



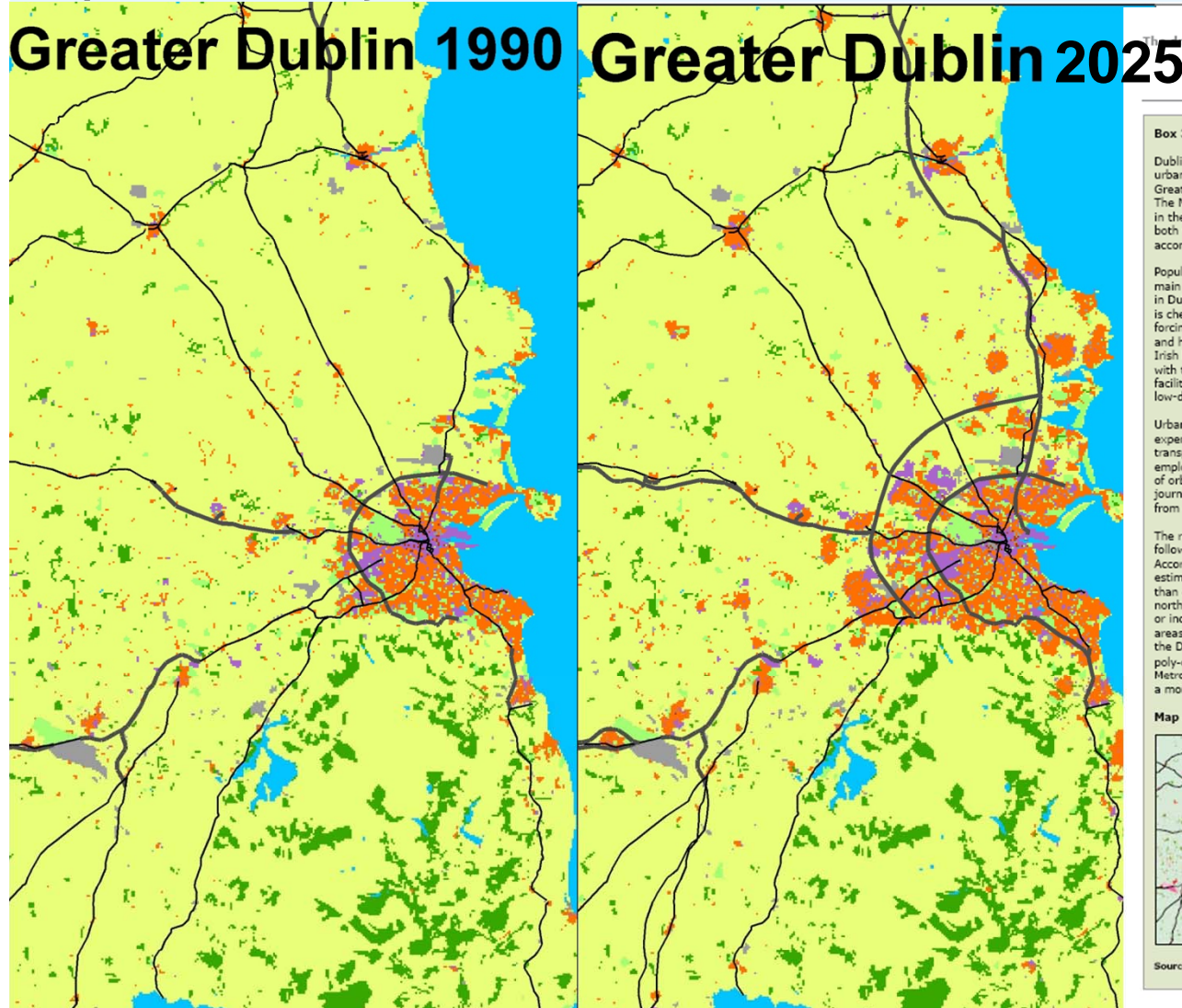
Scientists and policy-makers/ stakeholders working together: formulating scenarios, land use modeling and critical indicators

**Laura Petrov, Harutyun Shahumyan, Brendan Williams and
Sheila Convery**





Dublin as 'worst-case scenario' of urban planning (EEA, 2006)



