Backyard Matters

Sustainable building technologies for affordable housing

Practice Brief 5: 2024

BACKYARD MATTERS
ENABLING PEOPLE, PLACE & POLICY

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Acknowledgements

Backyard Matters is a partnership initiative between the Development Action Group (DAG) and Isandla Institute.

The project recognises that backyard housing is a community-driven response to housing shortages for many who fall through the cracks of state programming and unaffordable private rentals. Backyard housing, however, remains a neglected and sometimes invisible sector. The project is aimed at strengthening the backyard rental market and contributing towards well-managed, quality rental stock that provides affordable, dignified and safe housing solutions in thriving neighbourhoods. The project thus advocates for inclusive policy and programming that embraces the voice, needs and agency of backyard residents and landlords as an integral part of the municipal community. Backyard Matters is funded by Comic Relief.

Cover image: Design Network/10 x 10 Sandbag housing, Mitchells Plain, Cape Town

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Executive Summary

Recent natural disasters have emphasised again the importance of safe, habitable and climate-resilient housing. Incidents of flooding, drought and fires have shone a harsh light on the inequity that continues to define South Africa. This is manifested in the (in) ability of economically, socially and spatially marginalised households to cope with the diverse and often devastating consequences of these disasters. Yet, these households are least responsible for the activities that contribute to the negative consequences of climate change. The need for climate adaptation strategies does not, however, only manifest at the point of disaster or require reactive responses. How we build and live in our homes and communities must change. Energy inefficiency and an over-reliance on non-renewable resources has meant that almost every aspect of modern-day living is unsustainable, not only in respect of household expenditure, but also in terms of the immediate and long-term impacts on the environment. Communities therefore face mutually enforcing crises of climate-change impacts, inadequate housing opportunities, inequality and rising unemployment. Against this background, South Africa has committed itself to a just transition, which sees the country on a path to decarbonising the economy. The construction sector, as one of the most significant contributors to the carbon footprint of South Africa, is part of this process. What does addressing the imperative to decarbonise the construction sector mean for the urgent need to ensure that people live in affordable and dignified shelter? Arguably, alternate building technologies (ABTs) are an essential component of achieving safe, climate-resilient housing. ABTs also have the potential to contribute to new economic value-chains around construction processes with direct local economic development benefits. In a community of practice (CoP) event, practitioners and policy makers explored opportunities and challenges related to the uptake of ABTs, particularly for affordable housing.[1] Drawing on two examples of practice of projects utilising ABTs in the context of informal housing, the discussion identified key lessons and broader institutional changes that must take place to improve the uptake and accessibility of ABTs whilst addressing the current housing crisis.

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1 The theme of the CoP held on 15 August 2024 was 'Climate Resilience and Sustainable Building Technologies for Affordable Housing.' The CoP was used to present Isandla Institute's research on ABTs for affordable housing and to gauge further input from participants to augment and refine the findings. This practice brief therefore complements the full research paper Sustainable homes: Alternative building technologies for low-carbon affordable housing construction (Isandla Institute, 2024b). Inputs were made by Jens Horber (Isandla Institute), Barry Lewis of UBU and Benjamin Kollenberg of Urban Think Tank EMPOWER (UTTE). The CoP was attended by representatives of the African Centre for Cities, the City of Cape Town, Community Organisation Resource Centre (CORC), Development Action Group (DAG), Isandla Institute, Ndifuna Ukwazi (NU), People's Environmental Planning (PEP), UBU, Urban Think Tank EMPOWER (UTTE) and the Western Cape Department of Infrastructure.

Introduction

South Africa, like other developing countries, is increasingly seeing the manifestation of climate change impacts in diverse ways and with varied levels of impact. Increased temperature fluctuations during the different seasons means that homes do not, for example, provide the required insulation during winter and ventilation for cooling during summer.

Oftentimes, residents in informal housing experience the threat and/or reality of flooding, fires and even sewerage spills multiple times per year. The human costs of these (recurring) disasters are inestimable.

Energy inefficient homes directly contribute to the level of energy poverty experienced in so many communities, impacting both quality of life and household prospects to improve living conditions (Ledger & Rampedi, 2022).[2] Climate change impacts have also meant more frequent and severe incidents of flooding, drought and fires, disproportionately impacting those who live in conditions of informality, particularly in informal settlements and backyard housing. Informal housing is predominantly situated in under-serviced townships with inadequate infrastructure, in areas which are often at risk because of location, such as on floodplains, or in areas comprising unstable topography, which have not been fortified to withstand risk (James, 2023).

