

24/7 Population modelling for natural hazard assessment

Alan Smith

University of Southampton, UK

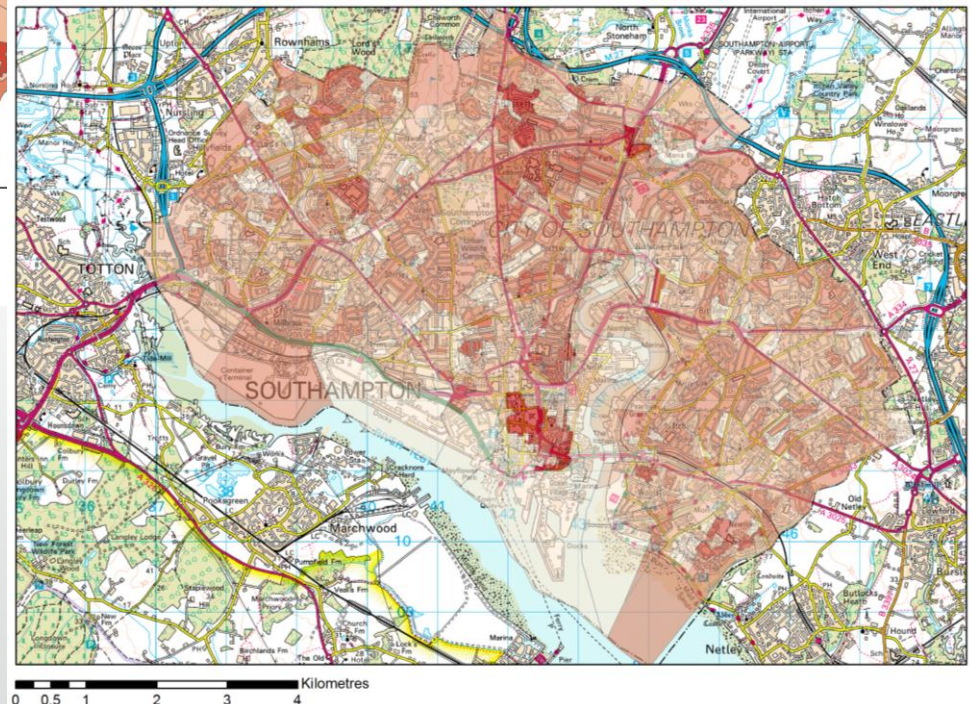
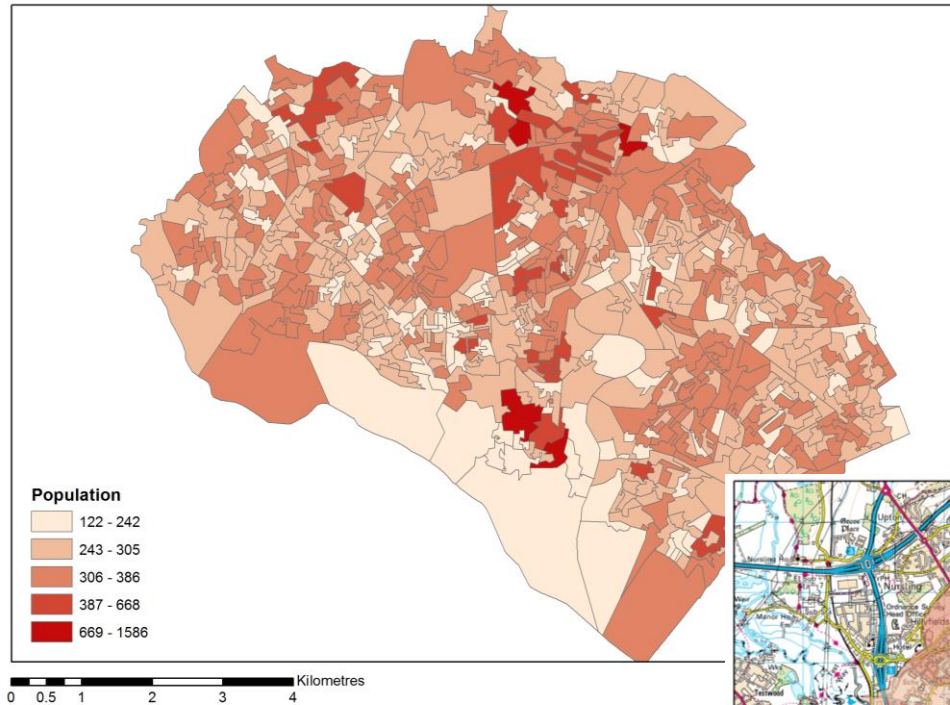
Association of American Geographers Annual Meeting, Tampa, FL

11 April 2014

Background

- Better population estimations are required for hazard risk assessment
- Censuses typically provide a decadal 'night-time' population estimation
- This does not take into account the large fluxes of temporary populations during the day
- Events of 2011/12 have focused global attention on natural hazards and their impacts

