

**Title:** Modelling urban transition from conventional to a green economy

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### **Abstract**

The severe consequences of climate change and extreme weather have prompted countries around the world to escalate the transition to a low-carbon green economy, retiring conventional fossil-fuel sectors such as mining, oil and gas, while developing new sectors in the green and knowledge-based economy. The transition process, however, could be challenging for many cities traditionally dominated by conventional sectors, which has an infrastructure and labour force built for the conventional sectors. They will need to quickly adapt to the changing environment to stay competitive and an attractive place to live, or they will soon lose their population and livelihood, just as many did during previous waves of industrial revolutions.

As cities are complex systems with multiple interacting sub-systems, the transition process will inevitably invoke complex feedback mechanisms between the sub-systems, such as between the housing and labour markets, and between households and the neighbourhoods. There will also be emergent systemic risks arising from the transition. How cities manage the risks and navigate the transition process will determine their future success. The proposed study can help by enhancing our understanding of the transition process and the complex feedback mechanisms, categorising transition paths under different scenarios, and enabling better decision making in the process.

This paper presents an agent-based model that simulates the dynamic transition process from conventional to a green economy in an (abstract) city previously dominated by conventional sectors. The model features the feedback mechanisms between the housing and the labour markets in heterogeneous neighbourhoods. We consider multiple scenarios in which the conventional sector is replaced by the new (green and knowledge) sectors, including the sudden collapse of the conventional sector without a plan to upgrade to the new sectors, the gradual decline and growth of the conventional and new sector respectively, and an escalated upgrade to the new sector with additional training for workers.

The paper makes several main contributions: 1) We introduce feedback mechanisms between the housing and the labour market and between households and the neighbourhoods in an urban simulation framework; 2) We use the framework to study the multi-effects of transition from conventional to a green economy in a complex urban system; 3) We categorise urban transition paths under different scenarios.