

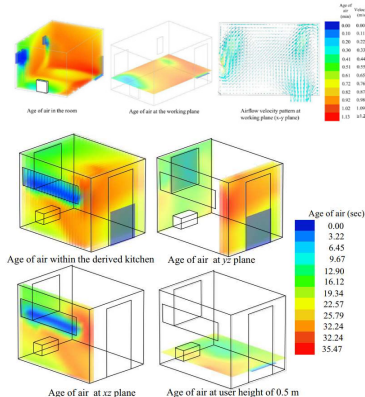
# Data-driven design heuristics for sustainable low income settlements

Lack of standardised sustainable habitat design guidelines for low-income housing plays an important role in determining the poor quality of life in these settlements, particularly in the slums. Our work investigates process-driven pathways for developing and delivering sustainable habitat design guidelines using socio-technical frameworks. We employ mixed-mode research methods where we integrate the depth of engineering with the breadth of social science to understand low-income habitat from the perspective of people, places and practices. We combine urban experimentation with robust simulation techniques to derive practical solutions for improving the quality of life (QoL) of the urban poor. Urban experimentation includes data acquisition through *in situ* environmental sensing of the low-income habitations, modeling of the houses, calibration of the sensed data, and its urban scale building energy calculations using state-of-the-art building energy simulation techniques. We integrate the socio-cultural stochastics in the building- simulation framework to derive empirical evidences of the urban QoL in these settlements. There are three cohorts of research:

## Investigation of building performance

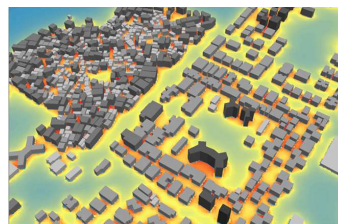


Rural kitchens and its indoor built-environment (source: Debnath et al., 2016)



Contours of local mean age of air, and airflow velocity during the time of cooking at working plane of 0.5 m (source: Debnath et al., 2016)

## Spatial analytics for urban sustainability and policy analysis



Sky-view factor of Navi Mumbai (Image courtesy: Nikhil Kumar, PhD candidate-CUSE).

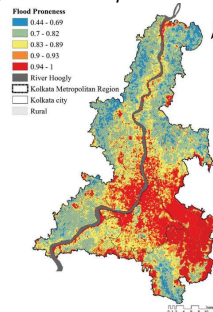
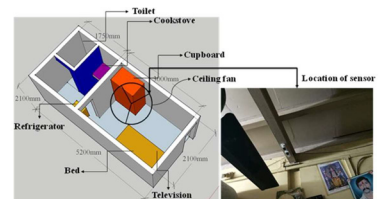


Fig. 1 Predicted flood proneness of Kolkata Metropolitan Region (KMR) (source: Bardhan, 2017).

## Data-driven simulation and modelling techniques for derivation of low-income sustainability heuristics.



Installation of field sensors in one of the slum houses of Dharavi, Mumbai (source: Ramit Debnath, Bardhan, & Jain, 2017).

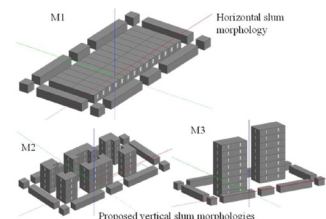


Fig. 2 Slum morphologies in Mumbai: horizontal structures (M1) and Vertical structures (M2 and M3) (source: Ramit Debnath, Bardhan, & Jain, 2017)