News Article for RISUD Joint Research Fund

		Name	Department
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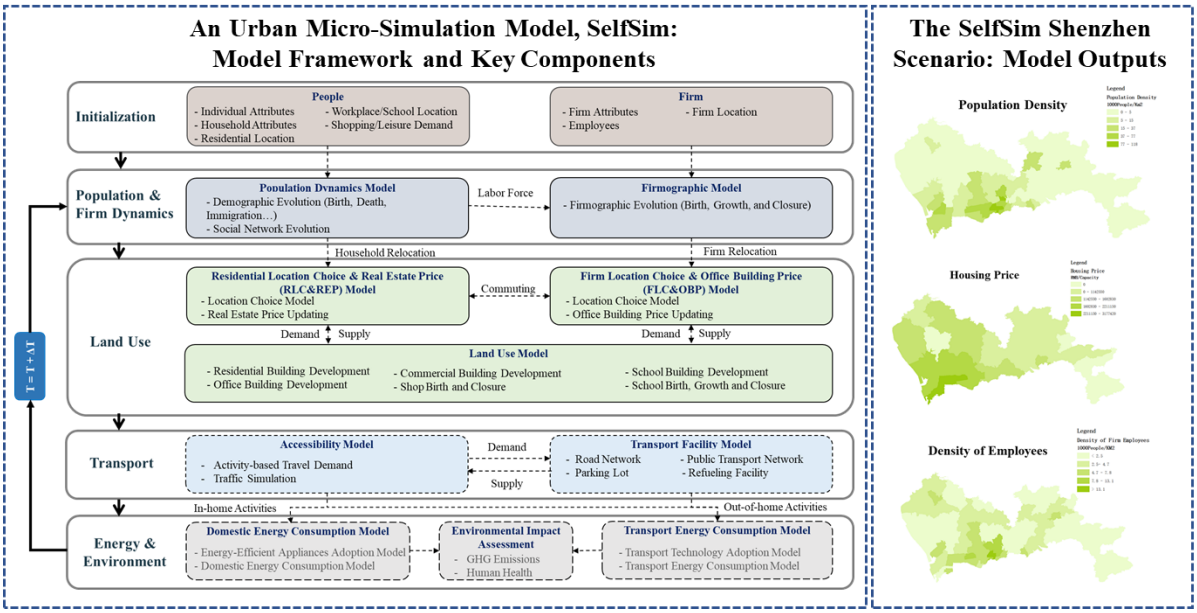
3. **Project Title:** Interlinked Low-Carbon Travel and Residential Behaviour: Energy, Climate, Social and Infrastructural Impacts

4. **Annual Progress/Achievement (***in layman's language, no more than two A4 pages, pls attach a few figures***)**

Household energy consumption in the transport and residential domains tends to be analysed separately, failing to recognise interlinkages between households' preferences, choices and behaviours expressed in different areas of everyday life. As a result, our understanding of the collective outcome of household actions on society, infrastructure and climate lacks behavioural realism, which makes it difficult to reduce energy consumption, deploy infrastructure, and mitigate climate change in these domains. In this project, we are developing a bottom-up, behaviourally-realistic, and spatially-explicit simulation environment to explore interlinked energy use and technology purchase behaviours across travel and residential domains (e.g., choice of car or commuting mode, and adoption of heating or cooling technology or smart devices in homes). Simulating hundreds of thousands of heterogeneous decision makers who interact socially will allow us to understand how information about innovations propagates through social networks, and the impacts resulting adoption has on urban-scale infrastructure including power grids and roads.

In the first year of this project, we conducted two questionnaire surveys on low-carbon technology adoption in Beijing and Shenzhen, developed a set of agent-based diffusion models for several emerging transport technologies and services, and also re-developed an urban micro-simulation model, SelfSim, within NetLogo. The key project outputs are summarized as follows:

1) An Urban Micro-Simulation Model, SelfSim. We re-developed and improved an urban micro-simulation model (proposed by the PI of this project), SelfSim, within NetLogo (one of the most-used agent-based simulation platforms). SelfSim is maintained on GitHub, and is expected to become an open-source project in the second year of this project. SelfSim is composed of a set of spatial agent-based models (see the figure below) to simulate how urban system evolves over time at the individual level. We have set up a real-world SelfSim scenario in Shenzhen and obtained preliminary simulation results. We will further improve SelfSim and also extend it by integrating the agent-based low-carbon technologies in both the transport and residential sectors. The models in the dashed boxes of the figure below are under development/improvement.



2) A Set of Agent-based Low-Carbon Technology Diffusion Models in the Transport Sector. We developed several agent-based models to simulate how those typical transport technologies and services (including mobility-as-a-service, autonomous vehicles, electric vehicles, shared bikes, car sharing and ride sharing) diffuse among citizens over time, with empirical findings from the Beijing survey. The models have been applied/tested in the Beijing scenarios, and could be further integrated into SelfSim, so that we can explore the diffusion and impacts of these low-carbon technologies in the context of urban evolution.