increases problematic. Developers are often reluctant to adopt new materials unless they offer a clear business case, proven technical performance, regulatory approval, and strong market acceptance.

They also noted that adoption becomes more attractive when low-carbon materials provide access to incentives, green finance, certification benefits, public procurement opportunities, or policy support.

6.4 Producers' perspectives

Material producers viewed the issue through the lens of production capacity, raw material availability, quality control, and market demand. Key concerns included the capital expenditures required for new equipment, certification, testing, and production adjustments.

Producers emphasized the importance of consistent access to raw materials such as calcined clay, limestone, pozzolans, recycled materials, and suitable aggregates. They also highlighted the need for reliable demand, since investing in low-carbon production is risky without market certainty. Many producers require support not only in technology but also in market development, certification, finance, and buyer engagement.

6.5 Technical and certification experts' perspectives

Technical experts highlighted the importance of testing, standards, certification, and environmental verification. Low-carbon materials must demonstrate compliance with performance requirements such as strength, durability, moisture resistance, and long-term reliability.

They also emphasized the need for life-cycle assessment (LCA), carbon accounting methods, environmental product declarations, and MRV systems to support climate claims. However, testing and certification can be expensive and complex for small producers, creating a need for technical assistance and simplified approval pathways.

6.6 Public and development actors' perspectives

Public institutions and development organizations emphasized the importance of policy alignment, public procurement, climate commitments, and concessional support.

They argued that low-carbon construction is more likely to scale when connected to housing strategies, climate policies, procurement rules, and urban development plans. Public procurement was identified as a powerful demand-creation tool, while grants, technical assistance, concessional finance, and development cooperation can help fund early-stage activities such as pilots, capacity building, standards development, and market validation.

These stakeholders also stressed that low-carbon construction should contribute not only to emissions reduction but also to affordable housing, employment, resilience, local production, and social inclusion.

6.7 Cross-cutting findings

Several common themes emerged across all stakeholder groups:

- **The main challenge is not technology but implementation.** Most actors agreed that viable solutions already exist.
- **Evidence is critical.** Different stakeholders require evidence on performance, cost, risks, climate impact, compliance, and market demand.
- **Risk is distributed throughout the value chain.** Producers, developers, financiers, regulators, and public buyers all face different forms of risk.
- **Trust must be built through demonstration projects.** Real-world pilots, testing, certification, and reference projects are essential.
- **Climate finance depends on credible impact measurement.** LCA, MRV systems, baselines, and emissions calculations are necessary for finance readiness.
- **Project preparation is the missing link.** Activities such as testing, certification, feasibility studies, producer support, market validation, and MRV design often lack funding despite being essential for scaling.

7. FINANCING MECHANISMS

Financing is needed not only for the large-scale deployment of low-carbon construction solutions but also for the project preparation phase, where materials must be tested, validated, certified, and structured before they become attractive to investors. The main challenge is a financing gap between innovation and implementation. No single instrument is sufficient. The most realistic pathway is a combination of preparation grants, technical assistance, blended finance, procurement demand and local financial institutions.

7.1 Why finance is needed before scale

Low-carbon construction materials require funding for activities such as laboratory testing, certification, life-cycle assessment (LCA), MRV systems, feasibility studies, market validation, pilot projects, and business structuring. These activities generate the evidence that developers, public buyers, and financiers need before committing capital.

In Tanzania, this challenge is particularly relevant due to a significant development financing gap. As a result, low-carbon affordable housing projects must be designed as bankable and evidence-based investments capable of attracting private capital, blended finance, and climate finance.

7.2 Scope 3 insetting

Scope 3 insetting involves reducing emissions within a company's own value chain. In construction, developers, cement companies, real estate firms, or infrastructure investors could support low-carbon materials to reduce embodied carbon in their projects.

For example, a developer could help finance testing, certification, or early production of low-carbon blocks in exchange for verified emissions reductions and lower-carbon construction materials. This approach links climate objectives directly to procurement and supply-chain decarbonization.

7.3 Article 6

Article 6 enables international cooperation on emissions reductions and climate finance. Under Article 6.2, countries can transfer verified mitigation outcomes in exchange for investment and support.

