Tyndall Centre for Climate Change Research

Newcastle University

ESMAP The Energy Sector Management Assistance Program

City-scale integrated assessment of climate impacts, adaptation and mitigation

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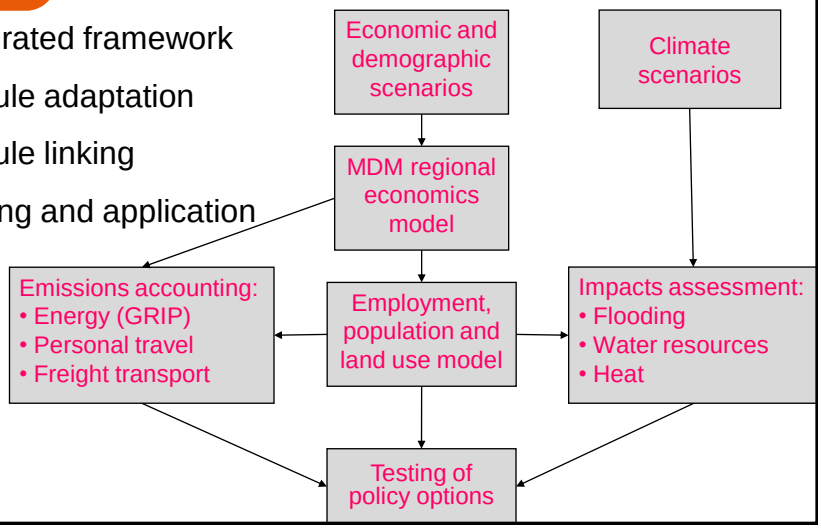
Objectives

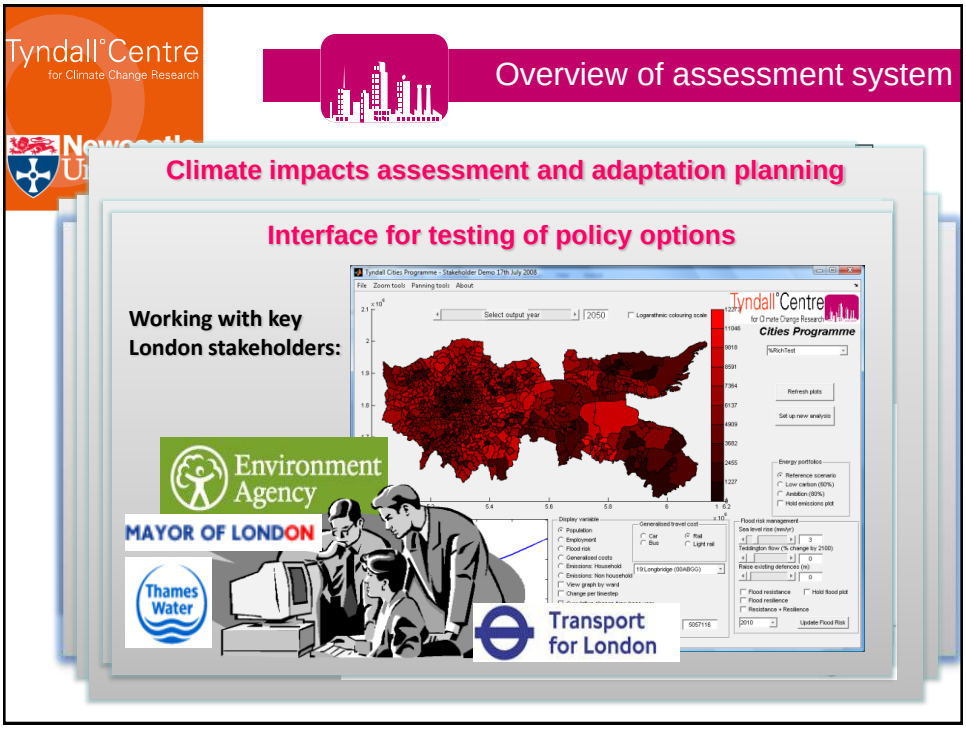
- To provide new integrated system-scale understanding of long term change in urban areas by analysing processes of change in:
  - Demography
  - Economy
  - Land use
  - Infrastructure
  - and their interactions
- To develop a quantified integrated assessment model to simulate their processes of change under a wide range of future scenarios.
- To use these new insights and technologies to inform decision making.

