



**India-UK Joint**

**Integrated Urban Model for Built Environment Energy Research**

**(iNUMBER)**

**Executive Summary:  
Approaches to Urban Stock Model**

January 2019

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UK India Joint Integrated Urban Model for Built Environment Energy Research (iNUMBER)

Work Plan 1 (WP1): Create a 3D Building Stock Model

# **Executive Summary:**

## **Approaches to Urban Stock Model**

January 2019

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iNUMBER (iNtegrated Urban Model for Built Environment Research) is a four-year (2017-2021) research project to help cities reduce their energy demand and improve their municipal services. This goal is led by CEPT University, Ahmedabad and supported in India by Indian Institute of Technology Bombay, Mumbai. It is led by University College London, London, and supported by the University of Oxford, Oxford.

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## Executive Summary:

iNUMBER is an Indo-UK collaborative research project that was co-created to address the Newton research topic: “Integration of information, communication and renewable energy technologies at building, community and city level interventions”. The project aims to address this research topic by developing a data-driven Intelligent Urban Model for Built Environment and Energy Research (iNUMBER). The primary focus of this tool is to support the Indian Municipalities to understand the variations in energy demand and thereby assist in providing clean and sustainable energy services to its citizens. iNUMBER being a four-year collaborative research project (2017-2021), Ahmedabad has been selected as the primary case city for the research. Further, the project could be extended by considering other cities as well.

The key objective of the project is to develop a City Energy Model that includes the 3D building stock and the municipal services energy model. The project aims to achieve the same by linking the existing and new data sets and testing the validity of the developed model for a range of scenarios in accordance with different data availabilities. To achieve this overarching objective, the project has been sorted into 3 work packages (WP) as mentioned below,

1. WP1: Create 3D Building Stock Model
2. WP2: Incorporate Municipal Energy Services
3. WP3: Improving Data Granularity

This executive summary provides a brief account of the activities carried out under the WP1: Create 3D Building Stock Model. This WP primarily focuses to incorporate and benchmark the data sets on cities, buildings and municipal services to build a viable 3D Building Stock Model. The report provides a comprehensive review of both remote sensing and UAV technical capabilities and processing techniques to achieve the desired 3D building stock model output.

The methodology adopts advanced aerial surveying technologies such as LiDAR and Photogrammetry attachments of UAV to capture the required resolution of building stock data and process into fully textured 3D Building stock model.

The report further includes the investigations and identification of methods to integrate the high precision 3D Building stock model to generate a robust City Energy Model. Further, the report comprises the literature review of the existing ‘Urban Building Energy Models’ to analyze the underlying methodology of the same. This is to critically examine and extract the best-suited framework for simulating Ahmedabad city energy model. The model shall finally integrate other work packages (WP2 and WP3) to build a complete City energy model for Ahmedabad city.

The integration of the outcomes from all 3 work packages will assist in understanding the energy demand of the entire city. Through a fourth work package, the activities under iNUMBER will further be integrated with other projects, related research in India, and across the world. Further, this integrated approach will develop new areas of inquiry related to future building stock and municipal services in India.



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