The housing crisis in South Africa, manifesting in both inadequate housing provision through state programming and inaccessible private market offerings, has meant that people have used their own limited means to realise their housing need – building what they can, when they can (Isandla Institute, 2023a). In practice, this means that a large proportion of people live in unsafe structures that do not meet the criteria of building standards and regulations, rendering these unsafe and non-compliant. Oftentimes, residents in informal housing experience the threat and/or reality of flooding, fires and even sewerage spills multiple times per year. The human costs of these (recurring) disasters are inestimable, whereas the cost borne by the state in responding to these crises are exorbitant and must be weighed against the imperative of improving living and housing conditions. Disaster management responds to the consequences of crises, rather than the underlying root causes – e.g. housing poverty and spatial marginalisation.

There appears to be growing acceptance that self-build housing will be a

2 The previous CoP event held on 14 February 2024 explored the diverse implications of energy poverty and how it impacts communities. See: Isandla Institute. 2024a.

key component of housing provision in South Africa, but that this requires both changes in the institutional environment and the introduction of supportive measures to enable poor and low-income households to build better, compared to current self-build structures (DHS, 2023: 68). Given the level of income inequality and the extent of the unemployment crisis (Valodia, 2024), the ability of poor and low-income residents to invest in their homes and undertake the necessary improvements to ensure both compliance with building standards and produce dignified, climate-resilient shelter is severely curtailed.

The demand for safe and affordable housing is significant and it is the construction sector that will continue to be the key stakeholder to respond to that need.

The demand for safe and affordable housing is significant and it is the construction sector that will continue to be the key stakeholder to respond to that need – whether housing is built by the state, the private sector or households themselves. The construction sector is, however, one of the most significant contributors to South Africa's carbon footprint (Fitchett, 2022) and environmentally unsustainable.

One of the measures of sustainability evaluates the 'embodied energy' of building materials and construction methods, which includes the composition of materials, energy for manufacturing materials, transport of materials to site, energy used on-site during the construction phase as well as an assessment of the contribution of materials to the life cycle carbon emission of the end-product – for example, a home (Moghayed, 2022). Despite having one of the highest measurements of embodied energy, brick and mortar (cement) remains the material of choice for developers and homeowners (Roux & Alexander, 2009: 31). The construction sector is also one of the largest employers, responsible for livelihoods and contributing to economic growth (Bekker, 2024). Thus, the critical question is: how can the potential role of the construction sector to contribute to affordable housing delivery at scale, using sustainable building materials and practices that maintain – if not grow – the employment potential, be realised?

This practice brief examines what alternative building materials and technologies (ABTs) are and their potential benefit over conventional building materials or methods. It identifies barriers to the broader uptake of ABTs, particularly for affordable housing and self-build construction. It also summarises a set of proposed criteria to guide the incentivisation, development and uptake of ABTs that enable climate-resilient, labour-intensive affordable housing construction. Building on lessons emerging from practice, it identifies opportunities to scale up ABT use as well as key levers of institutional change that must be leveraged to accomplish this. Before doing this, it will elaborate on how the human settlements sector needs to come to terms with the overlapping imperatives of poverty reduction and socio-spatial justice, climate resilience and decarbonising development and how ABTs can play a vital role in this respect.

Poverty reduction, climate resilience and decarbonisation: Imperatives for affordable housing

South Africa's affordable housing crisis is well known, with close to one in six households in the Metros living in informal dwellings (Stats SA, 2023: 27). To date, housing/human settlements policy, programmes and interventions have by and large sought to respond to this reality through the lens of poverty reduction and socio-spatial justice.

Put differently, the premise underpinning these efforts is that housing poverty is a particular manifestation of poverty and historical exclusion (with apartheid restrictions on land and home ownership for black urban residents), with post-democratic patterns of urbanisation and development perpetuating spatial marginalisation of poor and low-income settlements.

The importance of climate adaptation and resilience in the context of housing and neighbourhood development is increasingly recognised.

As the effects of climate change have become more pronounced – in the form of droughts, recurring flooding, storms and heat intensity – the importance of climate adaptation and resilience (i.e. the ability of systems and institutions to anticipate, respond to and bounce back from climate-induced events) in the context of housing and neighbourhood development is increasingly recognised. The Department of Human Settlements has prioritised the development and implementation of the Human Settlements Climate Change Response Strategy and Implementation Plan (CCRS&IP) to address the threats and impacts resulting from climate change.[3]

Climate adaptation and resilience efforts seek to respond to, and mitigate environmental risks and hazards, both for present and future generations. This includes coming to terms with issues related to the distribution,

3 *Since 2023, the department has engaged stakeholders on the proposed strategy and implementation plan, informed by a diagnostic analysis that includes a climate change risk and vulnerability analysis and a governance and policy review. The most recent stakeholder engagement was held on 21 February 2024. The final document has not yet been released.*

use and management of scarce resources like water, especially in a water-constrained country like South Africa. Crucially, climate adaptation and resilience efforts need to recognise and address underlying socio-economic drivers of vulnerability stemming from structural inequalities, such as gender, socioeconomic status and housing poverty, amongst others (Satterthwaite et al, 2020), which in turn heighten exposure to environmental risks and reduce people's ability to pre-empt, respond to or cope with the impacts of climate change.