Conventional density maps



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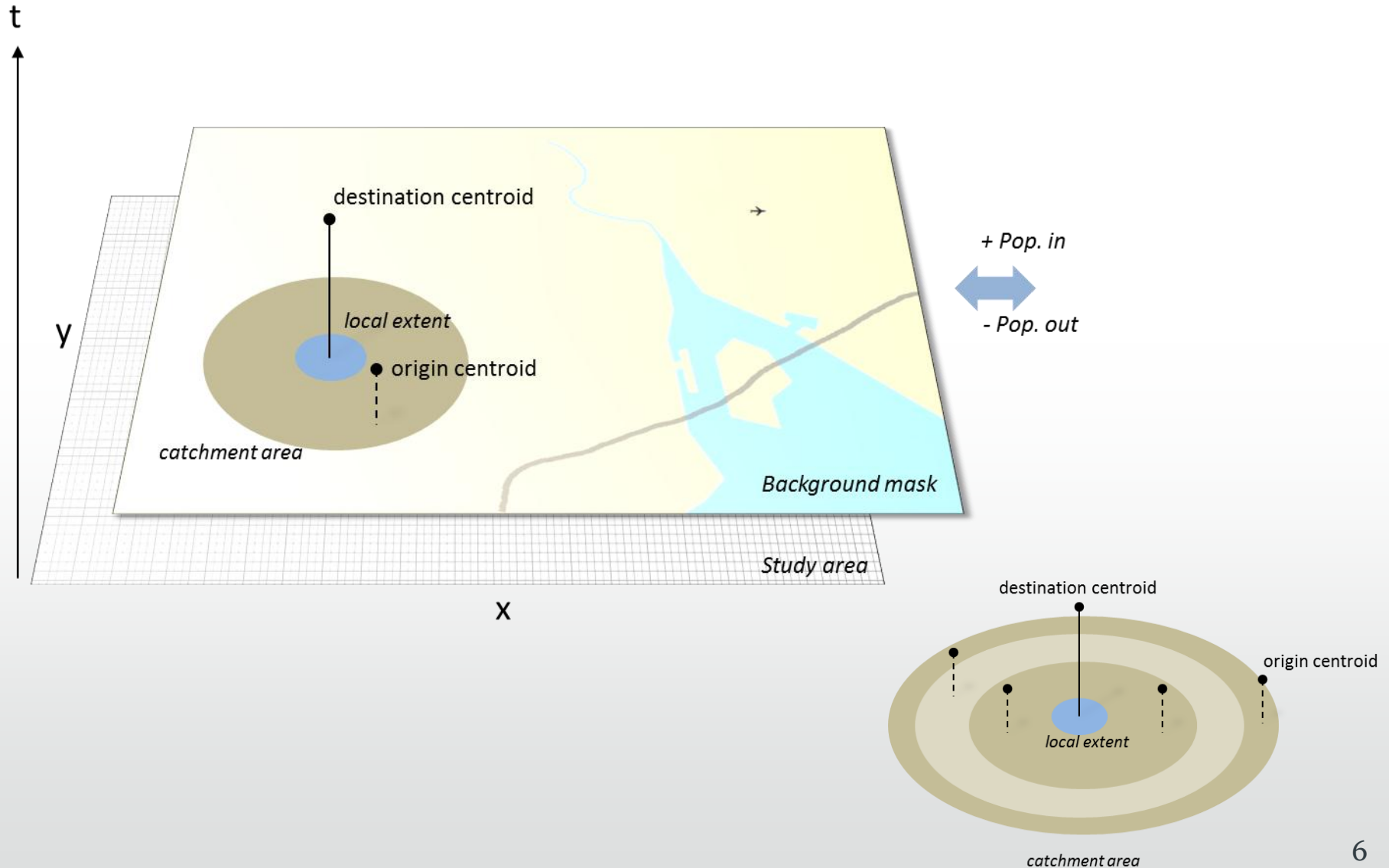
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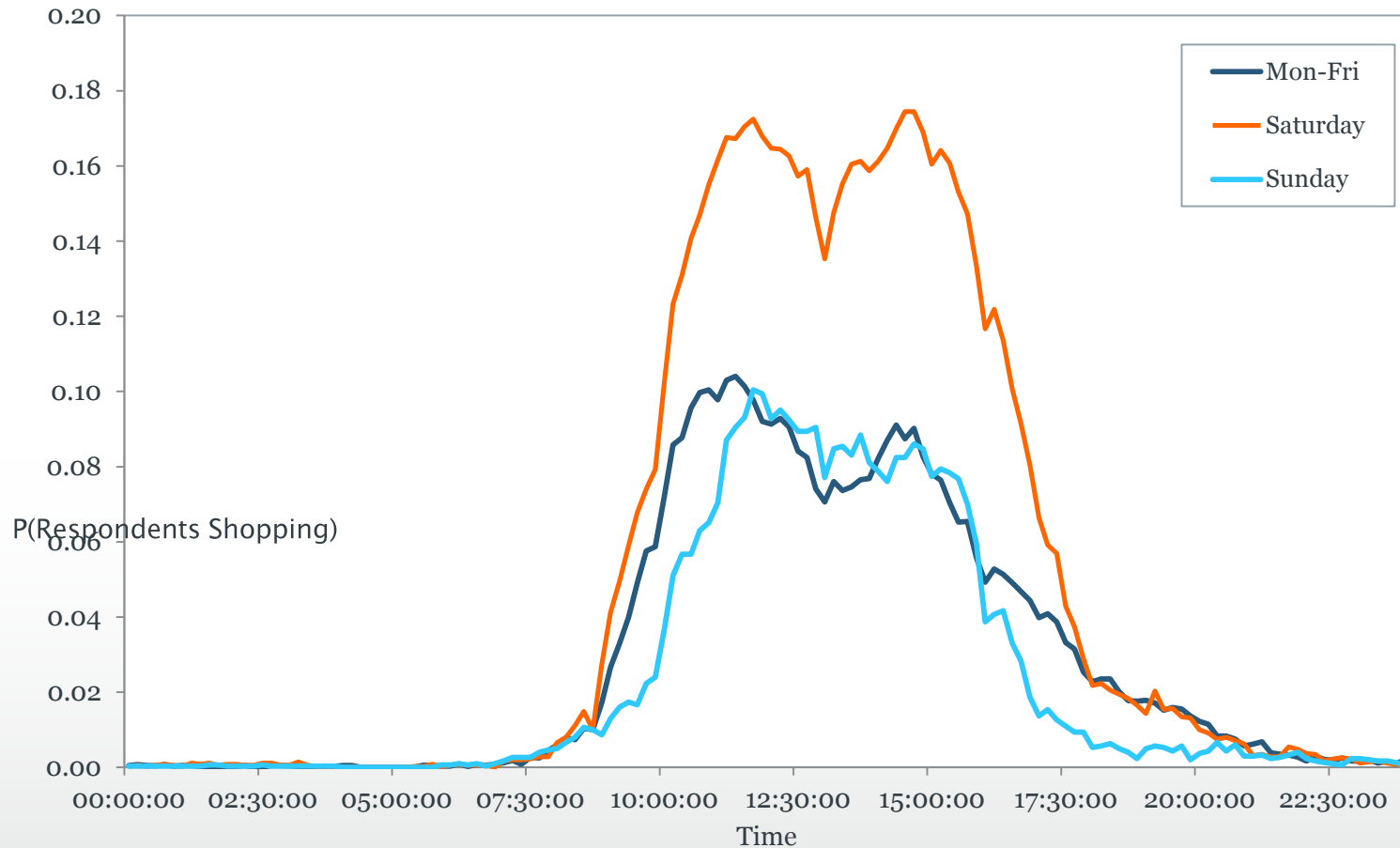


“Pop 24/7” overview

- Spatio-temporal gridded population modelling
 - Variable kernel density estimation (KDE)
 - Utilises population centroids
 - Redistributes resident populations according to a temporal profile
 - Population subgroups
- Removal of arbitrary administrative boundaries
- Allows locations of zero population density (Eg. Water)

Space-time interpolation





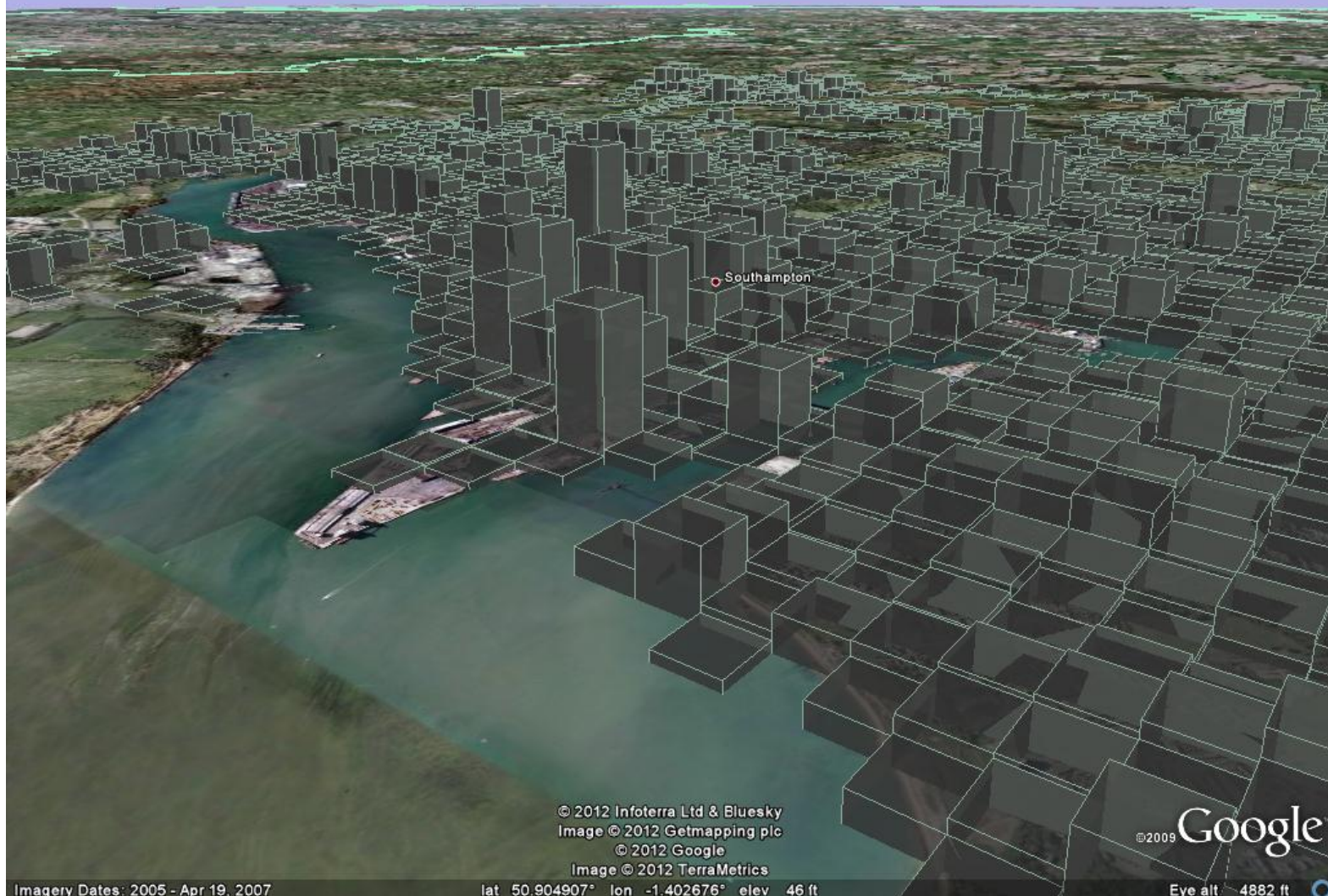
Temporal Profile

A retail example of a temporal profile derived from the *Time Use Survey 2000* indicating potential shopper numbers for a given time.

