MaS-SHIP

Mainstreaming Sustainable Social Housing in India Project

Brief 2: Using a Decision Support Toolkit to assist in mainstreaming sustainability into social housing | January 2019

SUMMARY

This brief discusses how a Decision Support Toolkit (DST) can assist in decoupling the socio-economic benefits associated with social housing development from its negative environmental impacts. That is, the DST serves as a common reference point for multiple actors to make informed choices and adopt more sustainable construction practices. It does so with a measurement framework to assess the sustainability of materials, new data on the performance and location of sustainable options, and guidelines for sustainable design. These resources can benefit actors such as developers, building practitioners, and manufacturers.

1. THE CHALLENGE

India's national urban housing shortage, currently at approximately 10 to 12 million units (FSG, 2018)[1], and concentrated amongst the country's poorest segments, is being addressed through a central government push to provide "Housing for All by 2022." This is coupled with substantive private sector interventions into previously untapped markets, notably in the informal sector.

However, sustainability is not effectively mainstreamed into social housing. That is, there is limited evidence of coherent strategies to decouple the socio-economic benefits arising from housing construction and provision from its negative environmental impacts, such as the deleterious effects of resource extraction. In particular, this shortfall applies to how building materials and technologies are not selected in a sustainable manner.

Persistent negligence in policy and practice to mainstream sustainability into social housing runs many risks. These include unabated increases in greenhouse gas emissions, resource degradation, failure to ensure access to adequate housing, and creation of sufficient jobs in the construction sector. There is therefore a need to develop innovative interventions to address a complex challenge.

2. RATIONALE FOR USING A DECISION SUPPORT TOOLKIT (DST)

2.1. Resolving Fragmentation and Knowledge Gaps

A coherent approach to mainstreaming sustainability into social housing must first recognize that the existing ecosystem shaping rapid housing construction is highly fragmented. Actors, ranging from social housing developers to local government officials, have varied and sometimes conflicting interests and preferences. What is common among them is that they demonstrate limited understanding or appreciation for sustainable housing development.

As such, the DST can serve as a common reference point for this disparate network to strike a balance between fulfiling their individual priorities and achieving systemic goals. That is, the DST can help prospective users in choosing sustainable building materials, and making and monitoring sustainable design interventions and construction practices.

The DST achieves this balance in a number of ways. It addresses the absence of a comprehensive measurement framework to assess sustainable materials. It fills missing data that is needed to quantify the performance and map the availability of sustainable options. It also includes design guidelines to ensure sustainability is embedded at the conception stage of a housing project. Filling these knowledge gaps can also assist in prioritising sustainability considerations in housing policy and implementation.

3. A COMPREHENSIVE MEASUREMENT FRAMEWORK

3.1. The Sustainability Assessment Tool (SAT)

There is limited evidence of a comprehensive measurement framework for mainstreaming sustainable social housing in developing country contexts, including in India. For building materials and technologies, very few systemic approaches exist to assess and balance their economic potential and usability with its resource implications, especially during the manufacturing stage.

Fig 1: Bawana Housing Development, Delhi (Case Study Report)

To address this gap, a Sustainability Assessment Tool (SAT) has been developed as a key component of the DST, to measure the relative performance of building materials and technologies during the manufacturing and construction stages of social housing projects that do not exceed four stories.[2] The four broad criteria, including:

- **Resource Efficiency**: to comprehensively account for the energy consumed and resources extracted throughout the entire life cycle of the construction process
- **Operational Performance:** to factor in traditional efficiency metrics to ensure high quality building construction
- **User Experience:** to factor in the role of residents and building practitioners in terms of their familiarity and experiences with existing options and sustainable alternatives
- **Economic Impacts:** to link better environmental choices with a comprehensive set of economic indicators, including cost and job creation potential

These criteria are broken down into 18 qualitative and quantitative attributes.

3.2. Ascribing Weightages to the Attributes of the SAT

The multiplicity of attributes require rationalized valuations relative to each other. A weighting process affords a rigorous evidence base for prospective users to prioritize their interventions, appropriately allocate resources, and potentially mitigate preconceived biases that perpetuate selection of unsustainable materials and technologies.

For example, developers with limited knowledge but interest in efficient resource management may lack the knowhow to weigh the financial and environmental trade-offs between labour intensive, traditional options, and modern, mechanized alternatives. In the absence of a standardization process, each developer may therefore prioritize the attributes differently.