In theory, low-carbon construction materials could generate measurable emissions reductions eligible under Article 6. However, this mechanism requires strong MRV systems, robust baselines, government authorization, and alignment with national climate commitments. Due to its complexity, it is considered more suitable for future large-scale programs rather than early-stage pilot projects.

7.4 Blended finance

Blended finance combines public, concessional, philanthropic, and private capital to support sustainable development.

For low-carbon construction, grants can fund feasibility studies, testing, certification, and MRV systems. Concessional loans can support equipment upgrades and production improvements, while guarantees can reduce risks for private lenders. Private investors can then participate once projects demonstrate technical viability and market potential.

Blended finance is particularly relevant because it helps bridge the gap between early-stage innovation and commercial investment.

7.5 Green procurement

By including sustainability criteria such as embodied carbon reductions, low-carbon materials, or certified products in procurement requirements, governments, municipalities, NGOs, and development organizations can create an initial market for low-carbon construction materials.

This demand can encourage producers to invest, reduce market uncertainty, and generate demonstration projects. However, effective green procurement requires reliable standards, certification, and verification systems.

7.6 Results-based finance

In the construction sector, eligible results could include:

- Verified CO₂ emissions reductions.
- Production and use of certified low-carbon blocks.
- Construction of affordable housing units.
- Achievement of sustainability standards.
- Energy, material, or resilience improvements.

This mechanism rewards measurable performance rather than activities. However, it depends on robust monitoring, reporting, and verification systems to demonstrate that results have actually been delivered.

8. CASE STUDY: TANZANIA

8.1 Housing context

Tanzania faces significant housing challenges driven by population growth, urbanization, affordability constraints, and limited access to formal housing finance. Housing needs extend beyond the number of units required and include quality, resilience, affordability, and access to services. As demand for construction materials increases, there is an opportunity to introduce lower-carbon materials that support affordable housing while reducing environmental impacts.

8.2 Construction sector

The Tanzanian construction sector is a major contributor to economic growth, infrastructure development, and employment. It includes developers, cement producers, contractors, engineers, public agencies, and informal builders. Since concrete blocks and cement-based materials are already widely accepted, improving the environmental performance of these familiar products may be more practical than introducing entirely new building systems. However, challenges such as inconsistent quality control, fragmented production, limited financing, and weak technical capacity remain important constraints.

8.3 Cement and block market

Concrete blocks are a particularly attractive entry point for low-carbon construction because they are widely used, easy to measure, and can be directly compared with conventional alternatives in terms of cost, strength, durability, and emissions. However, before scaling any solution, detailed market research is needed to understand producer profiles, production costs, cement consumption, pricing, supply chains, and buyer preferences.

8.4 Low-carbon material potential

Tanzania may have significant potential for low-carbon materials such as LC3, low-clinker cement, supplementary cementitious materials (SCMs), natural pozzolans, calcined clays, limestone, and improved production practices.

Two main pathways are identified:

- **Material substitution**, replacing part of the clinker or cement with SCMs.
- Production optimization, reducing cement consumption through improved dosing, mixing, compaction, curing, and quality control.

Both approaches could lower embodied carbon while maintaining affordability and technical performance.

8.5 Regulatory environment

The regulatory framework will play a critical role in determining whether low-carbon blocks can be adopted. Materials must comply with requirements related to strength, durability, water absorption, dimensions, and overall performance.

The study highlights the importance of:

- Standards and testing protocols.
- Certification pathways.
- Laboratory capacity.
- Public procurement rules.
- Performance-based specifications.

8.6 Climate finance relevance

Tanzania's climate policies, including its Nationally Determined Contribution (NDC), emphasize climate-resilient infrastructure, sustainable settlements, climate finance, technology transfer, and capacity building. This creates an opportunity to position low-carbon construction as both a mitigation and adaptation solution.

Low-carbon blocks could contribute to:

- Lower embodied carbon emissions.
- Climate-resilient housing.
- Local economic development.
- Job creation and skills development.

However, access to climate finance will require credible evidence through baselines, life-cycle assessment (LCA), monitoring, reporting and verification (MRV), and demonstrated emissions reductions.

8.7 Opportunity assessment

The analysis concludes that Tanzania is a strong candidate for a low-carbon concrete block pilot, but the pilot should focus on project preparation and evidence generation rather than immediate large-scale deployment.