Results

- Variable grid size, currently using 200 metre resolution
- Visualization for public communication
- Population weighted to background mask
- Combination and analysis with hazard footprint data
- Application to a UK flooding scenario, using the Environment Agency's 'Flood Map'.

Oct 10, 2012 12:00:00 pm



Southampton

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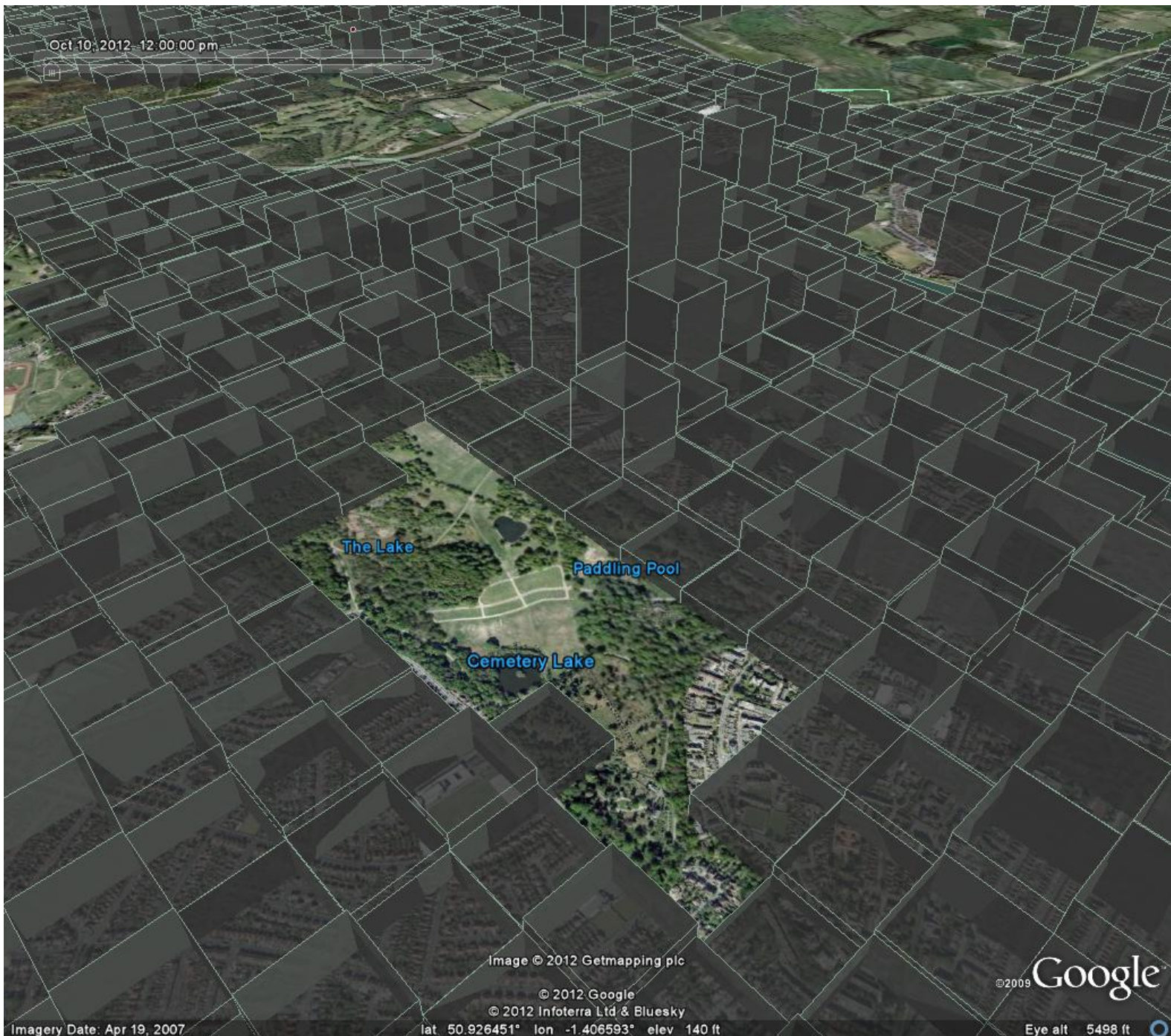
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Imagery Dates: 2005 - Apr 19, 2007

lat 50.904907° lon -1.402676° elev 46 ft

Eye alt 4882 ft





Oct 10, 2012 - 12:00:00 pm

The Lake

Paddling Pool

Cemetery Lake

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lat 50.926451° lon -1.406593° elev 140 ft

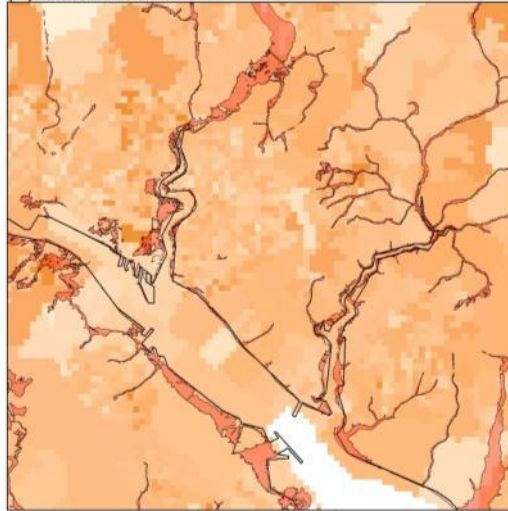
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Imagery Date: Apr 19, 2007

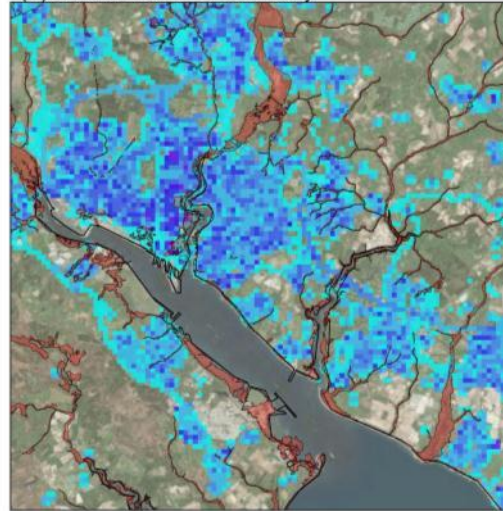
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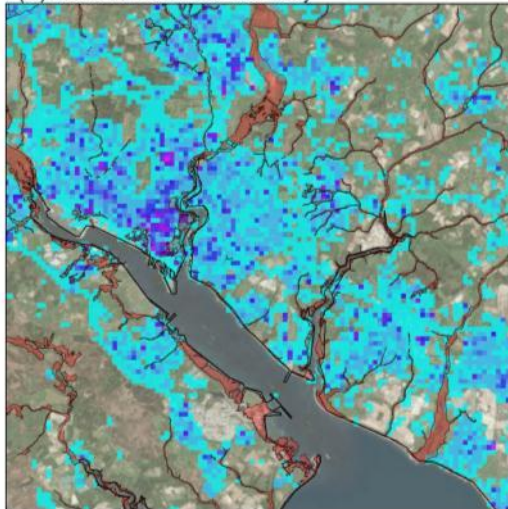
(A) 2001 Census



