

multi-scale infrastructure systems analytics

Urban Development Modelling for Arc Scenarios

Simulating population and land-use change



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- Two stage modelling progress:
 - Simulating demographic change to underpin demand
 - Spatial simulations based on planning policies













Energy



Solid waste



Transport



Water supply

Demographic projections







EPSRC

Engineering and Physical Science Research Council



Example results







Temporal horizon: 2016 to 2116 Geographical scale: Local Authority District (LAD)

- SIMIM is a spatial interaction model which redistributes population based on the **relative** attractiveness of an area
- Key variables include:
 - Housing availability
 - Jobs availability
 - Economic strength of the area
 - A metric of transport connectivity





Scenarios for the Arc







The Urban Development Model (UDM)

- For some applications, a spatially-explicit representation of land-use is needed
- The Urban Development Model (UDM) generates a detailed land-use grid of 1 hectare cells driven by values of zonal population from SIMIM
- Spatial patterns of development suitability are defined by **attractors** and **constraints** (reflecting planning policy)
- UDM simulates land developed based on this suitability score until population requirements are met
- The final output of UDM is detailed spatial mapping of land development patterns arising from planning policy decisions, and changes to population and employment.





Suitability drivers



Suitability scores are derived for each scenario from a set of input attractors (e.g. proximity to railway stations) and constraints (e.g. Green belt)







Arc spatial development outputs





Development
Undeveloped
Developed
Future Development



Selected results for Arc local authority districts



LAD Code	LAD Name	Baseline New Development (ha)	New Settlements New Development (ha)	Expansion New Development (ha)
E06000031	Peterborough	1058	1904	2417
E07000005	Chiltern	161	161	828
E07000006	South Bucks	87	87	1089
E06000032	Luton	259	259	364
E06000042	Milton Keynes	1668	3193	6817
E06000055	Bedford	1428	2570	4339
E06000056	Central Bedfordshire	2602	10562	3773
E07000004	Aylesbury Vale	2035	6951	3110
E0700008	Cambridge	110	0	933
E07000012	South Cambridgeshire	1055	8600	3274
E07000177	Cherwell	654	5621	1842
E07000178	Oxford	98	209	397
E07000179	South Oxfordshire	731	1620	2132
E07000181	West Oxfordshire	406	881	1383





The Expansion and New Settlement scenarios have different implications for development patterns and their impacts in the Arc



These play out in sector models and natural capital impacts





Downscaled urban form for drainage simulation







erstanding trade-offs in planning decisions

Considerations and scope

iding evidence for improving decisions around the Arc. **Not** recommending sions

nario driven models – need the planners to provide the scenarios – we have tools – not yet all the answers

se are **options,** not outcomes

erpinned by nationally-available data

sferable to other locations/scales (local to national)

