SHIFT-House: A Smart, Green Prototype for Sustainable Housing

Submitted By: Smart Green Shit Ltd., ARPEDAC



Organization Profile

Organization Name: Smart Green Shift Ltd

Organization Type: Private sector

Website: https://www.smartgreenshift.com/

Practice Details

Country(ies): Cameroon

City(ies): Yaounde

Start Year: 2019 **Ongoing:** Yes **End Year:** N/A

Main Adequate Housing Components:



Housing Thematic Areas:

- Housing Affordability & Financing
- Housing & Climate Mitigation
- Technology & Digital Solutions in Housing

Relevant SDGs:



UN-HABITAT

Problem & Context

Yaoundé faces a growing housing crisis driven by rapid urbanization, rising costs, and inadequate infrastructure. Informal settlements, often in flood-prone areas, lack access to clean water, sanitation, and reliable energy. Conventional housing models rely on costly, carbon-intensive materials, while policies rarely support low-carbon or climate-resilient construction. Key gaps include weak green building standards, limited smart infrastructure integration, and fragmented approaches to informal housing upgrades. SHIFT-House addresses these challenges by providing a smart, affordable, and low-carbon housing prototype tailored to Cameroon's urban context, supporting inclusive, sustainable urban growth.

Solution Developed

SHIFT-House addresses Yaoundé's housing and climate challenges with an affordable, low-carbon prototype tailored for urban resilience. Targeting low- to middle-income residents, it combines sustainable construction and smart technology to deliver durable, self-sufficient housing.

Key objectives include:

- Providing affordable, climate-responsive homes;
- Reducing energy and water demand;
- Enhancing comfort through passive design;
- Promoting waste and water recycling.

The solution prioritizes innovative envelope techniques, using stabilized compressed earth blocks (SCEBs) for thermal mass and locally made micro concrete tiles for a cool roof system. Combined with a waffle slab structure and cross-ventilation design, the house maintains indoor comfort without active cooling. Integrated systems manage greywater reuse, rainwater harvesting, and on-site waste sorting and treatment. A KNX automation platform controls lighting, ventilation, and metering for efficient, user-friendly operation. SHIFT-House is both a housing and environmental systems innovation, replicable across similar urban contexts.

Implementation

SHIFT-House was developed as a living laboratory in Yaoundé to demonstrate smart, low-carbon housing solutions. Key actions included:

- Construction & R&D: Built a ~100 m² prototype using stabilised compressed earth blocks, waffle-slab floors, cool micro-concrete tiles, clean cooking tech, and KNX automation. Integrated systems include rainwater harvesting, greywater recycling, waste sorting, and smart metering.
- Monitoring: Systems track thermal comfort, energy and water use over 12 months.

- Knowledge Transfer: Produced policy, technical, and user guides; held two professional workshops and five public demonstration events.
- Training & Education: Used as a research hub for ENSTP students and to promote sustainable technologies.

Key Actors:

- Smart Green Shift Ltd: Project lead and implementer.
- ENSTP students: Design, monitoring, and site-based training.
- ARPEDAC: Co-facilitator for outreach and SECAM events.
- Government and policymakers: Engaged via workshops and policy dialogues.
- Communities: End users giving feedback and participating in demonstrations.

Timeline:

- Planning began in late 2023 with ARPEDAC and ENSTP. Construction launched mid-2024. Monitoring, training, and events will continue through 2026–2027.

Resources:

- Supported by Smart Green Shift Ltd's R&D fund, with in-kind inputs from ARPEDAC and ENSTP. Events delivered through ARPEDAC's SECAM network.

Enablers & Obstacles

Key enablers included strong leadership from Smart Green Shift Ltd, student involvement from ENSTP, and alignment with Cameroon's green building codes (supported by UN-Habitat and ARPEDAC). Climate-responsive design was guided by Climate Consultant 6 and EDGE software, optimizing energy and water efficiency, and minimizing embodied carbon. Labor-based technologies like the QMR2-40 CEB machine and manual vibrating table empowered local workers, reduced costs, and offered hands-on training. ARPEDAC's SECAM platform enabled broad outreach and built institutional and community support.

Obstacles included a lack of local skills for advanced elements such as KNX automation, Micro Concrete Tiles, and Waffle Slab floors. These were addressed through on-site capacity building. Slow public agency coordination was mitigated by continuous engagement via workshops and policy events to ensure alignment.

Results & Impact

SHIFT-House demonstrated measurable environmental and social benefits. Quantitatively, the prototype achieved over 80% energy savings, 40% water savings, and more than 50% reduction in embodied carbon compared to conventional concrete-block housing. Real-time monitoring confirmed enhanced thermal comfort without air conditioning, thanks to passive design and

cool roof systems. Smart meters and automation systems enabled users to track and manage consumption, fostering behavioral change.

For low-income and marginalized households, SHIFT-House offers a path to dignified, cost-efficient urban living. By utilizing locally sourced materials and labor-based techniques like the QMR2-40 CEB machine, construction costs were reduced while empowering community members with training and employment.

Longer-term, SHIFT-House catalyzes a new model of sustainable urban development in Cameroon. It boosts local green economies, builds resilience to climate change, and contributes to national and international sustainability targets (SDGs 6, 7, 11, and 13). The project has already informed policy discussions and is positioned for replication through public-private collaboration, scaling its impact on housing access, community development, and environmental stewardship.

Replication & Scale Up

SHIFT-House is highly replicable due to its use of local materials, labor-based technologies, and passive design adaptable to diverse climates. It requires minimal infrastructure and aligns with EDGE and SDG standards, making it suitable for donor or government-led scaling. Critical factors include climate analysis, access to basic tools (e.g., QMR2-40), training programs, and policy alignment. With modest support, it can be replicated in regions facing housing, energy, and climate challenges.

SHIFT-House can be scaled through partnerships with government housing agencies, NGOs, and private developers. Its modular design allows for adaptation across climate zones and urban layouts. By integrating into national affordable housing programs or climate-resilient settlement upgrades, the model can reach thousands of households. Scale-up requires expanding local training, increasing access to tools like the QMR2-40, and securing climate finance or green housing funds to support replication at city or regional scale.

Policy Uptake

This housing practice has informed or been partially integrated into policy discussions, strategies, or pilot-level policy instruments.

SHIFT-House has contributed to policy dialogue by demonstrating how green, affordable housing can align with Cameroon's sustainable urban development goals. It has been presented in workshops involving government bodies, academic institutions, and international stakeholders (e.g., via ARPEDAC's SECAM platform). The project's technical guides have informed pilot-level discussions on integrating low-carbon materials, passive design, and smart systems into national housing strategies, and align with principles promoted by UN-Habitat's supported green building code for Cameroon.

Replicable across climates using local materials and passive design; aligns with EDGE standards and Cameroon's green building code.

Informed national policy discussions via ARPEDAC's SECAM platform.

Lessons & Takeaways

Using the HIMO approach (High Labor-Intensity), future versions will further optimize community engagement and job creation through tools like the manual vibrating table and QMR2-40 CEB machines. Simplifying tech components (e.g., KNX, Wafle slab) could reduce training barriers. Early integration of EDGE certification and alignment with green finance criteria would improve access to funding. Enhancing local tool production would reduce costs and support broader replication across similar contexts.