Approach for development

1. Integrated framework
2. Module adaptation
3. Module linking
4. Testing and application



Overview of assessment system



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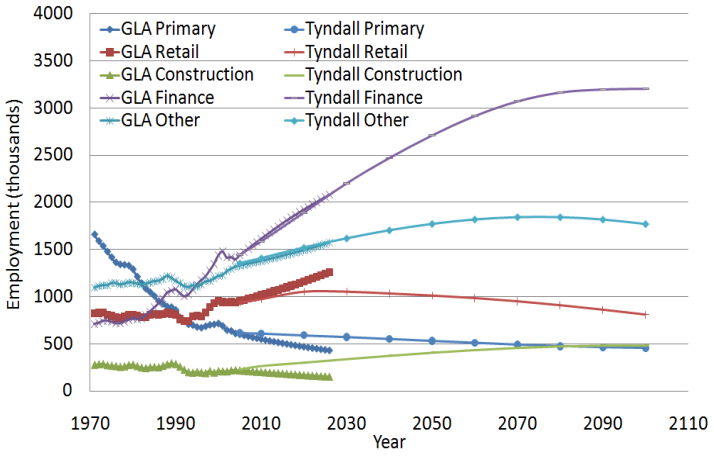
Regional economic modelling



Employment projections for London, comparing outputs from the MDM model (labelled "Tyndall") and figures used by the GLA. Industrial activity has been aggregated into 5 sectors.

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Land use change

Two scenarios of future residential development (blue grid boxes) in 2020. Red boxes denote existing residential land cover. Left hand panel is for low economic growth, unconstrained development; right hand panel is for high growth, constrained development)

Projected population change to 2100 at a ward scale (high economic growth, unconstrained development)

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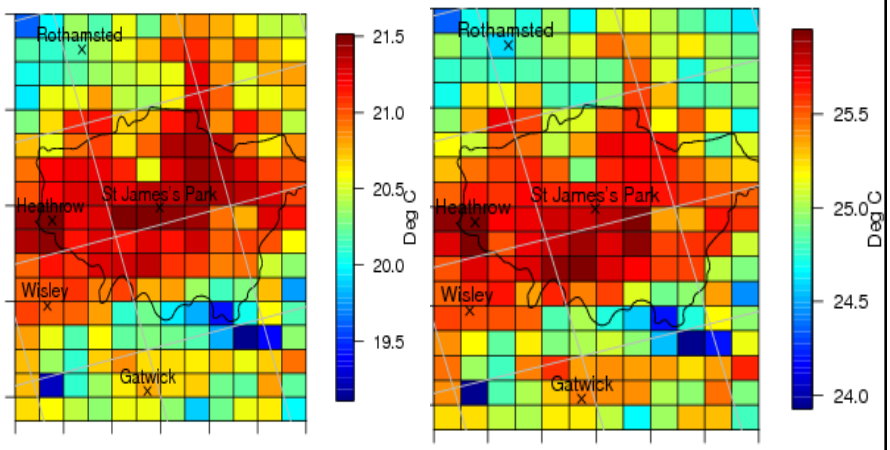
Climate impacts and adaptation analysis



Daily maximum temperature for London averaged over the summer season (June, July, August): 1961-1990 (left) and 2050s (right)

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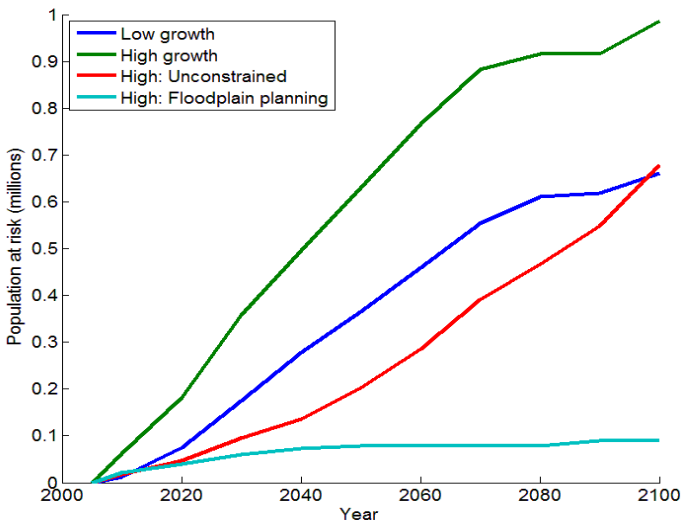
Climate impacts and adaptation analysis



Population at risk from tidal flood risk in London for different scenarios of land use change

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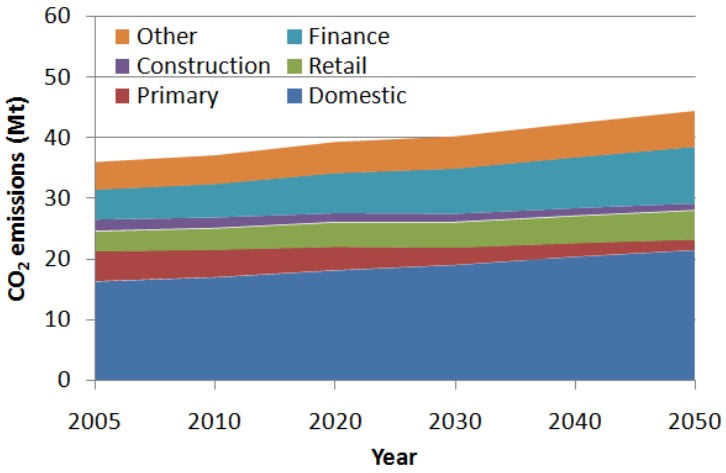
Emissions accounting



Projections of GHG emissions for London based upon a baseline economic growth scenario with no new mitigation policies