The drivers of urban sprawl

Box 3 Dublin metropolitan area: rapidly growing economy and population

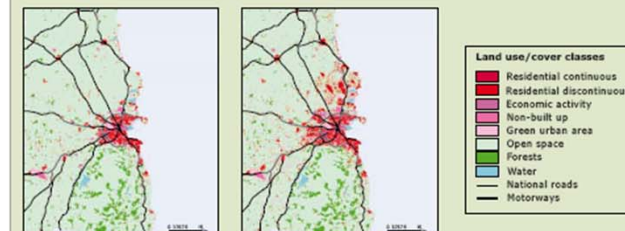
Dublin is a relatively small city by European and international standards. However, it dominates the urban pattern of Ireland in terms of demography, employment and enterprise (Bannon, 2000). The Greater Dublin metropolitan area population was 1 535 000 in 2002, 40 % of the total Irish population. The National Spatial Strategy (2002) suggests that by 2020 the Greater Dublin area population will be in the range of 1.9–2.2 million. The strong growth of the Greater Dublin is a result of the region's role both within Ireland and as a European capital city. Consequently, the Greater Dublin area will need to accommodate 403 000–480 000 additional inhabitants by the year 2020.

Population growth and economic development, as well as house type and price, are predicted to be the main drivers of land use change in the Greater Dublin area during the coming decades. High house prices in Dublin are a significant push factor driving the population towards the rural fringes of the city where it is cheaper to buy or build a house. Another push factor is the small size of apartments in the city centre, forcing families with children needing more space to move out of the city where houses prices are lower and housing more affordable. Personal housing preferences also play an important role as rural living is the Irish housing ideal (Michell, 2004). This preference is realised in single-family houses in open countryside with the benefits of the proximity to the capital or other urban areas. The realisation of this ideal is greatly facilitated by the planning regime which imposes few constraints on the conversion of agricultural areas to low-density housing areas.

Urban–rural migration in the Greater Dublin area has led to the growth of rural towns and villages at the expense of the City of Dublin. The growth of residential areas appears to follow the line of road and rail transport, suggesting a preference for rural living but with the benefits of proximity to urban areas including employment. Another push factor is the transport system in Dublin. Commuting times are long and the lack of orbital roads and rail networks means that to get from one side of the city to the other necessitates a journey through the centre. Often it is quicker to commute from outside Dublin to the centre rather than from one side to the other (Gkartzios and Scott, 2005).

The regional MOLAND model was applied to the Greater Dublin metropolitan region consisting of the following 9 counties: Dublin Co., Kildare, Laois, Longford, Lough, Meath, Offaly, West Meath and Wicklow. According to the 2025 scenario, the outward expansion of residential areas in the Greater Dublin area is estimated to increase by 110 % over the forecast period. In the same period commercial areas will more than double while industrial areas will grow slightly more modestly. The main development axis is to the north from the Greater Dublin area along the seashore as well as inland. To the south little new residential, or industrial or commercial development will take place because of the physical constraints of upland areas. The 2025 scenario also suggests the development of Dublin City to the northwest along the line of the Dublin–Belfast corridor. This development will encourage Dublin City to develop from a mono-centric to poly-centric relationship with the neighbouring cities of Dundalk, Newry and Drogheda. The Greater Dublin Metropolitan area needs land use guidance and zoning as well as new infrastructure if it is going to achieve a more sustainable form of development over the period to 2025.

Map Dublin 1990 and modelled scenario for 2025



Source: MOLAND (IRC).