The main advantages are:

- Growing housing and infrastructure demand.
- Existing market familiarity with concrete blocks.
- Ability to measure and compare block performance and emissions.

- Supportive climate policy environment.
- Increasing interest in blended finance and private capital mobilization.

A pilot could generate evidence on:

- Technical performance.
- Production feasibility.
- Cost competitiveness.
- Emissions reductions.
- Market acceptance.
- Certification requirements.
- Potential financing mechanisms such as green procurement, blended finance, Scope 3 inseting, and results-based finance.

9. THE MISSING MIDDLE

9.1 The gap between innovation and adoption

Technical innovation alone is insufficient to drive adoption. The construction sector is inherently conservative because buildings are long-term assets, and material failure can create significant safety, financial, and reputational risks. As a result, developers, contractors, regulators, and buyers tend to favor materials that are familiar, certified, and proven under local conditions.

Many low-carbon materials remain underutilized because users may lack trust, standards may be unclear, banks may perceive them as risky, and climate benefits may not be measurable. Therefore, the challenge is not only technological but also financial, market-based, regulatory, and institutional.

9.2 Why pilots fail to become financeable projects

Many pilot projects successfully demonstrate technical feasibility but fail to attract investment because they do not generate the evidence required by developers, financiers, regulators, and public buyers.

A pilot may prove that a material works technically but fail to demonstrate:

- Cost competitiveness.
- Scalability.
- Long-term durability.
- Market demand.
- Certification pathways.
- Supply reliability.
- Climate impact measurement.
- Business viability.

For Tanzania, this means that a low-carbon block pilot should be designed not only as a technical experiment but also as a process that generates evidence on costs, quality, standards compliance, supplier capacity, affordability, procurement feasibility, and climate benefits.

9.3 The evidence gap

The core of the “missing middle” is an evidence gap. Different stakeholders require different forms of evidence before supporting low-carbon construction solutions:

Technical evidence	strength, durability, water absorption, curing behavior, and suitability for local conditions.
Financial evidence	production costs, CAPEX requirements, affordability, pricing, and profitability.
Climate evidence	baselines, life-cycle assessment (LCA), avoided emissions calculations, and MRV systems.
Regulatory evidence	compliance with standards, certification requirements, and building codes.
Market evidence	supplier capacity, buyer demand, user acceptance, and procurement opportunities.

9.4 The project preparation gap

The project preparation gap refers to the lack of funding, coordination, and institutional support for activities that occur before investment. This stage includes testing, certification, feasibility studies, market assessments, business modelling, MRV design, financial structuring, and stakeholder engagement.

Research funding often supports studies, while commercial finance supports proven projects. The intermediate stage that transforms an idea into a financeable project is frequently underfunded. As a result, essential preparation activities often lack a clear source of funding.

The problem is not only financial but also organizational. Successful project preparation requires coordination among producers, laboratories, developers, regulators, financiers, public buyers, and climate finance actors. Without this coordination, evidence remains fragmented and projects fail to become investment ready.

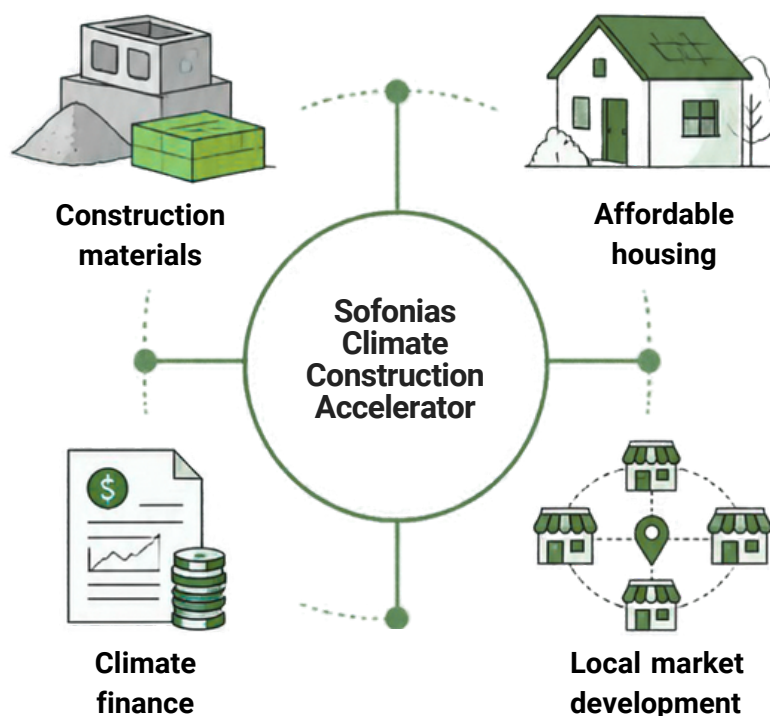
9.5 Implications for low-carbon affordable housing

