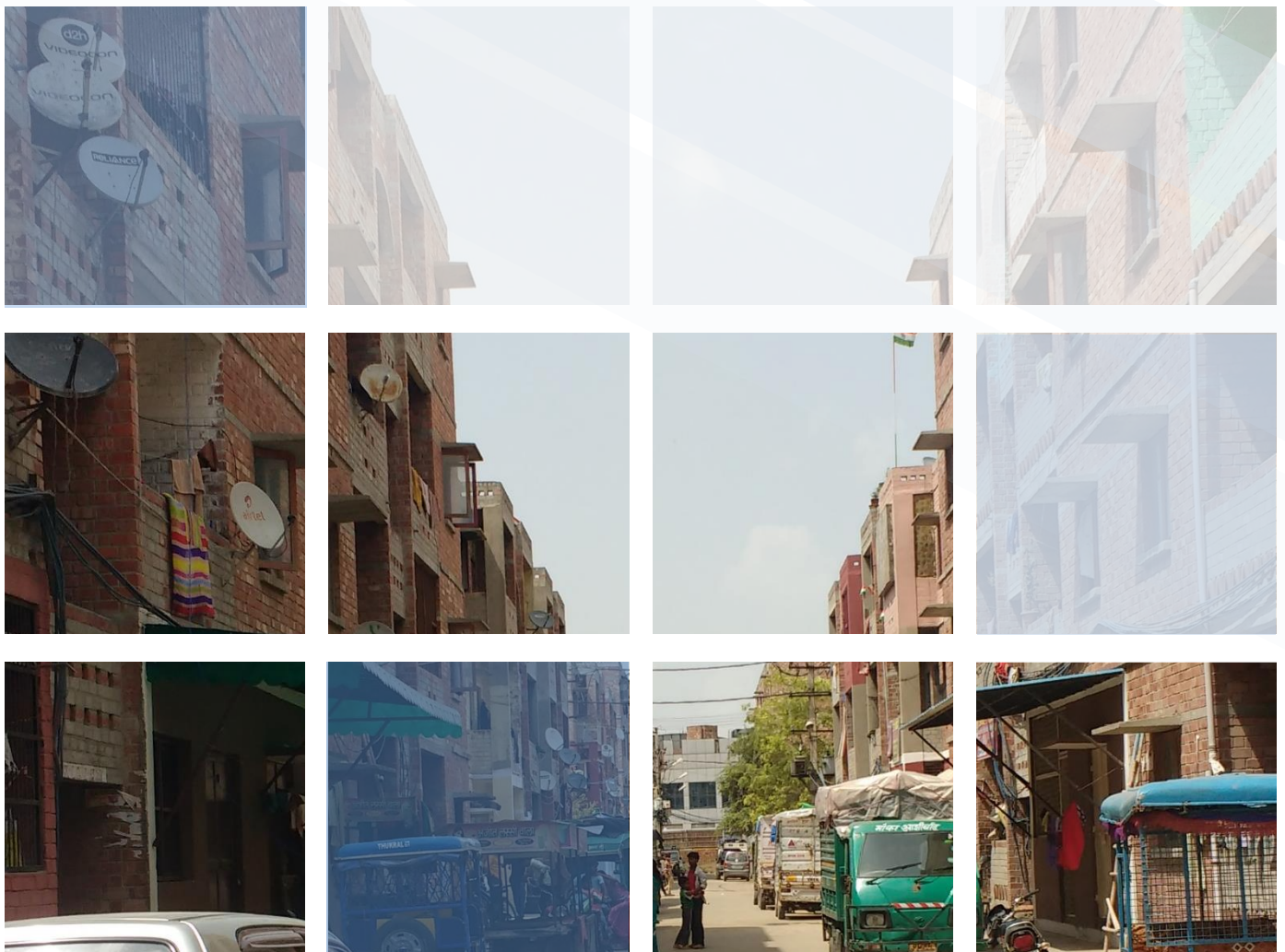


Mainstreaming Sustainable Social Housing in India

Findings and insights from the MaS-SHIP project



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Professor Rajat Gupta is Director of the Oxford Institute for Sustainable Development (OISD) and Low Carbon Building Research (LCBR) Group at Oxford Brookes University (Oxford, UK). He is leader of the UNE 10YFP funded mainstreaming sustainable social housing in India project (MaS-SHIP). He was instrumental in developing and pilot-testing the World's first Global Common Carbon Metric (CCM) for UNEP and has led research for UN-Habitat/UNEP on *Green building interventions for social housing*. Currently Rajat is leading a £1.5m EPSRC/DST funded [RESIDE](#) project on residential energy reduction in India, and is co-lead of a Newton Fund project on customising building performance evaluation for India ([Learn-BPE](#)).



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Sanjay Seth is Senior Director & Senior Fellow of the Sustainable Habitat Programme with The Energy and Resources Institute (TERI). He is also the Chief Executive Officer of GRIHA Council which administers the Green Rating for Integrated Habitat Assessment. Prior to joining TERI, he worked with the Bureau of Energy Efficiency, Ministry of Power, Government of India and headed the vertical on Building Energy Efficiency. By training he is a Civil Engineer and has more than 30 years of experience in the power sector of which the last nine years have been on the Demand Side.