Fig. 2: Breakdown of Weighted Attributes using AHP Process

	Attributes	Weights
	RESOURCE EFFICIENCY	
1	Embodied energy and carbon emission	6.1
2	Critical resource use	5.3
3	Current recycled content	3.9
4	Future reusability	3.8
5	Water use during construction and manufacturing	5.3
	OPERATIONAL PERFORMANCE	
6	Durability	5.1
7	Ease and frequency of maintenance	3.5
8	Thermal performance (flow of heat)	5.1
9	Thermal mass (absorption, storage and release of heat)	4.1
10	Impact on cooling (or heating) loads	7.1
11	Noise transmission	3.5
	USER EXPERIENCE	
12	Familiarity (with material or technology)	9.7
13	Modification ability	9.5
	ECONOMIC IMPACT	
14	Construction cost	10.1
15	Skills requirement	4.4
16	Supply chain	4.7
17	Duration of construction	5.6
18	Job creation	3.1

The SAT addresses these shortcomings and establishes consistency by drawing on the inputs of a representative sample of housing experts in India to weigh each attribute. That is, a widely accepted “Analytic Hierarchy Process (AHP)” was applied to survey 184 experts including project consultants, private and public housing providers, academics, manufacturers, and building practitioners.

4. FILLING DATA GAPS

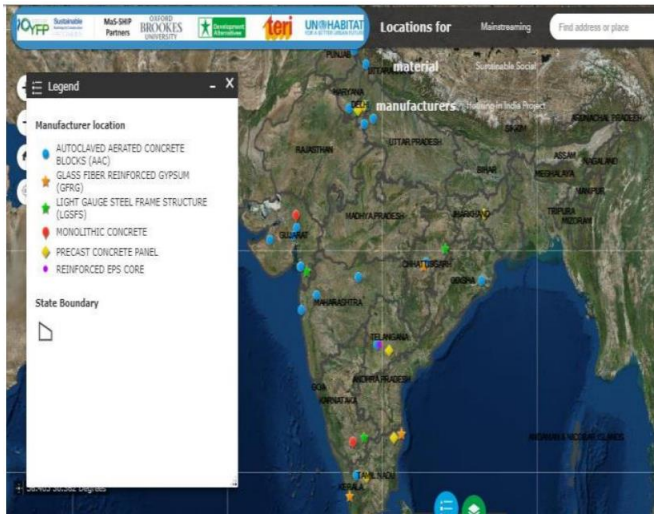
4.1. Technology Catalogues and Data Framework

Previous public and private efforts to develop measurement tools have been constrained by data gaps to populate the instruments. In particular, newer material alternatives lack sufficient detailing to enable informed decisions. The DST makes progress by collecting new data on 17 materials and technologies, and compares them by using the SAT. For example, new information is presented on the user's experience with materials. The findings are also collated into catalogues for each material. The granularity of available data and methodology for calculating the mix of qualitative and quantitative attributes are detailed in a supplementary data framework.

4.2. Materials Map

There is also limited awareness in the construction sector regarding the availability of sustainable alternatives. To address this shortfall, the DST includes a GIS based materials map for users to efficiently locate suitable options to enable more sustainable construction practices.

Fig 3: Location of Manufacturing Units of Emerging Technologies



4.3. Resident Surveys

Surveys of social housing residents are not only limited to measuring their perspectives and experiences with building materials. Instead, these studies also document levels of resident satisfaction with issues such as comfort and proximity of their homes to livelihod opportunities. These insights can help DST users better incorporate the social dimension of sustainability, and subsequently enhance the adequacy of social housing.

5. DESIGN GUIDELINES

To ensure sustainability is embedded at the conception stage of a housing project, appropriate material selection must be linked with sustainable design practices. As such, the DST consists of design guidelines that help users understand how sustainability should be mainstreamed into social housing.

That is, specifications for design interventions, such as lighting and shading, enhance resident comfort and ensure social housing is adequate. In addition, the guidelines are separated into five climatic conditions to account for India's regional variations.

Fig. 4: Jakkampudi Colony, Vijayawada (Case study report)

6. BENEFITS OF THE DST FOR KEY STAKEHOLDERS

MaS-SHIP research revealed several gaps in the construction ecosystem, specific to the needs and practices of various actors, many of which the DST could address.