The missing middle is especially important in low-carbon affordable housing. Affordable housing markets operate under strong cost constraints. Materials must be safe, durable and affordable. Developers must manage construction risk. Households must trust the final product. Public agencies must justify procurement decisions. Financiers must be confident that projects can repay loans or deliver verified results.

10. PROPOSAL: SOFONIAS CLIMATE CONSTRUCTION ACCELERATOR

The Sofonias Climate Construction Accelerator (SCCA) is proposed to address the "missing middle" between innovation and large-scale adoption of low-carbon construction solutions. Although many sustainable building materials and affordable housing technologies exist, they often fail to become financeable or scalable because of limited evidence, weak project preparation, unclear certification pathways, insufficient monitoring systems, and perceived risks among developers, regulators, investors, and public buyers.

SCCA is designed as a project preparation and market-building platform that helps transform promising low-carbon construction materials and climate-smart housing solutions into practical, bankable, and scalable projects. Rather than promoting technologies directly, it focuses on generating the evidence, partnerships, technical validation, and financial structures needed for adoption.



The accelerator would not present low-carbon construction as a ready-made solution. Instead, it would create a structured process to test whether specific materials and housing solutions can meet the requirements of real markets. These requirements include technical performance, affordability, standards compliance, user acceptance, supplier reliability, measurable climate impact and finance readiness.

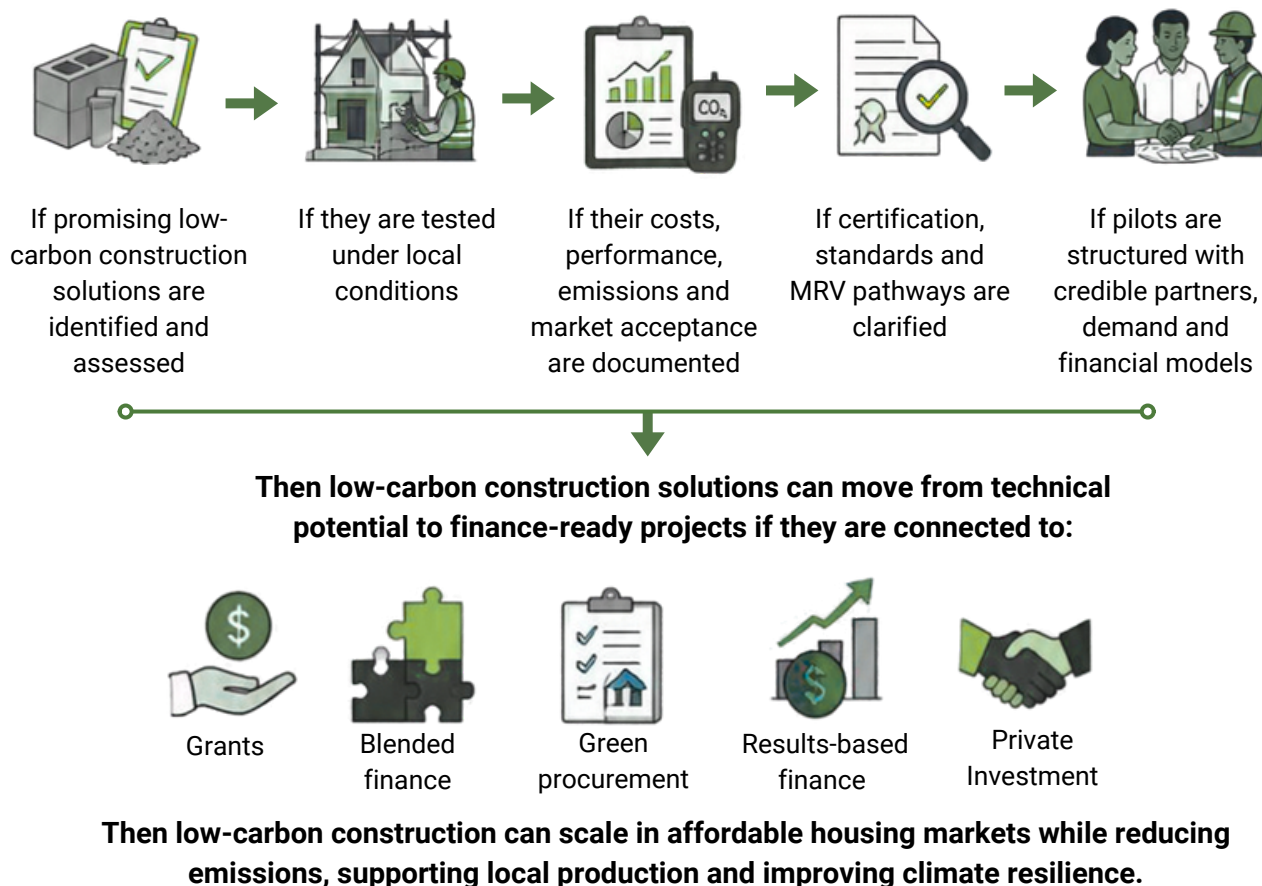
To achieve this, it supports activities often left unfunded, including material testing, pilot design, market assessments, certification pathways, life-cycle assessments, MRV systems, business modeling, and investment preparation.