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Sanjoli Tuteja is a Research Associate in the LCBR group at Oxford Brookes University (OBU) (Oxford, UK). She holds a master's degree in Sustainable Building Performance & Design from OBU and a bachelor's degree in Architecture from India. Sanjoli has worked as an architect for over 8 years with major architectural design firms in India, as part of which she worked on award-winning green building design projects. As a researcher in LCBR group, Sanjoli has been working on the MaS-SHIP project, helping to develop the decision support toolkit for integrating sustainability in social housing projects, and also undertaking statistical analysis of resident's experiences of living in social housing developments.



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Megha Behal is a Research Associate at The Energy and Resources Institute (TERI) in the Sustainable Habitat Program. She has a master's degree in Energy and Environment and was a gold-medallist during her Bachelor's in Architecture. She has a profound interest in studying sustainable building materials and construction practices. She is currently Project Lead for the 'Mahindra-TERI Centre of Excellence for Sustainable Habitat and Water Use', and 'Construction Waste Reduction: Australia-India Collaborative Workshops'-part of the Australia India Council grant. In MAS-SHIP, her core involvement has been in developing the Sustainability Assessment Tool (SAT) for comparing the sustainability performance of building materials and systems.



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Zeenat is vice-president of the Development Alternatives Group and has over 26 years' experience in the social and environment development sector. She is an architect and a planner by training, with a specialization in rural habitat development issues and additional training in policy analysis and advocacy. She has over two decades of experience in the design of affordable eco-housing delivery models, post natural disaster housing reconstruction interventions and habitat policy development at the national level. She is also a founder coordinator of the basin-South Asia – a regional knowledge platform for housing and habitat and represents Development Alternatives at the Climate Action Network South Asia.



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Ayushman Banerjee

Ayushman Banerjee is a technical expert at UN-Habitat's Housing and Slum Upgrading Branch, where he has developed MaS-SHIP's Policy Briefs. His interests include sustainable housing, and governance and planning for urban resilience. These interests are reflected in professional endeavours such as through conducting environmental risk analysis for social housing in Ontario, Canada, and advancing integrated planning in Chennai, India.

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A large number of stakeholders in India have been part of the journey of developing the Decision Support Toolkit (DST) and the various tools embedded in it. Architects, habitat planners, housing developers, academics, NGOs working in social housing, students, professionals from housing finance and officers of the Government of India have actively participated in the various stakeholder workshops conducted over the past two years. Their critical assessment has helped in guiding the project to maintain its relevance in the Indian housing market. We are grateful to all.

We are especially grateful to our project advisory group and technical reviewers - Dr Sameer Maithel and Prof Ashok Lall, who took time to critique the project, share knowledge and ensure that the clarity and quality of project outputs was maintained.

We would like to show our deep appreciation for Mr. Pramod Adhlakha (Adhlakha and Associates) and Mr. Arnab Gazi (B3B Group) for their constant support to this project. This project has been able to reach 750 householders across five cities in India to develop an empirical understanding of user perceptions of building materials and construction systems. This has been possible through the efforts of the students and academics from Vastu Kala Academy (Delhi); Jagannath University (Jaipur), Dehradun Institute of Technology (Dehradun); Vaishnavi School of Architecture (Vijaywada) and Impact School of Architecture (Bangalore), who conducted household surveys for the five housing case studies.

In a data poor environment, the support from building material manufacturers especially from Schnell Homes and Supertech Ltd. was admirable. This indicates the immense value of product disclosures to advance sustainability in the housing construction sector. We are especially thankful to Apurva Singh and Pankaj Khanna from DA for their help in gathering field data.

Finally, we would like to express our appreciation to the Building Materials and Technology Promotion Council (BMTPC) and the Ministry of Housing and Urban Affairs of the Government of India who have been following the development of this project and provided valuable guidance to the project.

Foreword

The Sustainable Development Goals Target 11.1 seeks to “By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums”. The Housing for All by 2022 mission of the Government of India is a step towards achieving this target. The overall residential construction demand is expected to increase more than fourfold over 2005 levels as a result of meeting the urban housing shortage.

Mainstreaming Sustainable Social Housing in India project (MaS-SHIP) is a research project funded by the United Nations Environment’s 10 Year Framework Programme (10YFP), that aims to identify what the impacts and benefits of housing production at scale, such as that of the Housing for All by 2022 mission, could be – for our environment, our economy, and our communities – and to provide a method for identifying the most optimal building materials and systems.

MaS-SHIP project has been undertaken by the Low Carbon Building Research Group at Oxford Brookes University (UK), The Energy and Resources Institute (TERI), Development Alternatives and the United Nations Human Settlements Programme (UN-Habitat).

MaS-SHIP research has developed a toolkit that enables building practitioners, housing developers and policy-makers to make informed decisions for selection of sustainable building materials, systems and design strategies for social housing projects. The Decision Support Toolkit (DST) enables multi-criteria decision making to provide comparative assessment. In addition, the systematic documentation of resident experiences of living in social housing developments has helped to better understand the preferences and concerns of the residents.