Socio-economic drivers of vulnerability stemming from structural inequalities heighten exposure to environmental risks and reduce people's ability to pre-empt, respond to or cope with the impacts of climate change.

However, bringing about human settlements and housing that are climate-resilient is not the only climate-related challenge facing the human settlements sector. A more fundamental challenge relates to decarbonisation, in line with South Africa's commitment to a just transition towards a low-carbon economy. The ***Just Transition Framework for South Africa*** produced by the Presidential Climate Commission (PCC, 2022) outlines policy measures and commitments to decarbonise the economy whilst ensuring that 'no one is left behind' through the job losses and knock-on economic affects that are expected.

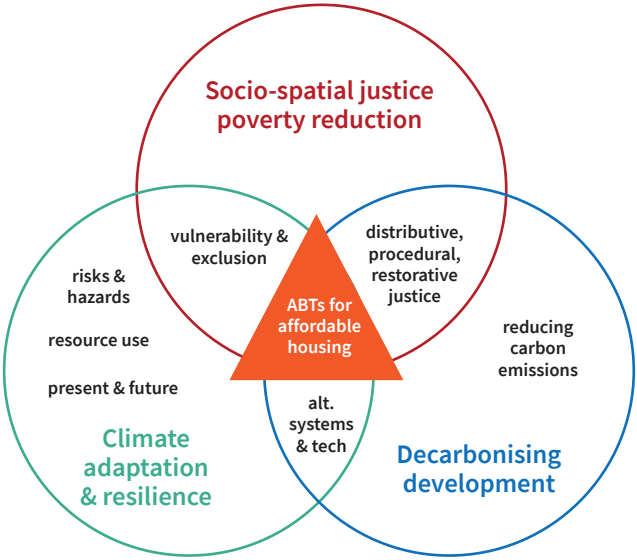
The Framework identifies four sectors that are particularly at risk of climate change and efforts to move towards net-zero emissions: coal, automotive, agriculture and tourism. Taking its cue from the Just Transition Framework, ***Pathways for a Just Urban Transition in South Africa*** (Cartwright et al., 2023) (also referred to as the Just Urban Transition, or JUT, Framework) focuses on the implications of climate change and a just transition for cities, including the need to decarbonise urban economic sectors and value chains whilst minimising job losses.

One of these is the construction industry. Efforts to transition economic sectors to become more sustainable include the development of alternative systems and technologies, such as water- and energy-sparing green infrastructure systems and technologies. In informal settlements in particular, such systems and technologies can simultaneously play a vital role in minimising climate-induced risks (e.g. green infrastructure for flood resilience) and realising basic rights, such as access to water, sanitation and energy.

Critically, a primary concern is that the transition is just – i.e. that the benefits and burdens are distributed fairly, that affected communities can influence decisions that affect them and that historical damages (to disenfranchised, marginalised communities) are rectified.

Figure 1 shows how these diverse imperatives – of addressing poverty and exclusion, advancing climate adaption and resilience and pursuing decarbonisation – have different and overlapping concerns. At the intersection of these imperatives lie ABTs for affordable housing, with specific requirements that these ABTs are sustainable, protect residents from weather-related risks and hazards (such as heat and storms), contribute to meaningful work and respond to people's socio-economic realities and aspirations.

Figure 1. Overlapping imperatives for affordable housing



What are ABTs and what are their benefits?

As the name suggests, ABTs differ from conventional building materials and technologies in varied ways. They comprise those materials perhaps not as widely recognised and/or regulated by national building standards.

Traditional building materials are often referred to as "brick-and-mortar construction" or the most commonly used materials that are recognised within the regulatory framework for building and construction in South Africa. ABTs are also referred to as innovative building technologies (IBTs) in that these either comprise non-conventional building materials or require non-conventional building or construction methods.

Examples of alternative building materials include nature-based materials such as wood, earth, hemp and straw, reclaimed materials (e.g. reused bricks, glass and building waste) or materials that incorporate recycled polystyrene (plastics).

The use of ABTs in South Africa is not necessarily new, although the practice tends to be limited to small-scale developments and pilots. In affluent areas, ABTs have been used to show-case 'green' and/or sustainable architectural design. For example, the City of Cape Town is now the official host to the world's tallest building constructed of industrial hemp (Hamilton, 2023). Similarly, game lodges are constructed to align with green principles around eco-tourism. Importantly, the use of natural, sustainable materials in this way may not automatically equate with a more affordable result that lends itself to the construction (of low-cost housing) at scale.

The use of ABTs in South Africa is not necessarily new, although the practice tends to be limited to small-scale developments and pilots.

Some examples of ABT use in the context of low-cost housing include sandbag housing (in Mitchell's Plain and Philippi, both in the City of Cape Town), the use of Saint Gobain products in the Diepsloot People's Housing Process, the LIFT (Lightweight, Improved, Fire-safe, Timber-frame) technology in eThekwini and the recycling of bricks and building rubble in the Mbekweni stonehouses in Paarl (Isandla Institute, 2024b).