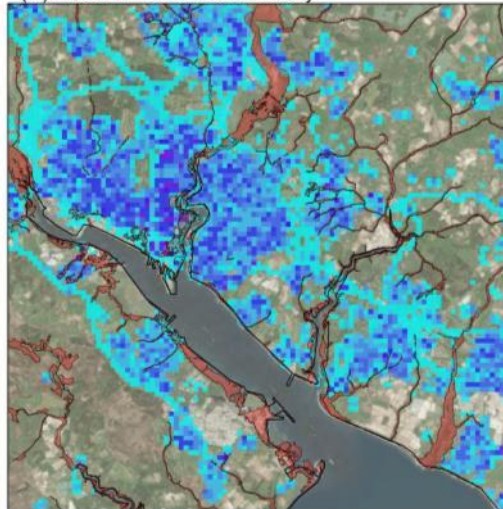
(B) Model time: 08:00 weekday



(C) Model time: 12:00 weekday



(D) Model time: 20:00 weekday



2001 Census Pop. Modelled Pop.

High : 1586
Low : 106

High : 5490.6
Low : 0

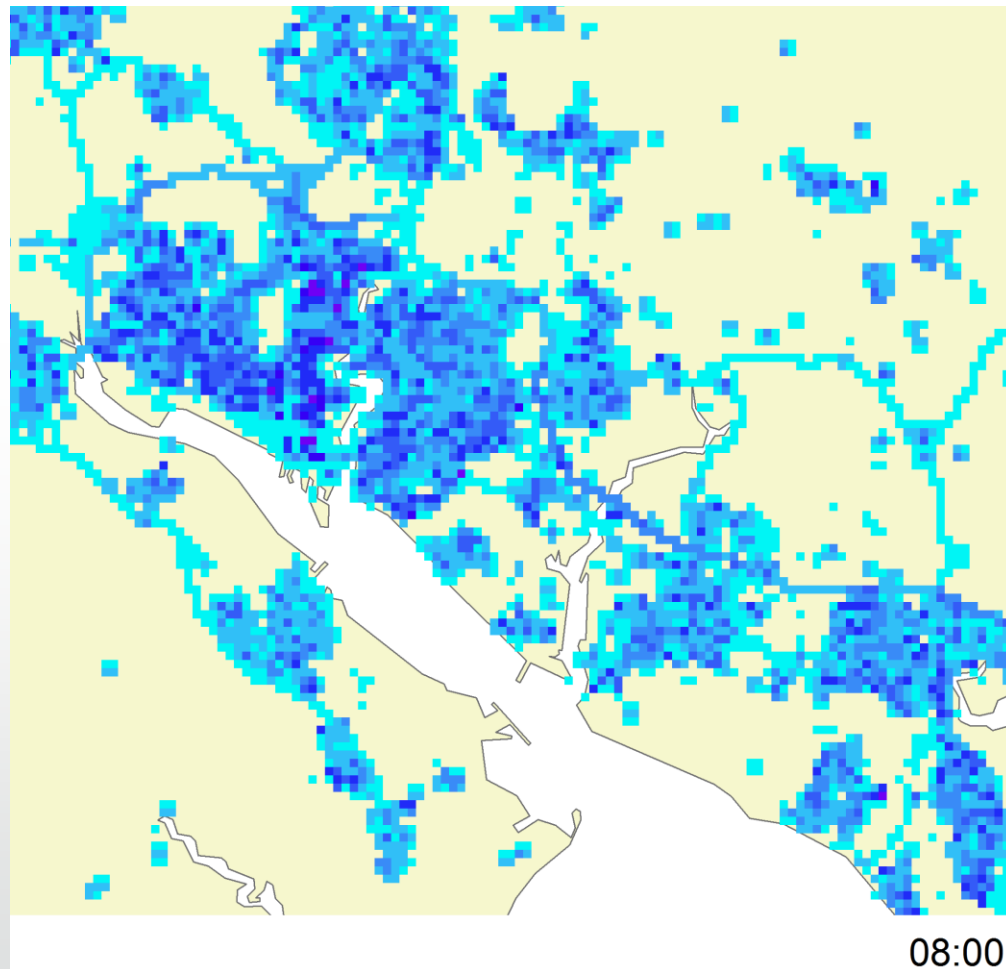
Flood Map Zone 3

0 8 km

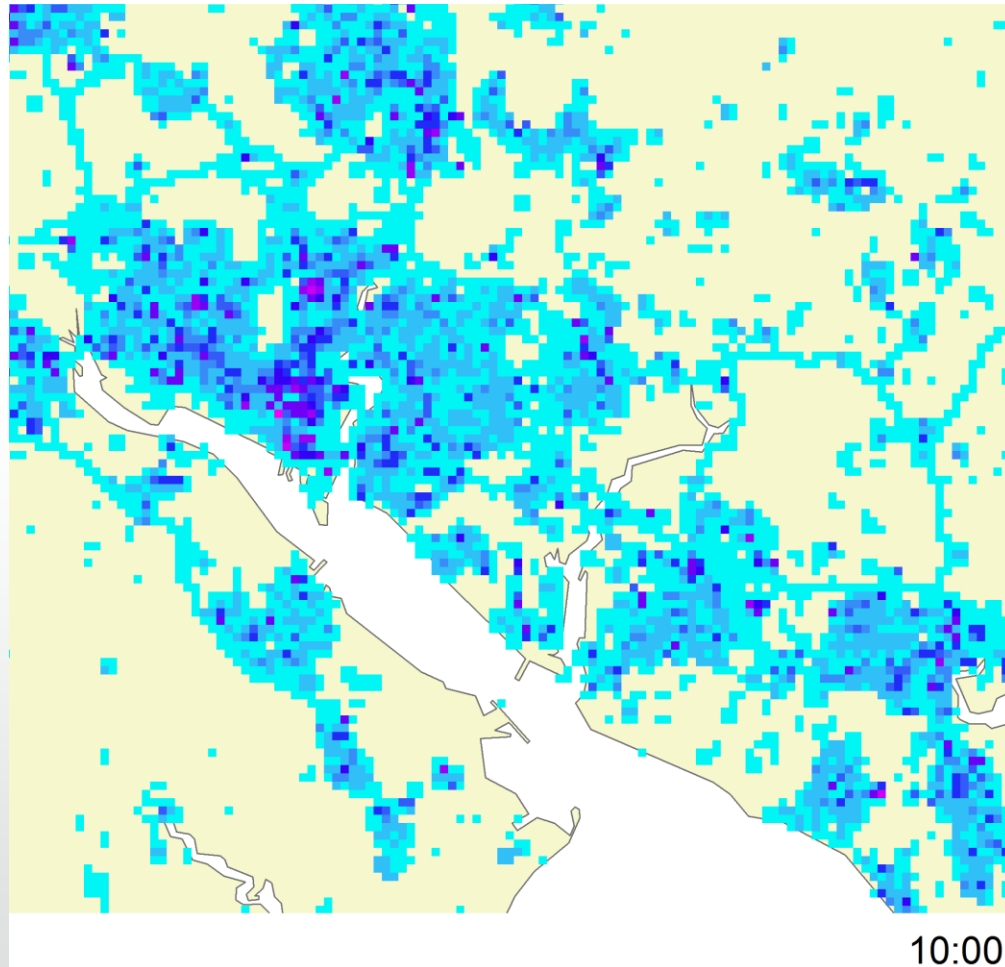


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Bing Maps Aerial © Copyright Microsoft Corporation and its data suppliers 2010