More specifically, SCCA would:

- Identify promising low-carbon construction materials, products and housing solutions.
- Assess their technical, market, regulatory and financial readiness.
- Support laboratory testing and performance validation.
- Develop baseline and emissions reduction calculations.
- Design simple and credible MRV systems.
- Review standards and certification pathways.
- Support local producers and developers with technical assistance.
- Structure pilots that generate useful evidence for scale.
- Connect projects with public buyers, developers, climate finance institutions and investors.
- Prepare projects for grants, concessional finance, blended finance, green procurement or results-based finance.

The theory of change behind SCCA is based on the idea that low-carbon construction solutions fail to scale when they lack evidence, trust and financial structure. If these gaps are addressed through project preparation, then low-carbon materials can become more credible, adoptable and financeable.

The theory of change can be summarized as follows:



SCCA would operate through several integrated workstreams. These workstreams reflect the main barriers identified in this research and the types of evidence required to move from innovation to adoption.

Workstream 1: Low-carbon materials

Focuses on identifying and validating materials such as:

- LC3 cement
- Low-clinker cement
- Supplementary cementitious materials
- Natural pozzolans
- Calcined clay
- Low-carbon concrete blocks
- Compressed earth blocks
- Recycled aggregates

Workstream 2: Affordable housing applications

Links material innovation to real housing needs by assessing applications in:

- Affordable housing
- Social housing
- Incremental housing
- Public buildings
- Community infrastructure

Workstream 3: Impact measurement

Develops credible methods to measure climate benefits through:

- Emissions baselines
- Avoided-emissions calculations
- Life-cycle assessment boundaries
- MRV systems
- Reporting and verification frameworks

Workstream 4: Standards and certification

Supports regulatory acceptance by:

- Reviewing standards and testing requirements.
- Defining certification pathways.
- Engaging authorities, laboratories, and certification bodies.

Workstream 5: Capacity building

Strengthens local capabilities through training on:

- Production processes
- Quality control
- Testing procedures
- Data collection
- MRV systems
- Business management

Workstream 6: Investment readiness

Transforms technical evidence into investment opportunities through:

- Feasibility studies
- Financial modeling
- Risk assessments
- Funding strategies
- Grant applications
- Blended finance structures
- Investor engagement

11. FINANCIAL MODEL

SCCA adopts a staged financing approach, reflecting the different needs and risk levels of project development:



Research and Opportunity Identification

- Includes market studies, stakeholder mapping, housing demand analysis, raw material screening, policy reviews, and climate finance assessments.
- Goal: determine whether an opportunity is viable.
- Funding sources: grants, technical assistance, and philanthropic support.