In addition, there seems to be growing uptake of ABTs in the construction of public infrastructure, such as schools, community halls, service centres and early childhood development centres.[4] In these public facilities, government has successfully used ABTs to show-case the versatility and varied positive impacts of using ABTs within communities, arguably building social acceptability around those ABTs. The benefits of using ABTs over conventional building materials or methods can be broadly grouped into three categories: environmental, economic and construction:

1. *Environmental* benefits can include reduced wastage in the construction process; energy efficiency (and other improvements in building performance, which may also increase comfort); and, lower embodied energy and related reduced carbon footprint across the whole lifecycle of the material.
2. *Economic* benefits can include lower upfront construction cost; improved long-term feasibility in terms of lifecycle cost;[5] the potential for localisation of production and value chains (particularly opportunities to strengthen township construction value chains and stimulate job creation); and, potentially improved market value of built structures.
3. *Construction* benefits can include ease of construction; reduced construction time and labour costs; the use of unskilled or semi-skilled labour; and, lower maintenance requirements (Isandla Institute, 2024b: 6).

The variability of ABTs in terms of contribution to employment, sustainability and affordability needs to be considered in identifying potential use for affordable housing.

Notwithstanding these potential benefits, it is worth noting that not all ABTs are the same or bring the same positive impacts. For example, some ABTs may be more labour-intensive than others, and as such make a more significant contribution to employment. The costs of ABTs may also vary significantly, making some less suitable for low-cost housing. Similarly, the sustainability dimension of ABTs can also vary markedly, in some instances addressing different aspects of sustainability. For example, some ABTs reduce carbon output by producing materials near or on site (e.g. sandbags) whereas others incorporate industrial plastic waste in building products, thereby responding to the problem of plastic pollution. This variability needs to be considered in identifying potential ABTs for affordable housing.

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4 Examples include the OR Tambo Environmental and Narrative Centre (https://worldlandscapearchitect.com/or-tambo-environmental-and-narrative-centre-ekhuruleni-south-africa-newtown-landscape-architects/?v=3a1ed7090bfa), the Manenberg Housing Contact Centre (https://www.specifile.co.za/corobrik-clay-bricks-in-4-star-green-star-sa-manenberg-housing-centre/news/green-building/), the Mike Woods Environmental Education Centre based at Helderberg Nature Reserve (https://www.naturalbuildingcollective.com/helderberg-eco-edu-centre/) and the Delft ECD Training Centre (https://www.naturalbuildingcollective.com/the-story-of-the-delft-ecd-training-centre/).

The challenges to uptake: Why are ABTs not used more widely?

ABTs, especially more sustainable ABTs, are still relatively new and their use in low-cost housing in particular has been quite limited. Reasons for the low uptake relate to the regulatory/administrative environment, professional expertise, social acceptability, accessibility and cost of ABTs and, lastly, the lack of policy guidance and institutional support.

Building regulations

In keeping with international best practice, the regulatory environment for housing construction in South Africa is extensive. This is to encourage compliance and good practice with the ultimate goal of ensuring the construction of safe, durable and habitable buildings. The National Building Regulations and Building Standards Act 103 of 1977 is the key piece of legislation regulating the sector. Within the framework of National Building Regulations (NBR), the South African National Standards, SANS 10400 (2011) Code of Practice for the construction of Dwelling Houses sets out prescriptive provisions that are deemed to satisfy the technical aspects of the NBR, i.e. the performance requirements that the building design or construction must satisfy.

The NBR are supported by a non-mandatory set of 'deemed-to-satisfy' rules, which are published in SANS 10400. These rules describe design and construction methods, materials and solutions, which, if applied, will ensure that the building will satisfy the functional requirements of the NBR. Importantly, amendments have been made to accommodate other frequently used materials outside of the conventional materials. For example, in 2011, in an endeavour to make buildings more sustainable and to decrease energy usage in South Africa, the XA (Energy Efficiency) part was added to SANS 10400 code. Part X deals with environmental sustainability, and Part XA deals with energy usage in buildings (SAHIF, 2020).

The regulatory framework for conventional building methodologies is firmly entrenched, with a strong ecosystem that supports the current system.

SANS 10400 does not, however, currently cover the broad scheme of functional standards/ requirements for ABTs. There are only three ways in which an ABT is considered to be compliant with the safety standards of the regulatory framework set by the National Building Regulations and Building Standards Act. The first is if the ABT can in fact be considered to fall within SANS 10400 requirements: i.e. a building's design and construction conforms to SANS 10400 requirements by satisfying the 'deemed to satisfy' rule. The second comprises a rational design or assessment, where a professional architect or engineer has certified that a particular design complies with requirements equal to that of SANS 10400.