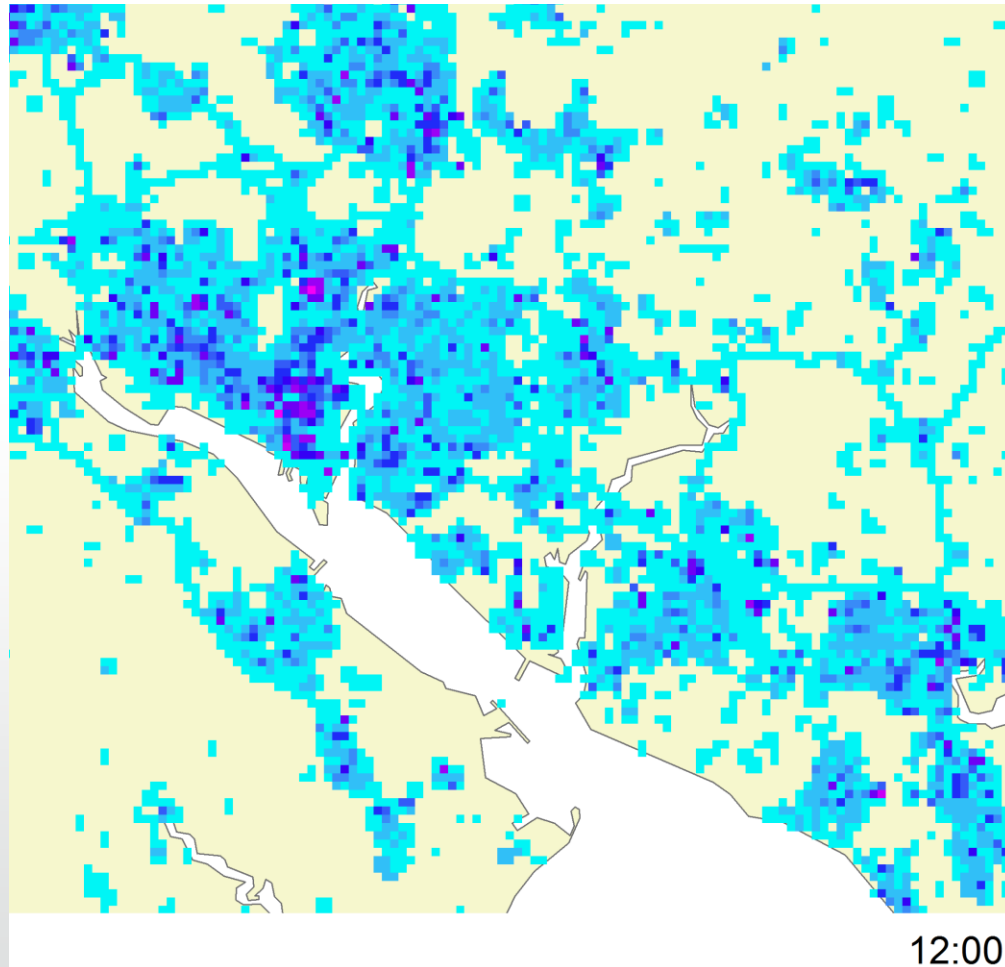
Example weekday population



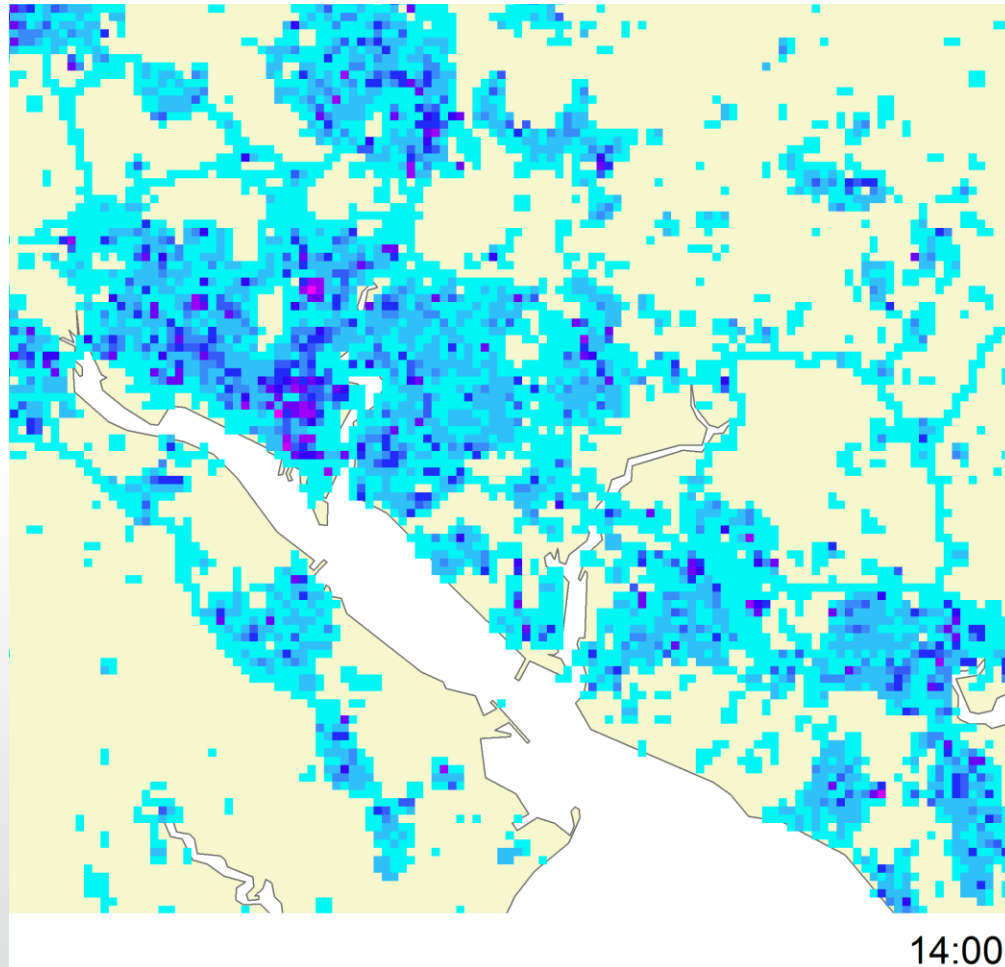
Example weekday population



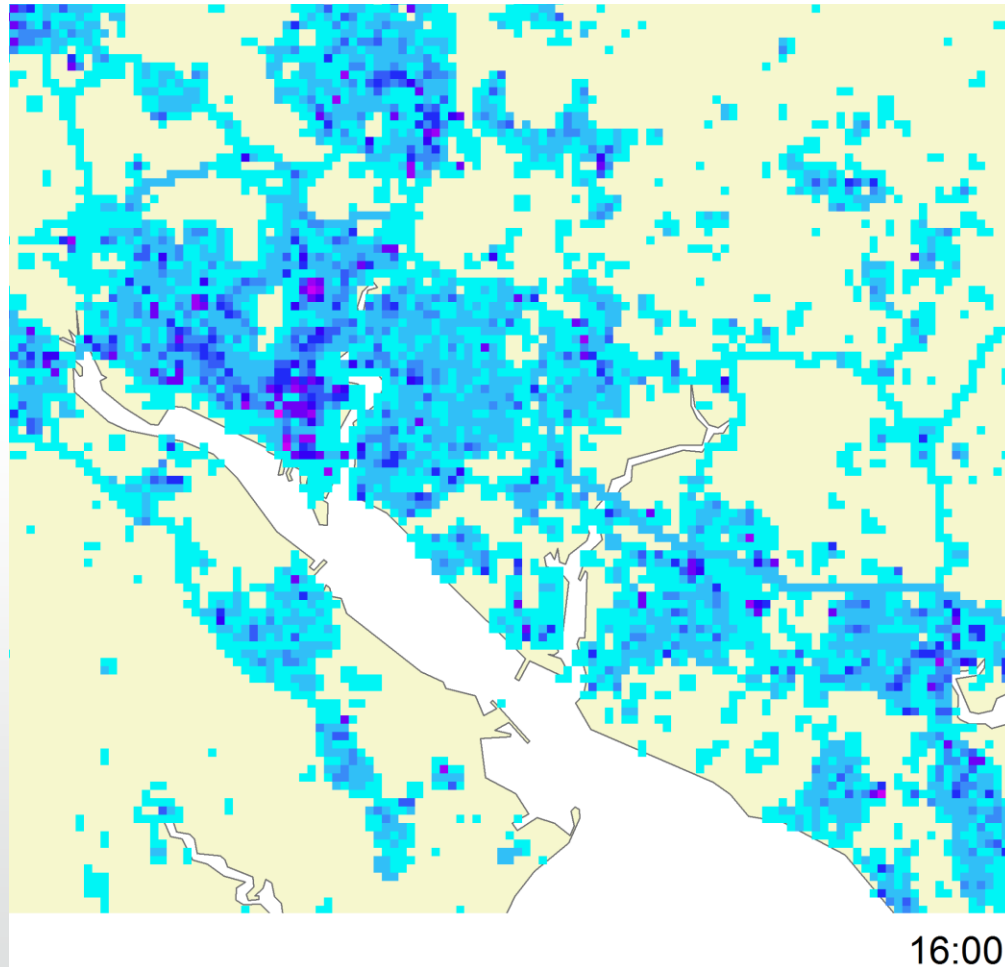
Example weekday population



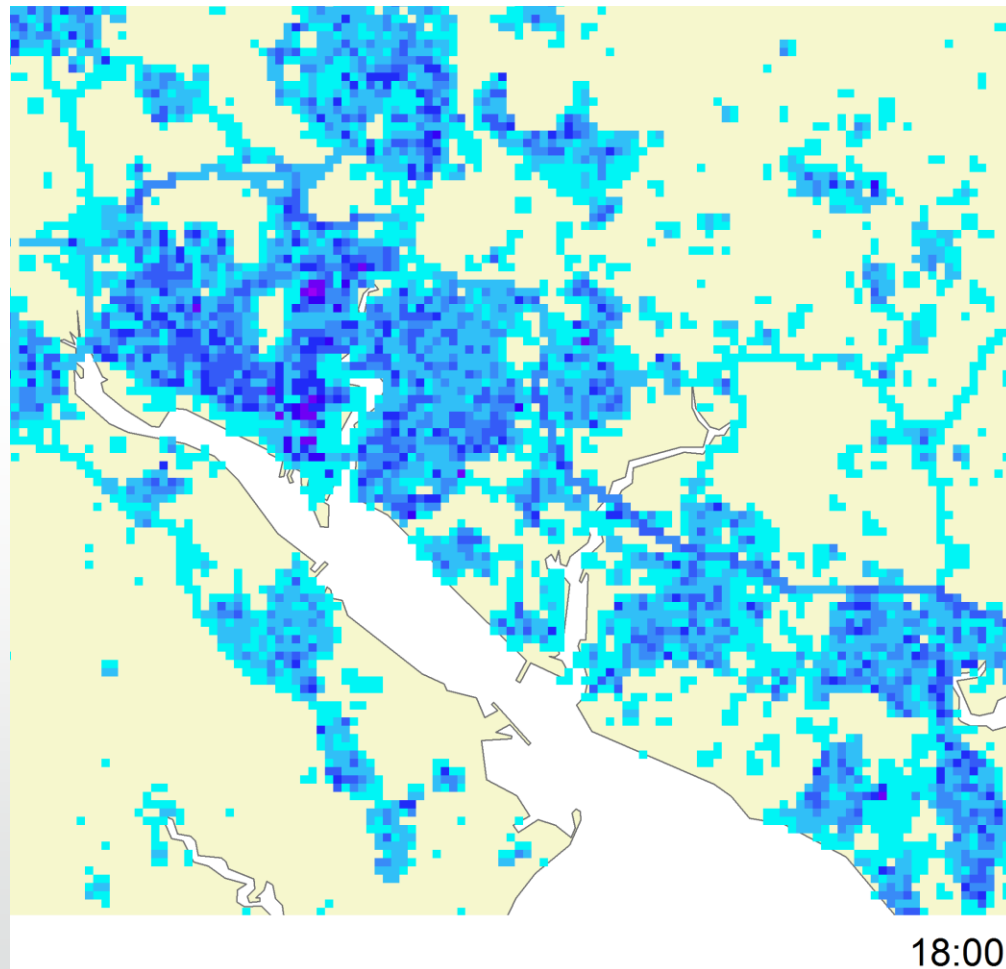
Example weekday population



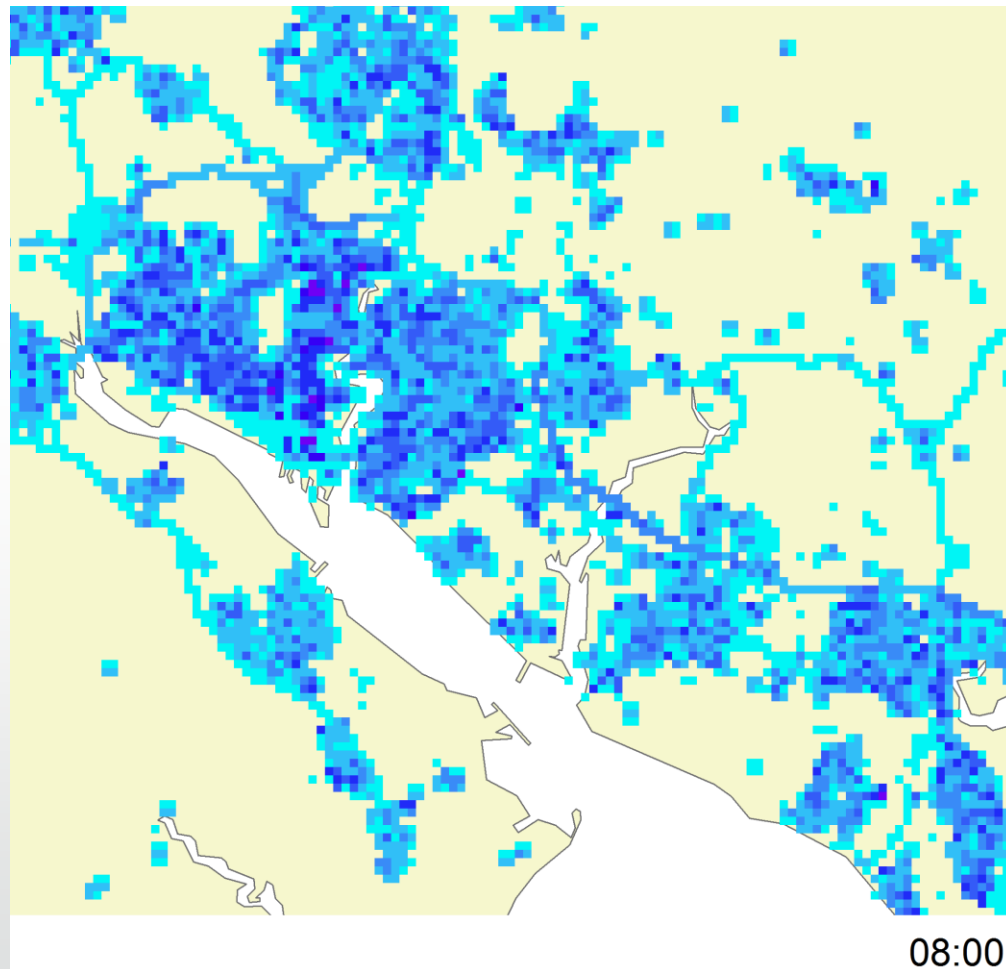
Example weekday population