Validation

- Covers laboratory testing, material performance assessments, life-cycle assessments (LCA), standards reviews, certification pathways, and preliminary MRV design.
- Goal: generate evidence to reduce technical, regulatory, and financial uncertainty.



Pilot Implementation

- Includes small-scale production, demonstration buildings, training, quality control, buyer engagement, and verification of results.
- Goal: test the solution under real market conditions and validate demand.



Scale-Up

- Involves production upgrades, larger procurement agreements, concessional loans, guarantees, equipment investment, and larger climate finance instruments.
- Goal: expand projects with proven technical and commercial viability.

During the early stages, grants and technical assistance (TA) are the most appropriate funding sources because projects have not yet proven market demand, technical performance, certification compliance, or climate impact.

Grants can fund:

- Feasibility studies
- Laboratory testing
- Market assessments
- Stakeholder engagement
- Climate impact assessments
- Training programs
- Pilot design
- Early MRV development

Technical assistance supports:

- Mix design and quality control
- Certification processes
- Data management
- Business planning
- Green procurement
- Risk assessment for financiers

12. PILOT ROADMAP

A staged pilot roadmap for low-carbon concrete blocks in Tanzania, is designed to move from research and validation to technical testing, market readiness, financing preparation, and eventual scale-up. The goal is to generate the evidence needed to determine whether low-carbon blocks are technically viable, affordable, market-accepted, compliant with standards, and suitable for climate finance.

12.1 Phase 1: Research and Validation

The first phase focuses on assessing whether a low-carbon block pilot is feasible and worth pursuing. Activities include market assessment, producer mapping, material screening, demand analysis, standards review, and engagement with key stakeholders such as the National Housing Corporation (NHC).

Key objectives are to understand current block production practices, identify potential low-carbon materials, evaluate regulatory requirements, and determine market interest.

Expected outputs:

- Market assessment of block production.
- Mapping of producers, buyers, and institutions.
- Analysis of prices, cement use, and production practices.
- Shortlist of potential low-carbon materials.
- Preliminary standards and certification review.
- Feedback from housing and institutional stakeholders.
- Initial climate finance assessment.
- Decision on whether to proceed to a technical pilot.

12.2 Phase 2: Technical Pilot

This phase evaluates whether low-carbon concrete blocks can meet required performance standards while reducing cement use and embodied carbon.

Activities include laboratory testing, mix design development, pilot production trials, baseline comparisons, and quality-control procedures. Potential solutions may involve supplementary cementitious materials, lower-clinker cements, improved mix designs, or production improvements.

Testing focuses on:

- Compressive strength
- Water absorption
- Density
- Dimensional consistency
- Durability
- Curing performance

12.3 Phase 3: Market and finance readiness

This phase transforms a technically validated product into a solution that can attract buyers, regulators, and financiers.

Activities include:

- Stakeholder consultations with developers, contractors, municipalities, NGOs, and housing institutions.
- Development of certification and standards pathways.
- Creation of MRV (Monitoring, Reporting and Verification) systems.
- Embodied carbon and life-cycle assessments.
- Identification of financing opportunities and demand partners.

Engagement with organizations such as the National Housing Corporation can help identify demonstration projects and clarify procurement requirements.

12.4 Phase 4: Scale-up

Scale-up begins only if previous phases demonstrate technical viability, affordability, regulatory alignment, market acceptance, and credible climate benefits.

Possible scale-up strategies include:

- Upgrading production facilities.
- Establishing procurement agreements.
- Supplying larger housing developments.
- Creating multi-producer quality and MRV systems.

SCCA's role is to coordinate stakeholders, manage evidence generation, structure financing, and maintain quality assurance rather than operate production itself.

12.5 Go / redesign / stop decision points

At the end of each phase, the project should be evaluated against predefined criteria to determine whether to:

- **Go:** Advance to the next phase.
- **Redesign:** Adjust the approach and address identified gaps.
- **Stop:** End the project if technical, market, financial, or regulatory barriers make scale-up unrealistic.