The final means of compliance is to obtain a valid Agrément certificate. Application is made to Agrément South Africa, an entity of the National Department of Public Works and Infrastructure (DPWI), which evaluates the fitness for purpose of non-standardised construction products, materials and systems against performance-based criteria. The holder of an Agrément certificate (i.e. the person or company that applied for certification of their material or method) or a licensee can build according to the stipulations of the certificate and must attach a copy of the certificate when submitting building plans for municipal approval.

The certificate holder must ensure that any licensee who constructs with the material or method complies with those stipulations and the approved quality management system, which thus necessitates site inspections. Practice has revealed that the Agrément process is complex and costly when compared to that of the SANS 10400 process. The licensee also has the onerous obligations of exercising oversight over the use of its product, which creates additional burdens and may act as a stumbling block to pursuing an already complex objective of getting new ABTs onto the market.

Lack of knowledge and professional expertise

The regulatory framework for conventional building methodologies is firmly entrenched, with a strong ecosystem that supports the current system. Standards for compliance are institutionalised and there is little incentive to pursue materials that require working outside of established systems. Professionals along the building value chain and process, including those dealing with architectural design, structural engineers and various officials responsible for ensuring municipal approval (building inspectors), are not sufficiently empowered with knowledge of ABTs and are at times ill-equipped to engage projects that incorporate them.

Lack of social acceptability

Social acceptability is a critical contributing factor to facilitating the increased use of ABTs. The current reality is that traditional brick-and-mortar houses are the status quo and aspiration of most houseless residents in informal settlements and backyard housing. There seems to be a concern that non-conventional materials may be of inferior quality and that the promotion of such materials is only targeted at the urban poor, who are – justifiably – reluctant to be the recipients of experimental projects with potentially sub-standard outcomes.

Social acceptability varies, however, from project to project. The adage 'if it looks or sounds like a brick' seems to hold water in certain instances. In other words, if an ABT appears to conform to the aesthetic and functionality of conventional materials with only marginal variations, then social acceptability is less of a problem. The demonstration effect is also a factor, as the proven efficacy of ABTs in public facilities and housing projects helps to increase social acceptability.

Material costs & lack of accessibility

The fact that ABTs are not widely in use has created a vicious cycle related to availability, acceptability and cost. For example, most ABTs are only available directly from producers (Agrément certificate-holders), which tend to have a limited geographic reach. In contrast to conventional building materials, ABTs cannot easily be accessed at building materials suppliers. While this lack of availability is partly a result of the low demand for ABTs, it further hinders their normalisation and increased uptake. Low market demand also impacts cost, which in turn is an important factor in facilitating social acceptability of the product or technology. Research reveals that "informal settlement households in African cities can spend 15-30% of their monthly budget on materials for repairs and improvements" to their existing structures (Cociña et al, 2024). As such, the cost factor – both for the initial construction and for maintenance, repairs and incremental improvements – can be a key barrier in promoting ABTs for affordable housing.

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Insufficient government / institutional support

There are clear positive commitments that national government has taken in encouraging the use of ABTs. For example, the Science, Technology

and Innovations for Sustainable Human Settlements (STI4SHS) Roadmap serves to guide implementation and scaling up of technologies and innovations in the human settlements sector for the period 2020 to 2029 (CSIR, DHS & DSI, 2021). However, while a repository of ABTs exists and pilots have been implemented, some of the evaluative work on how to take pilots forward, how to improve and how to capitalise on lessons has not yet taken place. Rather, what we see is a piece-meal implementation of ABTs without constructive peer-learning.

So, for example, maintenance issues and suitability for incremental augmentation and multi-storey construction after the building is constructed is important to document and share. It is also important to recognise that government will not be able to be the sole provider of safe, climate resilient, affordable housing, but that there are various facilitative roles that it can fulfil to enable other stakeholders to enter this space, including reducing the administrative barriers to the increased uptake of ABTs. Enabling interventions to facilitate access to finance and housing insurance related to ABTs is an important step that government could facilitate with key stakeholders in the private sector.

Criteria for sustainable ABTs for affordable (self-build) housing

As highlighted previously, ABTs can vary significantly in terms of carbon footprint, cost, ease or difficulty of building as well as labour intensity, both in the production of the material and/or its use in the construction process on-site. The sustainability/longevity and aesthetics may also differ. It is therefore important to specify minimum, or desired, features of ABTs, which become important for different contexts.

ABTs can vary significantly in terms of carbon footprint, cost, ease or difficulty of building, labour intensity, longevity and aesthetics.

Of course, the extent to which an ABT contributes to sustainability and decarbonisation is a critical criterion. Related to this is the issue of local environmental suitability, which refers to the specific geo-environmental conditions in which affordable housing is to be built. From an economic perspective, localisation (of sourcing, producing and manufacturing ABTs) and the extent to which these processes and construction contribute towards 'meaningful work' also need to be considered. In addition, in the context of low-cost housing, the affordability, accessibility and social acceptability of ABTs become particularly important criteria. Finally, the extent to which ABTs enable incremental augmentation, particularly in the context of self-build housing construction, and affordable multi-storey construction to address urban density is also an important consideration.