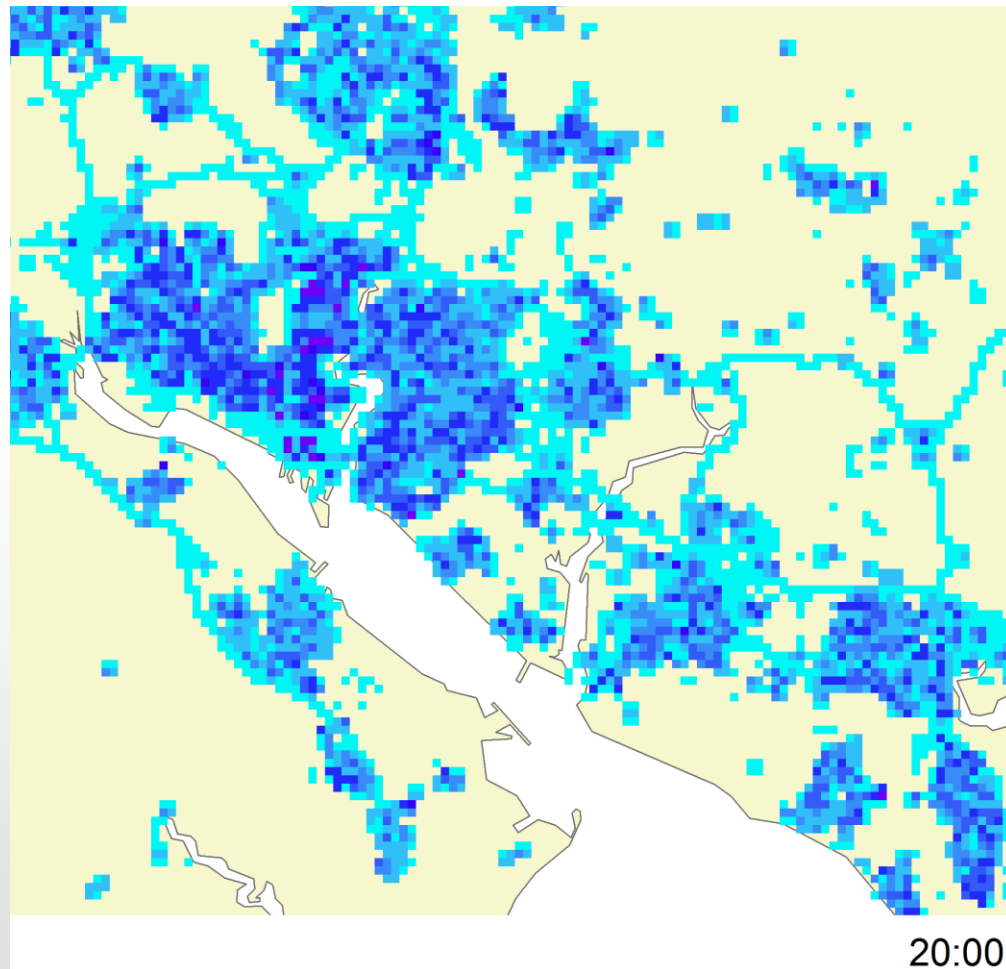
Example weekday population

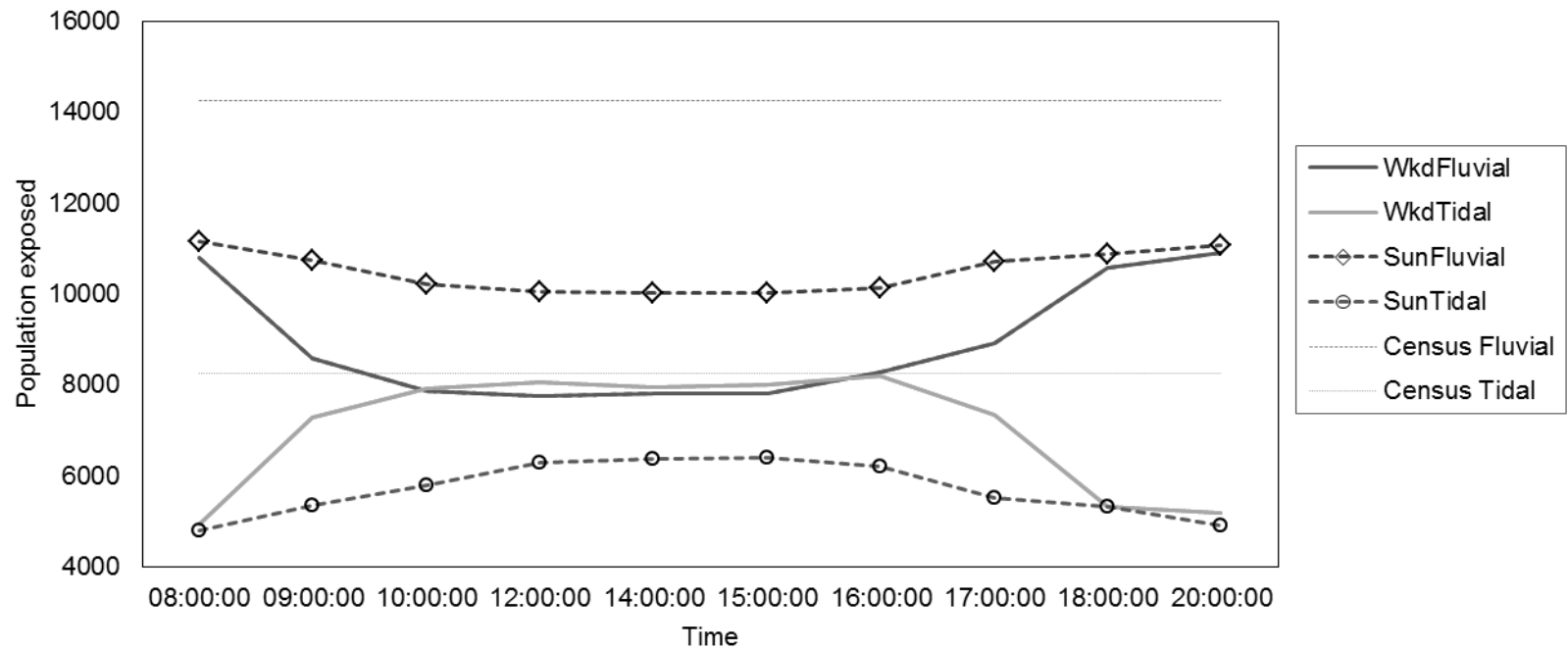


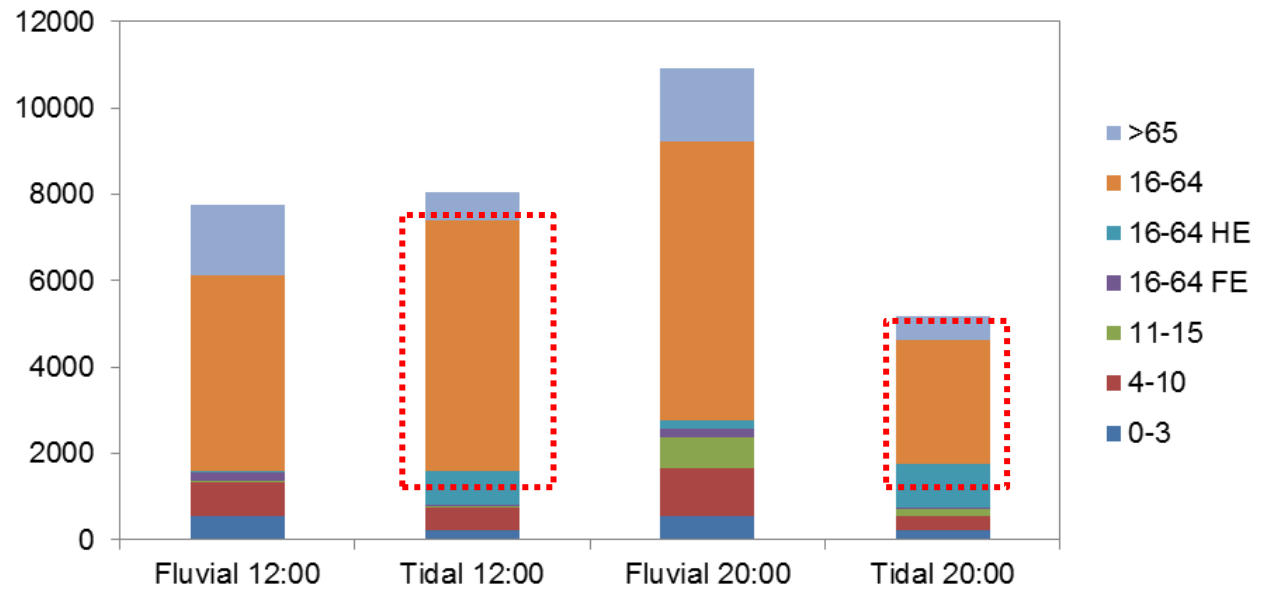
Example weekday population

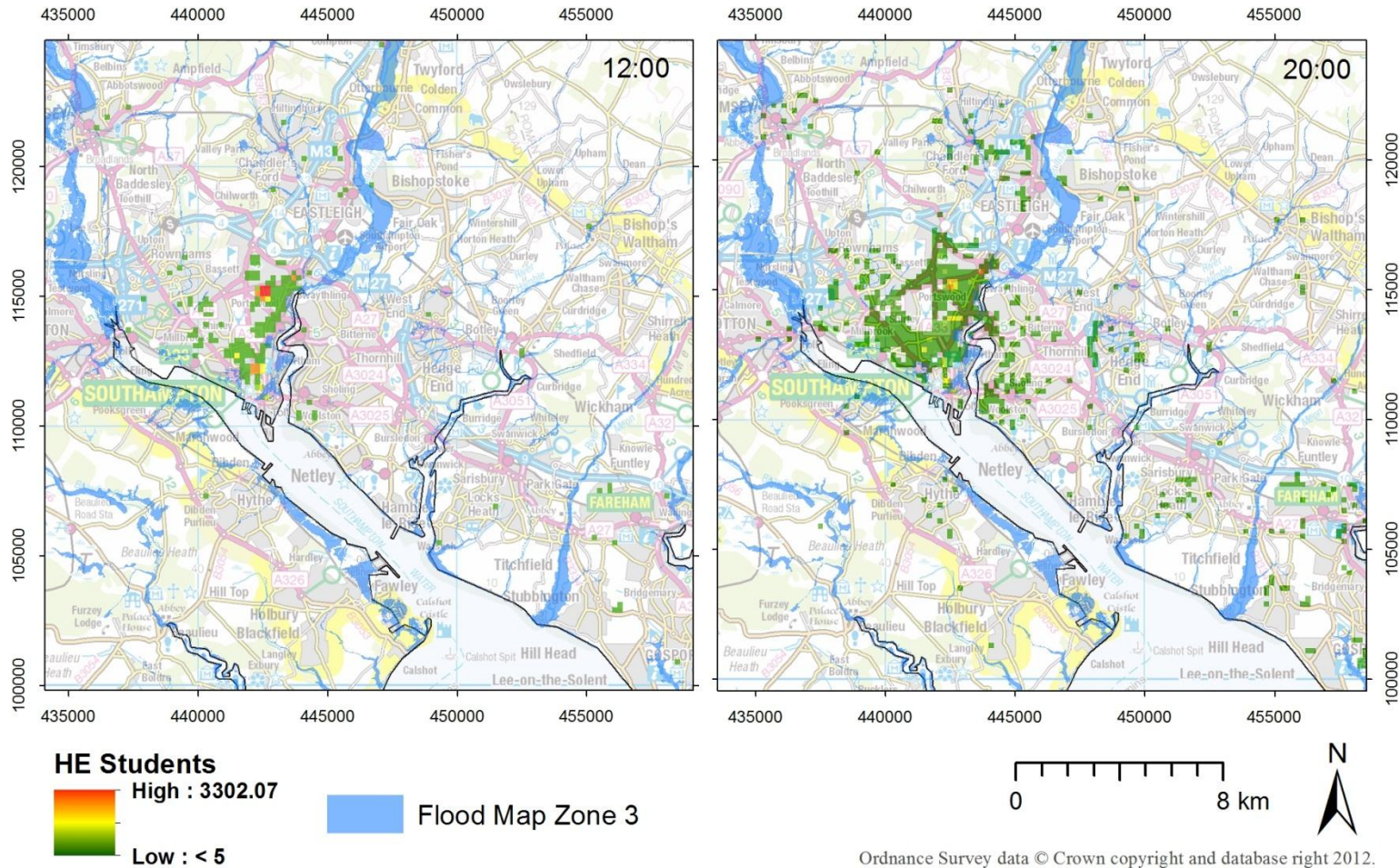


Example weekday population





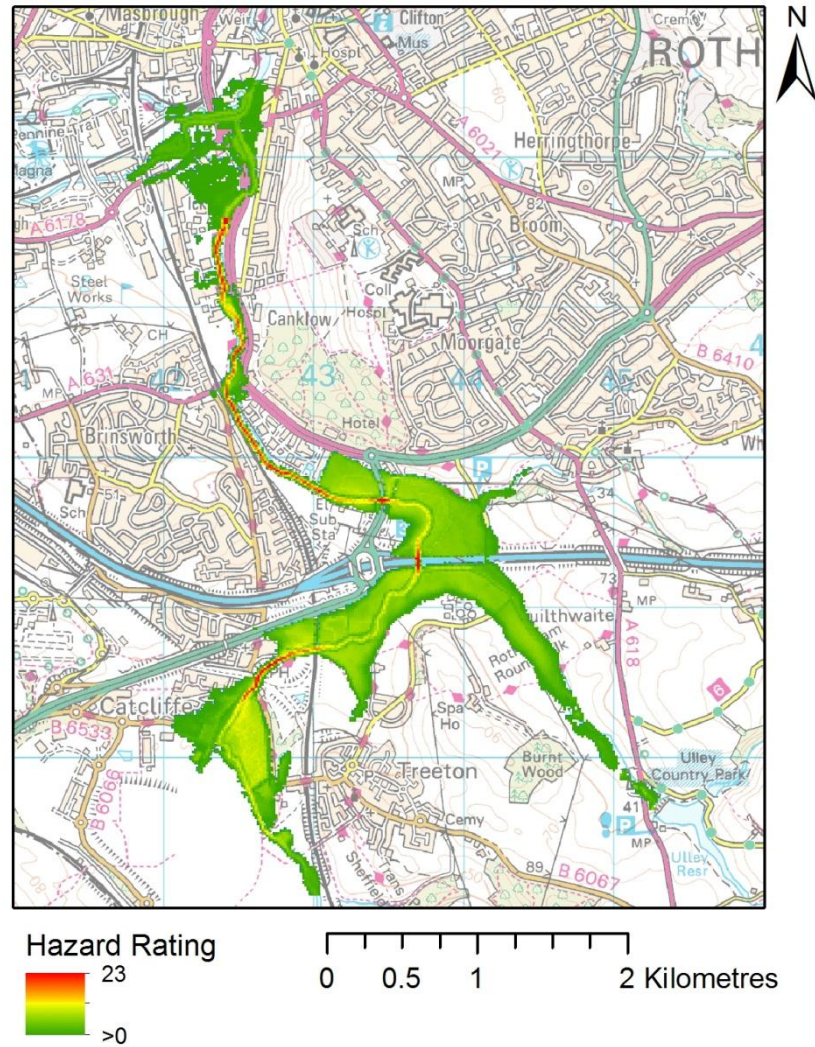




Flood modelling (TELEMAC-2D)



- Destabilized 25/07/2007
- M1 J32-34 closed 40 hours
- 1000 evacuated
- High voltage pylons
- High pressure gas main



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Next steps

- Continued development of datasets and temporal profiles
- Demonstrate improved exposure estimations
- Advances in natural hazard risk management

Acknowledgments

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Professor David Martin

Dr Samantha Cockings

http://www.southampton.ac.uk/geography/research/projects/space_time.page

Contact:

Alan.Smith@soton.ac.uk

Geography and Environment
University of Southampton
Southampton, UK
SO17 1BJ

 @NatHazard

www.personal.soton.ac.uk/ads4g11