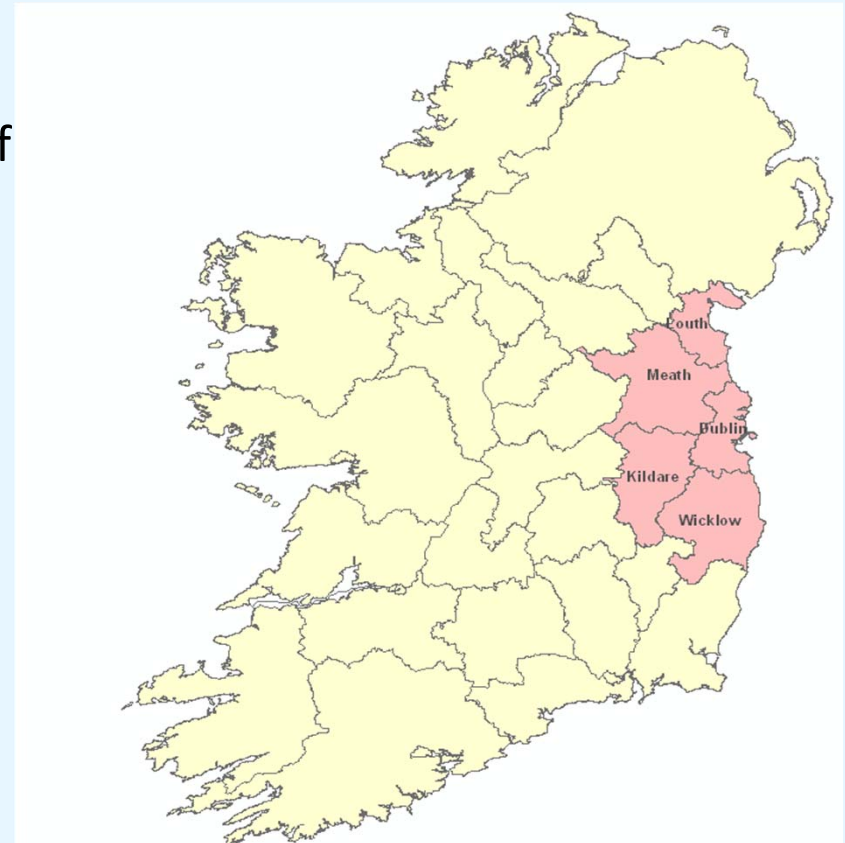
Study area:

Between 1996 and 2006 Ireland's population growth was five times the European average of 3.25% (EPA, 2008).

The Greater Dublin Region experienced the biggest growth nationally with an increase of 8.3% between 2002 and 2006 (CSO, 2007)

Main drivers for land use development:

- Demographic changes
- Economic development
- House prices and housing facilities
- Travel-to-work commuting patterns



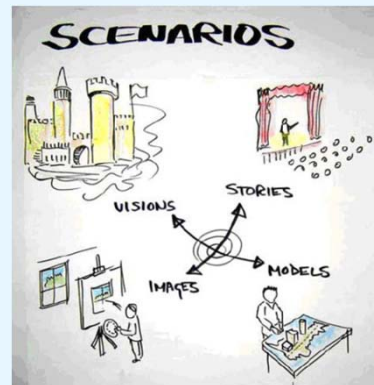


Scenarios are the link among...

SCIENTISTS/MODELLERS



SCENARIOS



STAKEHOLDERS





What IF?

SCENARIOS : BU, CD, MD, R

Key drivers	Narrative of scenario
Population	Birth rate, Immigration/Out-migration, Ageing population, etc.
Socio-Economic Trends	GDP, Sectorial developments, Economic competitiveness, Growth and investment capacity, Regulatory and fiscal measures on location decision making, Drivers influencing markets/sub-markets, Research and innovation, Technology, etc.
Urbanization/Spatial Planning	Polycentric, Growth and sprawl, Urban-region, Small-scale development, etc.
Transport and Infrastructure Provision	Transportation, Cross border networks, Accessibility, Trans-European Transport Networks, etc.
Policy Framework, 'Shock' Clues and Overall Trends	Policies, Environmental sustainability, Climate change, Natural hazards, Economic competitiveness, growth and investment capacity, etc.



Why choosing MOLAND?

- A range of what-if scenarios can be explored
- The environmental impacts of different land-use policies can be quantified
- To monitor urban sustainability in cities and regions, a variety of spatial planning policies can be assessed
- Provide robust framework for comparing, discussing and visualizing a variety of spatial planning policies



