

# UNDERSTANDING CHANGES IN SPATIAL VULNERABILITY TO CLIMATE RISKS: MODELLING FUTURE POPULATION AND EMPLOYMENT



ARCADIA FACTSHEET 3  
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*In order to fully understand the spatial patterns of vulnerability to future change in climate it is essential to consider changes in the urban fabric which may occur over the next century. These include spatial changes in employment, population, and patterns of urban development. This factsheet outlines a model of future population and employment patterns. The model has been developed to allow testing of spatial adaptation scenarios.*

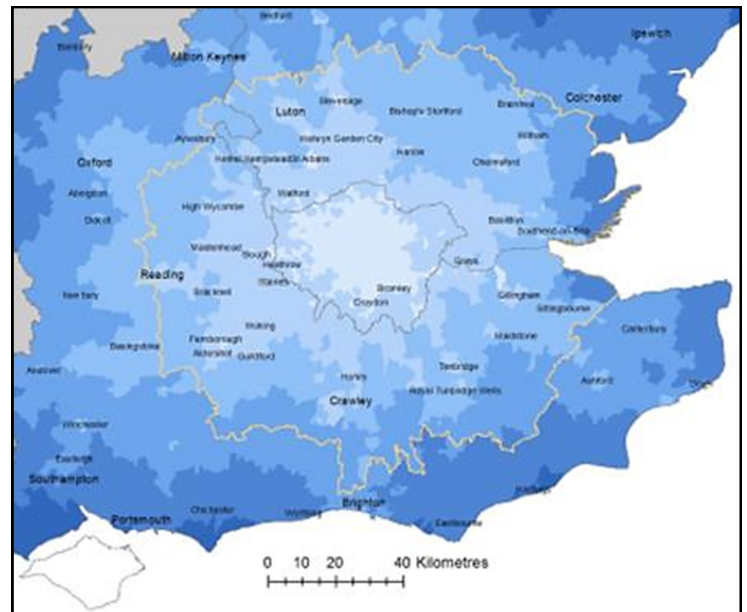


## Context

- ◆ Climate change is not happening in isolation. Population growth, urban development and land-use change all have an effect on the vulnerability of urban areas to the future threats of climate change.
- ◆ It is therefore important to understand the implications of the changing spatial structure of the city under different scenarios of demographic and socio-economic change.
- ◆ The economy of a city is a key driver of patterns of growth and development, with the locations of employment and accessibility to them in turn driving the locations of population and housing.
- ◆ London is intrinsically linked to its surrounding area, with large numbers of commuters entering the city

## Understanding employment drivers

- ◆ The future location of jobs in the South East of England is a key driver of locations of population and changes to land development patterns.
- ◆ Job locations also determine the vulnerability of the city and its economy to future climate events.
- ◆ A study of drivers of current employment patterns was undertaken. This provided an understanding of how they may influence employment in the future.
- ◆ Key drivers included accessibility to airports and to the public transport system (fig. 1).
- ◆ Based on this study future employment scenarios were developed.
- ◆ The analysis focused on ten sectors representing the key employment types across London and the wider South East.
- ◆ Business Services, Financial Services, IT and Professional Services, and Construction sectors were expected to have the largest role in driving the economy of the region.
- ◆ Regression analyses were run for each sector to determine the biggest drivers of the spatial location of employment.
- ◆ The most important driver was the availability of office floor space for service-based industries, retail floor space for retail sector, and industrial floor space for manufacturing and primary sectors.



**Fig. 1: Pattern of accessibility to public transport in the South East of England. Shading reflects the pattern of accessibility to public transport from high (light blue) to low (dark blue).**

## The ARCADIA Employment Location Model

- ◆ Based on the drivers of employment and employment location a model has been developed to allow simulation of possible future employment patterns under various economic and planning scenarios.
- ◆ Three planning scenarios are available: Business as Usual, Decarbonisation, and Deregulation (representing a relaxing of planning laws to encourage business growth).
- ◆ The three scenarios can be used to assess future employment locations and the effects of these changes in terms of climate hazards.
- ◆ The employment patterns are also used as a driver to the Population Location Model.

## The ARCADIA Population Location Model

- ◆ The ARCADIA Population Location Model produces projections of future population across Greater London and the surrounding region.
- ◆ Future population is projected using a number of drivers and constraints.
- ◆ For example, the number of jobs in the area (estimated by the Employment Location Model) and the transport accessibility to reach these jobs are key drivers of population locations (as shown in fig. 2).
- ◆ Future patterns of population can be examined alongside future climate change scenarios to understand how vulnerability to climate hazards will change in the future.