Proposed criteria for ABTs in low-carbon, sustainable affordable housing construction

Sustainability relates to the ABT assumed life cycle carbon footprint, its durability, any re-use / recycling of materials and (other) waste reduction (e.g. plastics).

Local environmental suitability: considers local physical factors and environmental conditions to determine whether the ABT is appropriate for that context.

Localisation: refers to whether the ABT consists of locally sourced and / or produced materials.

Job creation: Includes both the labour Intensity associated with the material sourcing and manufacturing of the ABT and the employment opportunities inherent in local housing construction value chains, specifically through the use of local labour.

Affordability: relates to both the cost to access or purchase the ABT and the maintenance cost.

Accessibility: refers to how easy the ABT is to access or purchase and learn to build with.

Social acceptability: relates to the level of social acceptance by beneficiaries/ community members.

Incrementalism / multistorey construction: considers the extent to which the ABT allows for incremental augmentation of a new/existing structure (whether built with the same ABT, another ABT or bricks and mortar) and how suitable it is for constructing a multi-storey building or adding additional storeys after initial construction.

Source: Isandla Institute, 2024b

CASE STUDY1

Sandbag and Ecobeam technology

Philippi, Mshini Wam and Imizamo Yethu, Cape Town (UBU)

UBU stands for 'Ubuhle Bakha Ubuhle' which is IsiXhosa for 'beauty builds beauty'. At the centre of the sandbag and ecobeam technology is the desire to not only build homes, but to facilitate people to build their own home, utilising ABTs in the form of ecobeams and sandbags.

The technology has been used in several projects since 2012, including in Philippi, Mshini Wam and Imizamo Yethu, Cape Town (2012-present). It uses one of the most common natural resources – sand –, packed into recycled bags and stacked into a timber-framed superstructure. The house frame is constructed using ecobeams (composite of a steel lattice and 38mm timber battens) and the walls are built from woven sandbags filled with local sand. The sandbags are covered with fibreglass mesh and then plastered over.

Some of the key benefits of the project include thermal and acoustic efficiency, it is fireproof, bulletproof and not affected by rising damp issues. These characteristics make the sandbag technology attractive for construction for a range of users, as is seen in the use in affluent holiday homes. Nonetheless, the ABT speaks directly to the needs of people living in informal settlements, where fire and safety risks are urgent priorities to be addressed.

The power of making and inclusion was evident from the beginning in that 50 percent of the workforce comprised beneficiary-residents, thereby reducing costs, enabling skills transfer and inculcating a sense of ownership and commitment to the project. The homeowner can be involved in the design and trained in the building technique (in one day) to be involved in building on site. Sandbags and ecobeam technology is lightweight, labour intensive and requires on-site labour, rather than expensive machinery to assemble. This creates multiple opportunities for employment and skills development within the community.

CASE STUDY 2

The Empower Model

Khayelitsha Site C, Cape Town (Urban Think Tank Empower)

Urban Think Tank Empower (UTTE) is a collaboration with the City of Cape Town and Ikhayalami to implement a project in BT Soweto, Site C, Khayelitsha, Cape Town from 2014 – present. The Empower Shack Pilot Project was launched in 2015, driven by the idea of upgrading informal settlements through community-driven construction and innovative design. The Project replaced 72 informal structures with 72 new homes (resulting in no displacement) and also included public open space and a shared community centre with socio-economic benefits for over 400 beneficiaries.

There are 9 different unit types/configurations (ranging from 38m^2 to 86 m^2). The UTTE-designed homes feature fire-resistant materials, hollow-core concrete blocks, wood and zinc sheets, ensuring durability and safety and, by building two-storey units, capitalising on vertical densification. The modular design allows for 10 different unit sizes to accommodate a variety of layouts suited to specific resident needs, including family size/needs and affordability. The modular design also enables scalability and adaptability.

The project employed a participatory approach to upgrading, which fosters ownership and pride among residents. Community engagement considered existing uses and needs in residences, for example, running an educare from home or the need for mixed-use models, with the ground floor designed for one purpose and the first floor reserved for residential purposes. Furthermore, the project's in situ upgrading plan yielded communal spaces and shared communal facilities to enhance the quality of life.

The Empower Model was funded internationally by Swiss philanthropic funders who contributed 90% of the funds needed for the project, with families contributing the remaining 10% through microfinance loans (ranging between R300 – R1,300 monthly instalments), with the option to repay between 36 months to 60 months.

The project required community education, professional humility, local authority generosity and NGO facilitation, with co-production with the community and negotiation being integral.