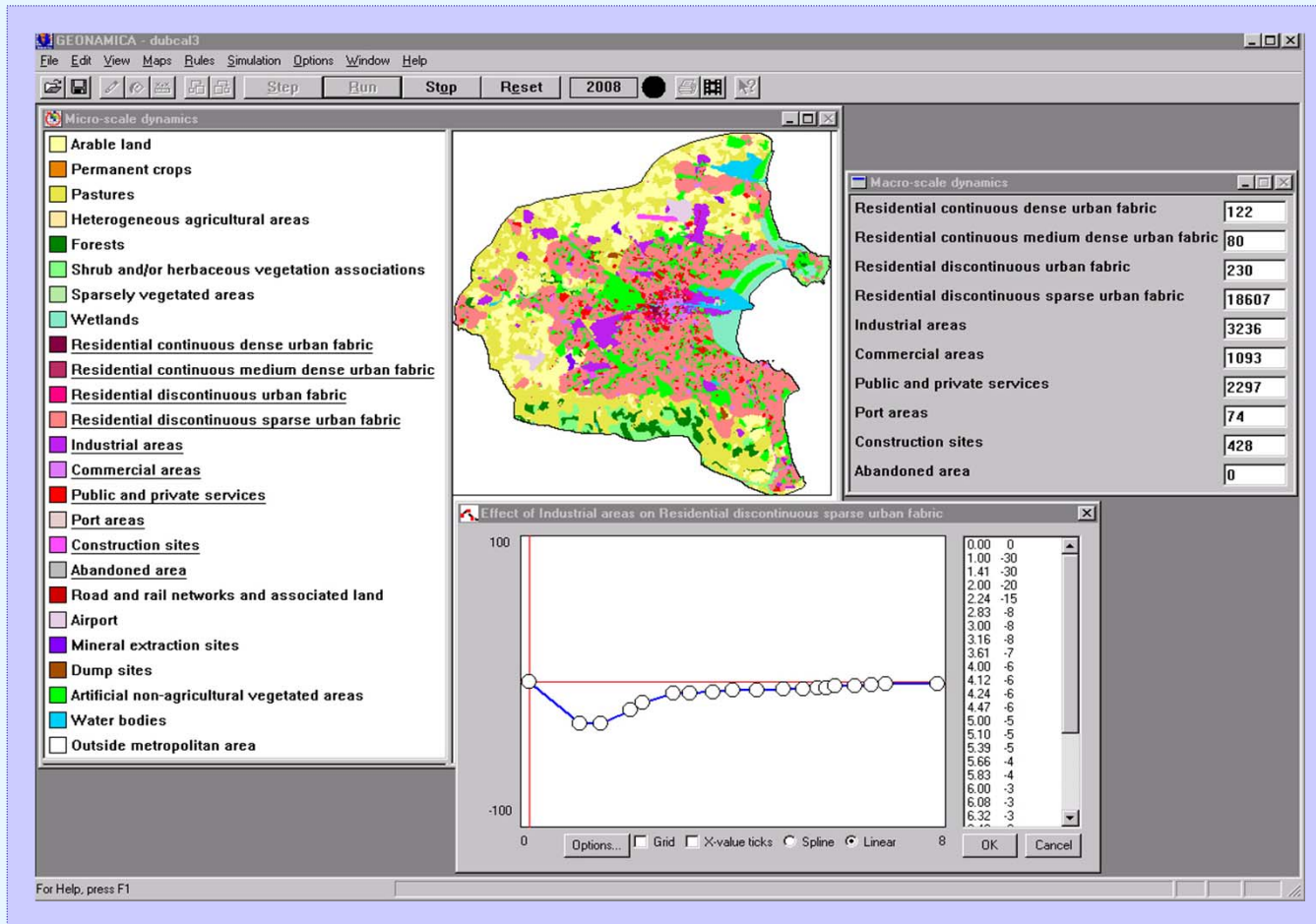
MOLAND assumption..

At some level, cities are fundamentally similar.