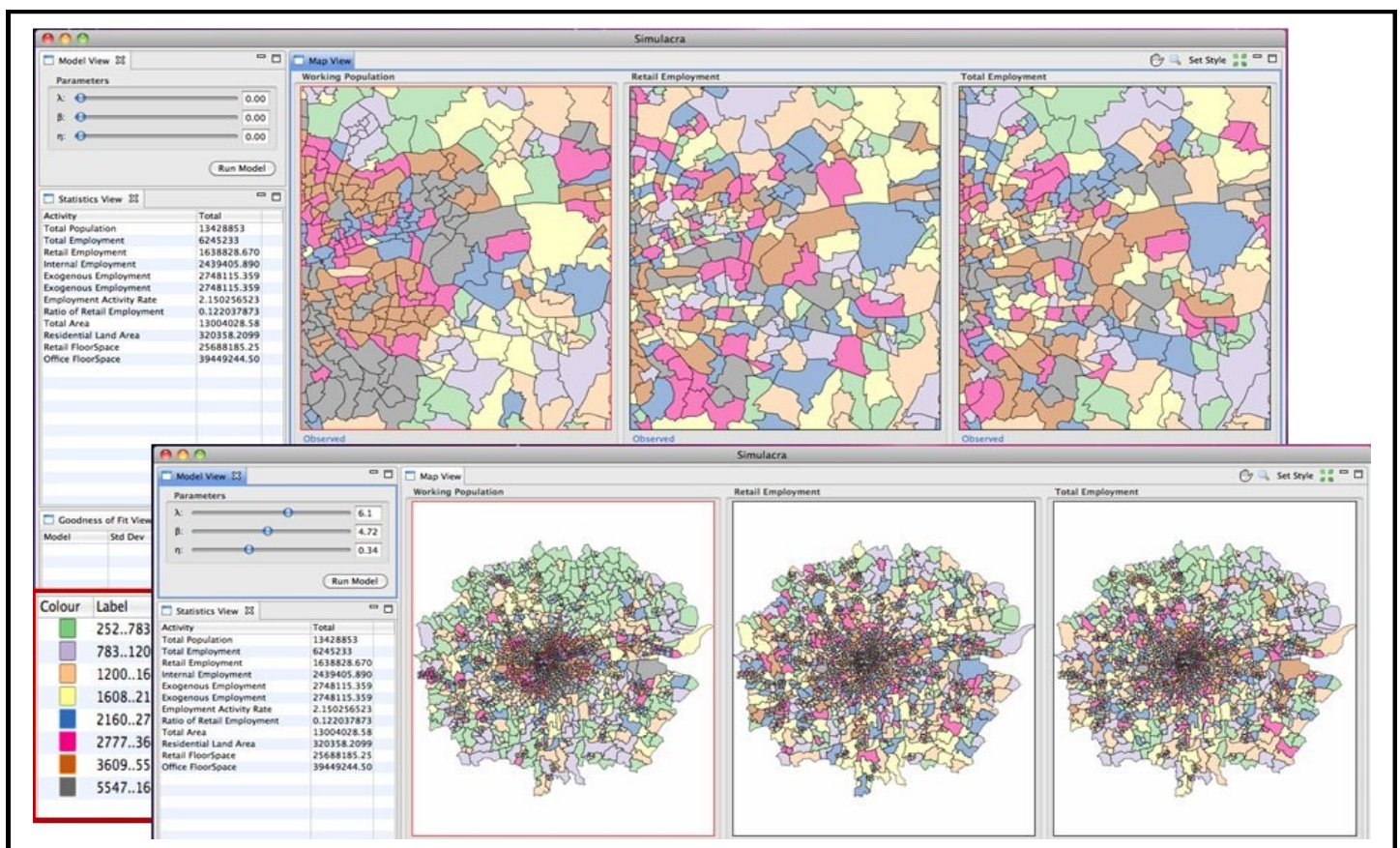


Fig. 2: An example screenshot of the ARCADIA Population Location Model, showing population (left) driven by factors such as retail jobs (centre) and total jobs (right) for the study area.

## Summary

- ◆ The two models outlined above provide future scenarios of urban development, in terms of employment and population locations.
- ◆ The models produce spatial snapshots of employment and population numbers at future time periods (e.g. for the 2030s and 2050s) which allow the analysis of future vulnerability to climate change.
- ◆ Desktop and web-based versions of the models are being developed at the Centre for Advanced Spatial Analysis (CASA) to provide tools for the rapid exploration of urban patterns and future scenarios.

### For additional information see:

- ◆ CASA website: <http://www.bartlett.ucl.ac.uk/casa>
- ◆ ARCADIA Website: [www.arcc-cn.org.uk/project-summaries/arcadia/](http://www.arcc-cn.org.uk/project-summaries/arcadia/)