Making ABTS conventional in affordable housing

In addition to the institutional analysis, perspectives from practice are key in identifying opportunities to make ABTs conventional in affordable housing. The sandbag and ecobeam technology used by UBU in different parts of Cape Town (see case study 1) and the Empower Project of Urban Think Tank Empower (UTTE) in Khayelitsha (see case study 2) both intentionally seek to respond to the need for safe, dignified and affordable housing – and have shown significant success in this regard. However, the underpinning technology, project scope and financial resource base are very different, as the project summaries show.

To make ABTs more commonplace in affordable housing, changes are required in the policy and regulatory environment, in the social environment, among built environment professions and in the supply chain of ABTs, particularly to ensure that ABTs are easily accessible and affordable.

Policy and regulation

It is important that the current regulatory framework is made more amenable to the use of ABTs. There are various ways of achieving this. Much in the same way that new subsections were added to the SANS10400 to accommodate the regular use of certain materials, such as wood and light steel and the framework for energy efficiency, so could additional standards that cover the various broad categories of ABTs be introduced. This would eliminate uncertainty about the safety and efficacy of use, institutionalise knowledge and practice related to these materials with wider and regular use and, significantly, compel all stakeholders within the construction chain to engage with ABTs. For example, municipal building plan examiners would have a regulatory standard against which to assess building plans using ABTs, without having to reference any external processes such as the Agrément certificate or rational design sign-off by an engineer.

The new Climate Change Act (Act 22 of 2024) is likely to provide further impetus in this regard. The Act requires national sector departments to develop a Sector Adaptation Strategy and Plan, in line with the National Adaptation Strategy and Plan. With the drafting of the Human Settlements

Climate Change Response Strategy and Implementation Plan (CCRS&IP), the Department of Human Settlements is well on its way to fulfilling this requirement. The draft document identifies three strategic priority areas, one of which relates to the determination of what constitutes climate resilient infrastructure and the establishment of appropriate norms and standards. Two strategic objectives identified in this respect are:

— Identifying and mobilising innovative ways and means of financing the design and implementation of resilient norms and standards, particularly for housing, water and sanitation, and roads and transport to bring about catalytic change for South Africa's vulnerable communities.

— Establishing climate resilient and green building norms and standards that are aligned with best practice for protecting the country's ecosystems and that enhance the Green Star SA rating portfolio, an internationally recognised mark of quality for the design, construction and operation of buildings, interior fitting, and precincts (DHS, 2024: 35-36).

It is important that the current regulatory framework is made more amenable to the use of ABTs. There are various ways of achieving this.

10 x 10 Sandbag housing, Mitchells Plain, Cape Town. Image courtesy of Design Network.

National policies and standards provide the enabling framework within which the provinces and municipalities can operate with certainty.

Although not stated explicitly, ABTs can be understood to be included under 'climate resilient' norms, standards and practices, as the CCRS&IP understands climate resilient norms and standards to be "primarily driven by a combination of emission reduction and resilience objectives" (DHS, 2024: 36).

Nonetheless, a clearer articulation of the role of ABTs in advancing resilience and a just transition, that addresses emissions, socio-economic marginalisation and employment, would certainly give greater guidance to the sector. After all, national policies and standards provide the enabling framework within which the provinces and municipalities can operate with certainty.

As the use of ABTs will vary in terms of suitability and various contextual factors, provinces and municipalities need to take the lead in creating context-specific policies and guidelines to enable the sector and meet asymmetrical need. Various provinces and municipalities have produced green procurement policies, or other policies or design guidelines that promote ABTs in housing and infrastructure construction.

Provinces with such policies finalised or in draft form include KwaZulu-Natal, North West, Western Cape and Gauteng, while metros include Cape Town, Johannesburg, Tshwane and Nelson Mandela Bay, with Tshwane having a Green Building Development By-Law in place since 2013. It should be noted that many of the green procurement and green building development policies do not make specific reference to ABTs in terms of building materials and methods (Isandla Institute, 2024b).

Making ABTs work for people – and people for ABTs

ABTs are not yet commonplace in low-cost housing and there is a perception that ABTs are inferior to conventional building materials and methods. Creating awareness among communities allows them to make an informed choice, particularly if the ABT has been tried and tested and the results are made visible – whether in the construction of low-cost housing or public facilities.

One of the most important lessons from both case studies relates to the value of social inclusion and empowerment through co-design processes. Capitalising on the knowledge and needs of residents contributed to fostering commitment by the recipient residents. Sustaining their involvement from start to finish provided a form of agency that is not associated with conventional forms of construction in the large-scale delivery of affordable housing delivery. While the intensity of community engagement in both projects led to time investment that was longer than anticipated, a key outcome was increased social acceptability, which extended to adjacent or other communities once the 'product' and its benefits (e.g. structural integrity, fireproof, bulletproof, etc.) became visible. This confirms the importance of the demonstration effect to increase uptake and social acceptability of ABTs.