This publication produced by the four consortium partners elaborates the methodology adopted for arriving at the outcomes and provides links to DST for its easy implementation. It also proposes and discusses the policy implications of mainstreaming sustainable social housing in India and the utility of the DST in supporting these endeavours.

I congratulate the consortium partners for their in-depth analysis and for providing evidence-based solutions for bridging the existing gap in an inherently data poor environment. It is clear that planning and design of social housing should require more resident participation so that design intentions are achieved in reality. I urge the building practitioner community to not only use the MaS-SHIP toolkit, but also help in augmenting its capability by further populating it with newer building systems.



Dr Shailesh Kr Agrawal
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Executive Summary

As the Government of India aims to construct 12 million social housing dwelling units through the *Housing for All* by 2022 programme, the pressure to deliver in a timely, and cost-effective way, will increase. It is vital to identify what the impacts and benefits of housing production at such a massive scale and speed could be, especially when currently sustainability is not effectively mainstreamed in social housing projects.

This report describes the wider context, objectives, methodology and findings of a two-year research project entitled MaS-SHIP. Funded by the United Nations Environment's Sustainable Buildings and Construction programme of the 10 Year Framework Programme. MaS-SHIP has produced a comprehensive data framework, tools, evidence-based knowledge, insights and policy recommendations for mainstreaming sustainable social housing in India. A socio-technical approach was adopted in the research, bringing together primary and secondary data collection with both quantitative and qualitative assessments, using literature review, stakeholder engagement, online and field surveys, statistical tests and thermal simulations. The construction and policy ecosystem were examined to identify barriers and opportunities in adopting sustainable building materials and related design and construction practices, so as to develop policy recommendations.

First, MaS-SHIP created a framework of 18 attributes in collaboration with developers, practitioners and academics to measure the performance of 17 established and emerging building systems, against four criteria, including *resource efficiency*, *operational performance*, *user experience*, and *economic impact*. The findings were collated into catalogues for each material, while the methodology for calculating the mix of qualitative and quantitative attributes were developed into a new data framework.

The multiplicity of attributes required rationalized valuations relative to each other. To establish consistency, inputs of a representative sample of housing experts in India were invited to weigh each attribute. That is, a widely accepted *Analytic Hierarchy Process* (AHP) was applied to survey 200 experts including project consultants, private and public housing providers, academics, manufacturers, and building practitioners.

New information was revealed on residents' experience with building materials and systems. Large-scale surveys showed that residents also influence the demand for sustainable materials - they were found to prefer less resource and operationally inefficient materials such as English-bond brickwork because such an option affords them greater flexibility to make in house adjustments such as nailing wall-hangings. Many residents also raised grievances about factors such as discomfort because of inadequate ventilation, and their homes being located away from employment opportunities.

A key output from MaS-SHIP research has been the creation of the Decision Support Toolkit (DST), an interactive and online toolkit comprising a range of outputs, datasets, tools and insights that can help prospective users in choosing sustainable building materials and making and monitoring sustainable design interventions and construction practices in social housing projects. The DST not only addresses the absence of a comprehensive measurement framework to assess sustainable materials, but also includes design guidelines to ensure sustainability is embedded at the conception stage of a housing project. Through the development of a Sustainability Assessment Tool (SAT), it fills missing data that is needed to quantify the performance, and using Material mapping application, spatially maps the availability of sustainable building systems options. As a key component of the DST, SAT has the capability to measure the relative performance of building materials and systems for social housing projects that do not exceed four stories, using the framework of 18 attributes. Filling these knowledge gaps can assist in prioritizing sustainability considerations in housing policy and implementation.

Finally, based on the research findings, the following recommendations are made for mainstreaming sustainability into social housing projects in India:

- Develop an Overarching Sustainable Housing Policy Framework that integrates resource and energy efficiency considerations with socio-economic parameters in urban contexts.
- Develop a data collection strategy to fill missing information on factors such as job creation potential for new technologies, based on interventions such as instituting mandatory disclosure, funding primary data collection efforts, and developing a centralized, open source database for constant updating.

- Incorporate sustainability requirements in state procurement guidelines as conditions for developers to win social housing contracts.
- Provide supply side subsidies and tax breaks to incentivize private financing and construction of sustainable social housing.
- Develop awareness programs for developers with a focus on sensitizing such actors to potential convergences between cost and efficiency considerations, with environmental benefits. Identify key materials and design practices that achieve such goals and link them to its potential benefit for their prospective customers – the residents of social housing dwellings.
- Systematically develop training programs and educational materials on sustainability which should be made available to urban local bodies.
- Develop training modules for developers, masons and unskilled construction workers to adopt better construction practices with a focus on ensuring basic design factors are implemented for resident comfort.
- Engage residents in design and planning through: awareness programs to sensitize residents to the value of sustainability and influence them to demand sustainable options from housing providers.
- Study resident needs in order to apply design changes to enhance comfort, and potentially allocate additional resources to empower residents in sustainably managing their homes.

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