DECISION POINT	GO	REDESIGN	STOP
After Phase 1: Research and validation	There is market demand, credible partners, potential materials and a possible standards pathway	Interest exists, but the technical option, location, partner or market segment needs adjustment	No demand, no credible partners, no material pathway or no institutional relevance
After Phase 2: Technical pilot	Blocks meet technical requirements, show cost or emissions potential and can be produced locally	Technical results are promising, but require mix redesign, better curing, training or additional testing	Blocks fail minimum performance or are impractical for local production
After Phase 3: Market and finance readiness	Buyers show interest, MRV is feasible, certification pathway is clear and a financing route is plausible	Market interest exists, but value proposition, MRV, certification or finance structure needs adjustment	No buyer interest, no credible finance pathway, no feasible MRV or unacceptable regulatory barriers
During Phase 4: Scale-up	Production can expand, demand is confirmed, finance is available and quality can be maintained	Scale-up is possible, but requires more technical assistance, guarantees, procurement support or producer strengthening	Model remains dependent on grants, costs are too high, quality is inconsistent or demand does not materialize

13. RECOMMENDATIONS

This chapter presents recommendations for the main actors involved in low-carbon construction and affordable housing. The recommendations are based on the central findings of this research: **low-carbon construction solutions already exist, but they often fail to scale because they are not yet technically validated, regulation-ready, market-ready or finance-ready.**

Governments play a critical role in creating an enabling environment for low-carbon construction.

Key recommendations include:

- Strengthen standards and approval pathways through performance-based regulations that focus on outcomes such as strength, durability, safety, and environmental performance.
- Integrate low-carbon materials into affordable housing policies and strategies.
- Use public procurement to create initial market demand for validated low-carbon materials.
- Link low-carbon construction with Nationally Determined Contributions (NDCs), climate goals, housing development, and green job creation.
- Support project preparation activities such as testing, certification, feasibility studies, technical assistance, and MRV systems.

Development Finance Institutions (DFIs) and Climate Funds should focus on financing the "missing middle" between innovation and commercialization.

Key recommendations include:

- Establish dedicated project preparation facilities for low-carbon construction and affordable housing.
- Fund feasibility studies, material testing, certification, LCA, MRV systems, pilot preparation, and financial structuring.
- Provide technical assistance to producers, developers, public agencies, and financial institutions.

- Use guarantees, concessional finance, and blended finance to reduce investment risks.
- Support MRV and verification systems needed to measure climate benefits.
- Finance not only mature projects but also SMEs, local producers, and affordable housing initiatives during the preparation phase.

Climate finance institutions should adapt their instruments to the specific needs of construction materials and affordable housing.

Recommendations include:

- Develop practical methodologies for measuring embodied carbon reductions.
- Support simple and affordable MRV systems suitable for small producers.
- Introduce results-based financing linked to verified outcomes such as CO₂ reductions, certified materials, or affordable housing delivery.
- Recognize the dual benefits of mitigation and climate resilience in housing projects.
- Promote aggregation models that allow groups of producers to access climate finance collectively.

The construction industry has a significant role in validating and mainstreaming low-carbon materials.

Key actions include:

- Collaborate with laboratories, universities, and technical experts to validate material performance.
- Share technical and production data to reduce uncertainty and improve learning.
- Develop strong quality-control systems and standardized operating procedures.
- Support smaller producers through technical assistance, purchasing agreements, and supplier development programs.
- Emphasize the broader value of low-carbon materials, including quality, durability, cost stability, local sourcing, and access to green finance, not only carbon reductions.

Developers are essential because they create demand for construction materials.

Recommendations include:

- Participate in pilot projects that test low-carbon materials in real construction applications.
- Help define adoption requirements such as cost, durability, certification, performance, and buyer acceptance.
- Provide conditional purchasing commitments to encourage producer investment.
- Incorporate embodied carbon considerations into design and procurement decisions.
- Explore green finance opportunities, concessional loans, sustainability certifications, and climate-related funding mechanisms.

Material producers are responsible for transforming innovation into reliable commercial products.

Key recommendations include:

- Invest in quality-control systems covering raw materials, production processes, curing, storage, and handling.
- Participate actively in testing and performance validation.
- Improve traceability and data management for certification, MRV, and climate finance purposes.
- Develop a clear understanding of production costs, efficiencies, and potential savings.
- Engage buyers early to understand market requirements and demand expectations.
- Collaborate with universities, laboratories, NGOs, developers, standards bodies, and financial institutions to strengthen credibility and reduce risk.