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Transport policy options

Policy[1]	CO2 emissions 2025[2]	% change from baseline	% change from 2005	CO2 emissions 2050[2]	% change from baseline	% change from 2005
Baseline	***2572156***		***32.2***	***4073101***		***109.4***
Promotion of Low Emissions Vehicles	2147451	-16.5	10.4	2235125	-45.1	14.9
Drivers' Training and Performance Measures	2324237	-9.6	19.5	3524500	-13.5	81.2
Construction Consolidation Centres	2433212	-5.4	25.1	3491394	-14.3	79.5
Urban Distribution Centres	2478955	-3.6	27.5	3660207	-10.1	88.2
Vehicle Reception Points	2546320	-1.0	30.9	3929435	-3.5	102.0
Relaxing Delivery Times (out of hours)	2514282	-2.3	29.3	3802290	-6.6	95.5

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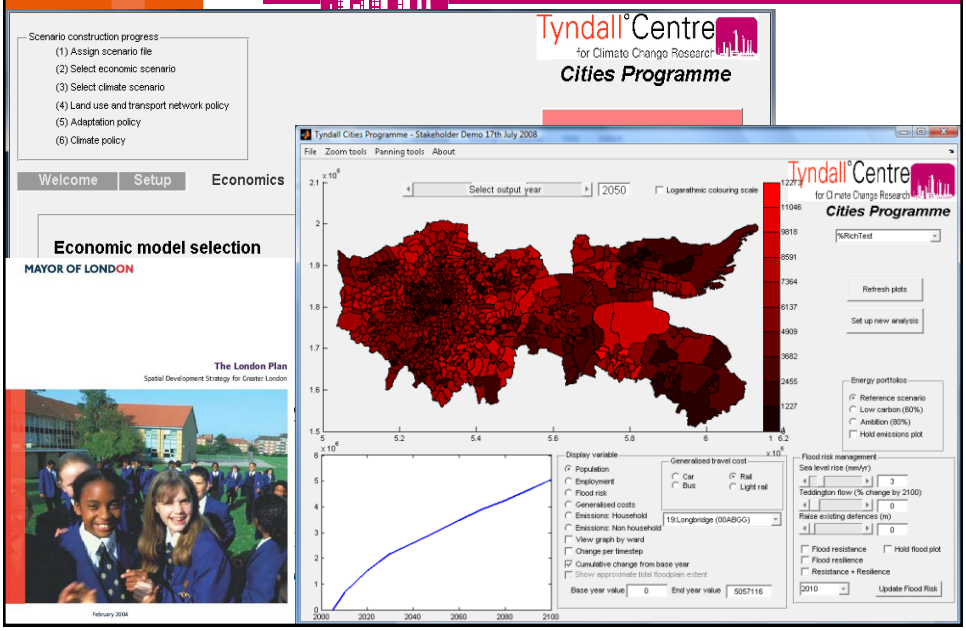
Decision making



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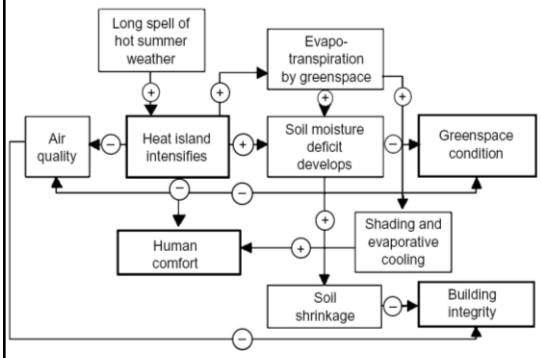
What makes this 'different'

- Systems analysis at city-scale

- Address emissions, impacts, adaptation and mitigation
- Works on the timescales of major planning and infrastructure decisions
- Is based upon coherent national and regional economic, demographic and climate scenarios
- Is coupled with spatially explicit simulations of land use in order to understand key vulnerabilities (e.g. flood risk) and the effects of spatial planning decisions
- Includes the functioning of engineering infrastructure systems in a physically realistic way
- Allows portfolios of adaptation/mitigation strategies to be explored – likely to be more effective than unilateral action

Some remaining questions



McEvoy, Lindley and Handley (2006). Adaptation and mitigation in urban areas: synergies and conflicts *Municipal Engineer* **159** (4): 185-191.

1. How far is far enough in tracking down consistency, interactions and feedbacks?
2. How can we estimate and communicate uncertainties?
3. How transferable are our insights and methods to other cities worldwide?
4. How can we build a global coalition of researchers and practitioners equipped to address these problems?
5. How can we best engage stakeholders and inform decision making?

Conclusions

Urban Integrated Assessment Framework –

- Demography, economy, land use, climate impacts and GHG emissions
- Urban systems scale
- Informing decision making

Future research –

- Feedback of climate impacts into the economy and land use
- Application to other cities worldwide

Energy Efficient Cities Initiative: Tools & Assessments
5th Urban Research Symposium – Cities and Climate Change
June 28-30, 2009, Marseille, France

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