Capitalising on the knowledge and needs of residents contributed to fostering commitment by the recipient residents.

Equally important is the employment dimension of ABTs and the need to ensure that the construction sector retains, if not expands, its labour absorption potential. In particular, creating local labour opportunities, including home owner self-build opportunities, as in the case of sandbag housing (*see case study 1)*, is critical to ensure ABTs contribute to a just transition.

Government to lead and partner

Government can set an important example by using ABTs in infrastructure development, whether for housing, public facilities or road infrastructure. Public acceptance of ABTs will increase if functional (and often aesthetic) buildings are designed that showcase not only the use of

alternative building materials, but also draw on local labour and create meaningful work opportunities.

Government can also partner with other stakeholders and bring complementary expertise, skills and (potentially) funding. The two case studies both have an element of this, with the City of Cape Town having an MOU with UTTE regarding the Empower Project and a more recent contract with UBU to use the sandbag and ecobeam technology for emergency housing.

Improving knowledge and professional expertise

For the use of ABTs to become the norm (as and where appropriate), it requires improved knowledge and expertise from a range of stakeholders within the housing construction value chain. Architects and draftsmen, engineers and building contractors have to acquire knowledge and skills so as to advise clients from the design stage, through the municipal approval process, to sourcing materials and, finally, construction.

Building material suppliers and, significantly, municipal building plans examiners and building inspectors must have the knowledge to ensure safety and facilitate compliance. Through regulatory reform, awareness raising, skills training and curriculum development, current and future professionals can be equipped to play a leading role in promoting ABTS for affordable housing.

ABT costs and accessibility

It is critical that ABTs are affordable and easily accessible for low-cost housing, including to those who are building and/or augmenting their homes. Currently government cannot use ABTs at scale in low-cost housing projects as conventional building practices are still cheaper – unless the project is subsidised by an external party (as in the case of some pioneering initiatives). In addition to regulatory reform and addressing onerous (and often costly) administrative requirements, appropriate measures to incentivise the market are needed, with a specific focus on ABTs for affordable housing.

Conclusion

ABTs can play a vital role in responding to the imperatives of poverty reduction and spatial justice, climate adaption and resilience, and decarbonisation.

But how do we make ABTs the norm for affordable housing? There is no single-entry point or solution that will instantly up-end entrenched systems and traditional ways of conceptualising, constructing and delivering affordable housing. Research and practice reveal that what is required is various points of intervention by a multiplicity of stakeholders.

Government has already taken steps to institutionalise relevant legislative and policy frameworks. The Climate Change Act of 2024 is an example of this, providing the necessary impetus for all sector departments, including human settlements, to transition from progressive policy on climate change and resilience to active implementation. However, more explicit policy attention needs to be given to how the construction sector can, and should be, a positive force for change towards a just urban transition. This includes the need for regulatory reform to facilitate further development and uptake of ABTs in everyday practice without compromising safety and sustainability.

The Empower Model Khayelitsha Site C, Cape Town (Urban Think Tank Empower)

The use of local labour in building sandbag houses in Mshini Wam, Cape Town. Image courtesy of UBU.

But the required change cannot only be imposed or directed 'from above'. Local practice and testing of new technologies is key and lessons from these practices need to inform the enabling environment, so that appropriate changes can be made. This will allow for pilots and small-scale initiatives to be replicated and taken to scale, which is vital to address the current housing need.

As the case studies demonstrate, partnerships play a vital role, especially – but not exclusively – at the stage of testing new practices and technologies. Partnerships between government, civil society, the private sector and, fundamentally, recipient communities yield multiplier positive results that extend far beyond the product of a house.

Given the scale of poverty and unemployment, one of these results has to be an improvement in livelihoods and local economic development. Done correctly, affordable housing initiatives using ABTs can incrementally make inroads into the socio-spatial inequity that is characteristic of so many communities which live in conditions of informality. These projects hold valuable lessons and have the potential for replication at scale.

Practice also reveals, however, that transposing projects without clear contextual adaptation can be a recipe for disaster. Drawing on, and expanding, the knowledge, skills and aspirations of residents is crucial for the sustained success and sustainability of any initiative.

In moving forward with pursuing ABTs as a lever for multiple positive impacts, there must be greater focus on flexibility, partnership-approaches, nuance and 'failing-forward', to learn lessons that can shape and inform improved practice.

A pre-condition to achieving these gains, however, is a paradigm shift for a range of stakeholders, a willingness to implement changes, to adapt and in some cases even replace entrenched systems and practices. It is said that crises can be the leverage for change and innovation. As South Africa continues to face the impacts of mutually enforcing human settlements, climate-change and employment crises, it becomes increasingly clear that maintaining the status quo and traditional way of doing things is too costly to sustain.

Partnerships between government, civil society, the private sector and, fundamentally, recipient communities yield multiplier positive results that extend far beyond the product of a house.

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