6.1. Developers and Other Building Practitioners

Many developers have limited awareness of the existence of sustainable and cost-effective building materials. As such, the DST offers such individuals the opportunity to calculate the costs of sustainable alternatives and locate these new options. As standards, rules, and the market evolves to mandate and prioritize more sustainable approaches to construction, the DST can be used by developers to ensure adherence, and by extension, promote their commitment to high sustainability standards.

In addition, developers and other practitioners, such as architects, can save costs by forgoing expensive measurement instruments and instead leverage the free of cost DST to make holistic assessments. This would enhance their competitiveness and provide substantial savings in project development and management.

In addition, the design guidelines can assist these actors in ensuring interventions are conducive to resident needs. However, good quality design also needs to be implemented by construction workers, who are often hired through informal networks. Many are also trained on-site by an intermediary, such as a mason. This ad-hoc approach increases the risk of poor quality construction. As such, the DST can be leveraged by the developer, contractor, or mason to monitor the performance of their employees.

6.2. Local Government Bodies

Monitoring and enforcing building codes is contingent on local government bodies. Such organizations' fiscal and technical constraints in effectively fulfilling their duties can partly be addressed through adopting the DST. This is because it is free and offers a simple set of resources to achieve sustainable gains in housing construction. The DST's guidelines and metrics could also be used to complement ongoing initiatives to draft or revise local development plans and by-laws that are incorporating sustainability guidelines.

6.3. State Government Bodies

State housing agencies that are considering incorporating sustainability criteria into procurement guidelines for developers could use the DST to fulfil this purpose. More stringent guidelines can induce greater supply and adoption of sustainable materials and strengthen an underdeveloped green technologies supply chain.

6.4. Materials Manufacturers and Suppliers

The DST offers materials manufacturers and suppliers the opportunity to promote the performance and location of their products and use it as a basis to form long lasting relationships with prospective clients. By extension, the DST's potential to centralize and disseminate such information and form industry linkages can also strengthen the green technologies supply chain. This, in turn, can help reduce currently higher costs of green alternatives.

6.5. Financiers

The DST is well suited to assist the burgeoning field of impact finance. In particular, alternative financial organization, such as micro-finance firms, investing to achieve social impact and sustainability, can leverage the comprehensively assessed materials options to make quantifiable conclusions. Data on materials costs and projections can contribute to making linkages between returns on investments with socio-economic and environmental impact.

5.6 Educational Institutions

For universities and students involved in architecture, planning, and civil engineering, the DST can function as an important capacity building tool that fosters a nuanced understanding of sustainability. The tool can be used as entry points in classes to explore issues that range from sustainable resource management to best practices in sustainable design.

7. POLICY AND PROGRAMME ALIGNMENT

The DST is aligned with the United Nations' Sustainable Development Goals, particularly 12.1 – *Implementing the 10 Year Framework of Programmes on sustainable consumption and production (10YFP).* Furthermore, the project development process sought to factor in convergences in ongoing Indian government initiatives such as prospective support to the Technology Sub-Mission, as part of the central government's housing programme targeted at low income groups – Pradhan Mantri Awas Yojana (PMAY). For example, the DST offers new data and metrics on resource efficiency to complement the existing focus on options that enable speedy and cost-effective construction of social housing. Providing data and measurement tools for resource efficiency are also in line with measures proposed by the Indian Resource Panel (InRP), and articulated in the government think-tank, Niti Aayog's publication of its Strategy Paper on Resource Efficiency (2017).

As policy frameworks evolve, conceivably to further integrate environmental and resource management practices with socio-economic factors in urban housing, the measurement framework and data collected from the DST can support these efforts in quantifiable, pragmatic ways.

Note: The references used in this document can be found here

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MaS-SHIP

Mainstreaming Sustainable Social Housing Project in India (MaS-SHIP) is a two-year research developed to promote sustainability in terms of environment performance, affordability and social inclusion as an integral part of social housing. Funded by United Nations Environment Programme (UNEP) 10 Year Framework of Programme on Sustainable Consumption and Production (10YFP).

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[1] A 2018 report by FSG settled on this range based on estimates of around 10 million according to an announcement by the Ministry of Housing and Urban Affairs (MoHUA) and "close to 12 million as mentioned by government officials as part of" a National Housing Bank (NHB) workshop (FSG. (2018). *State of the Low-Income Housing Finance Market*., p.8)

[2] The most common Indian social housing typology is G+3 (Ground Floor + 3 stories) (Herda et al., 2017)