They evolve by the same processes

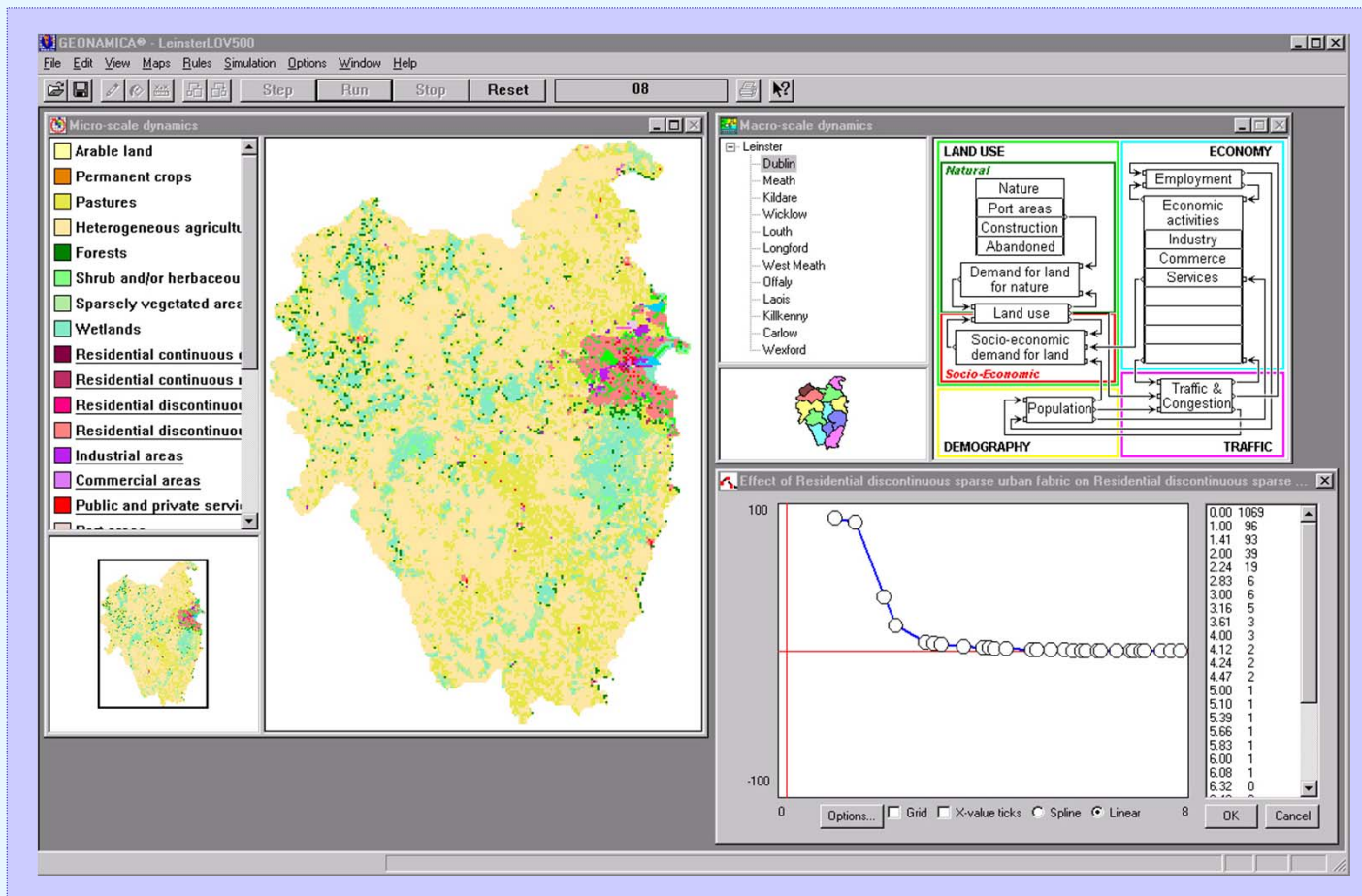


Urban level



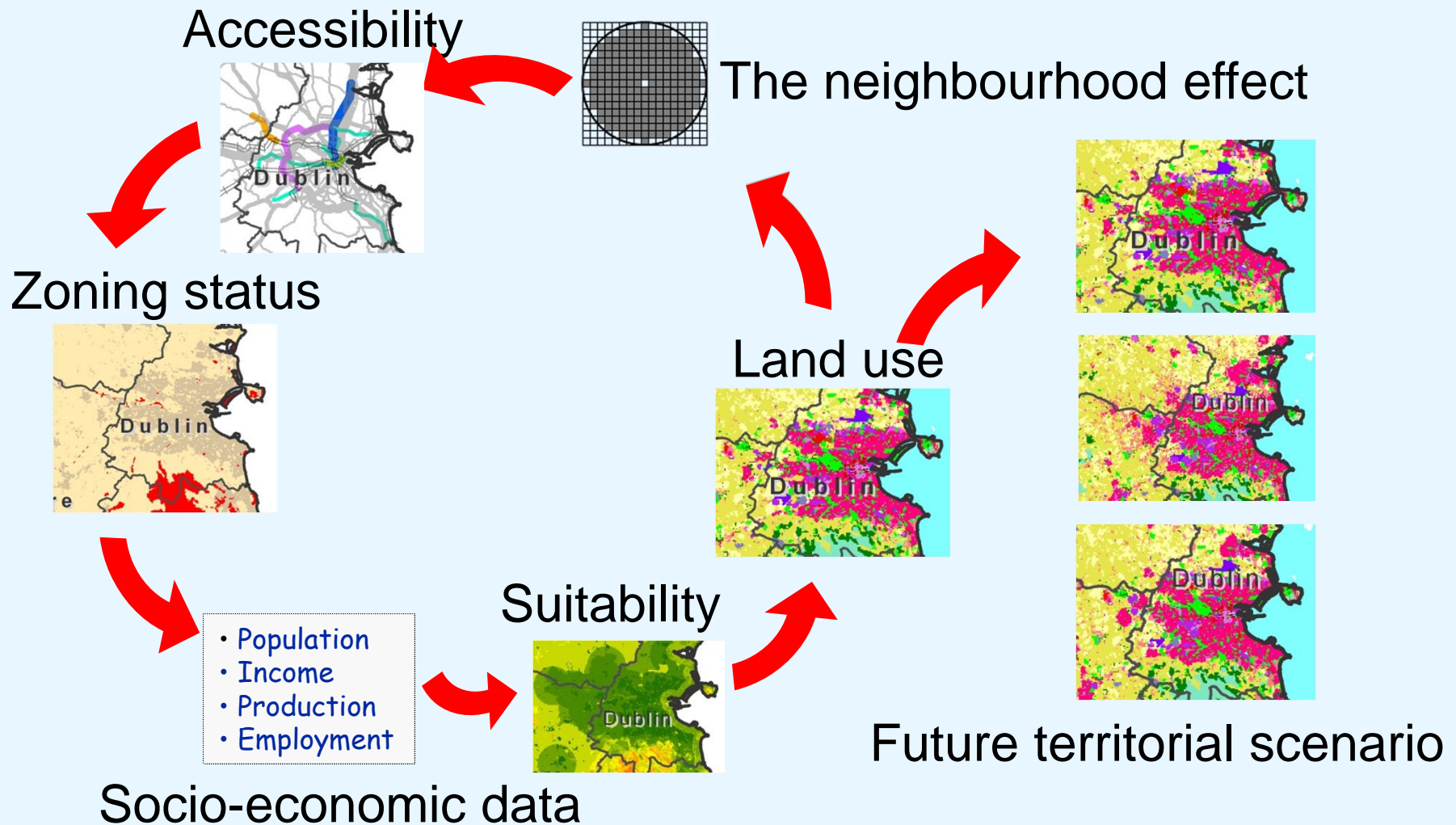


Regional level





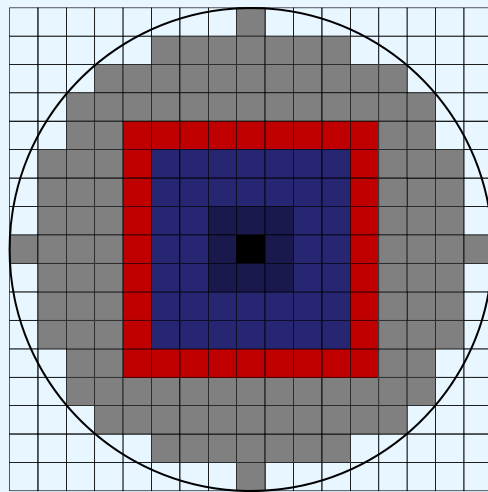
How the model works?



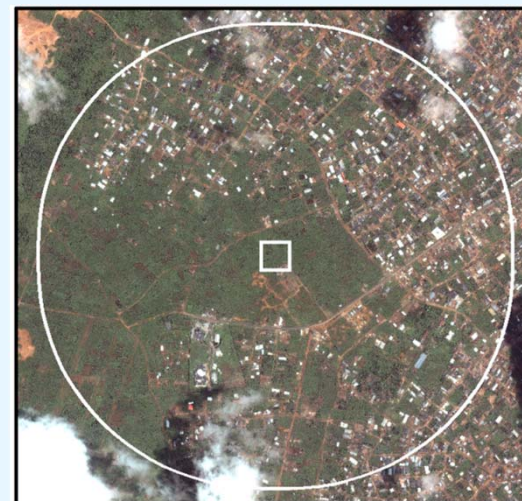


Neighbourhood effect

- A circular neighbourhood consisting of 196 cells is applied (radius eight pixels)
- The effect in the central cell is calculated in a distance-decay way

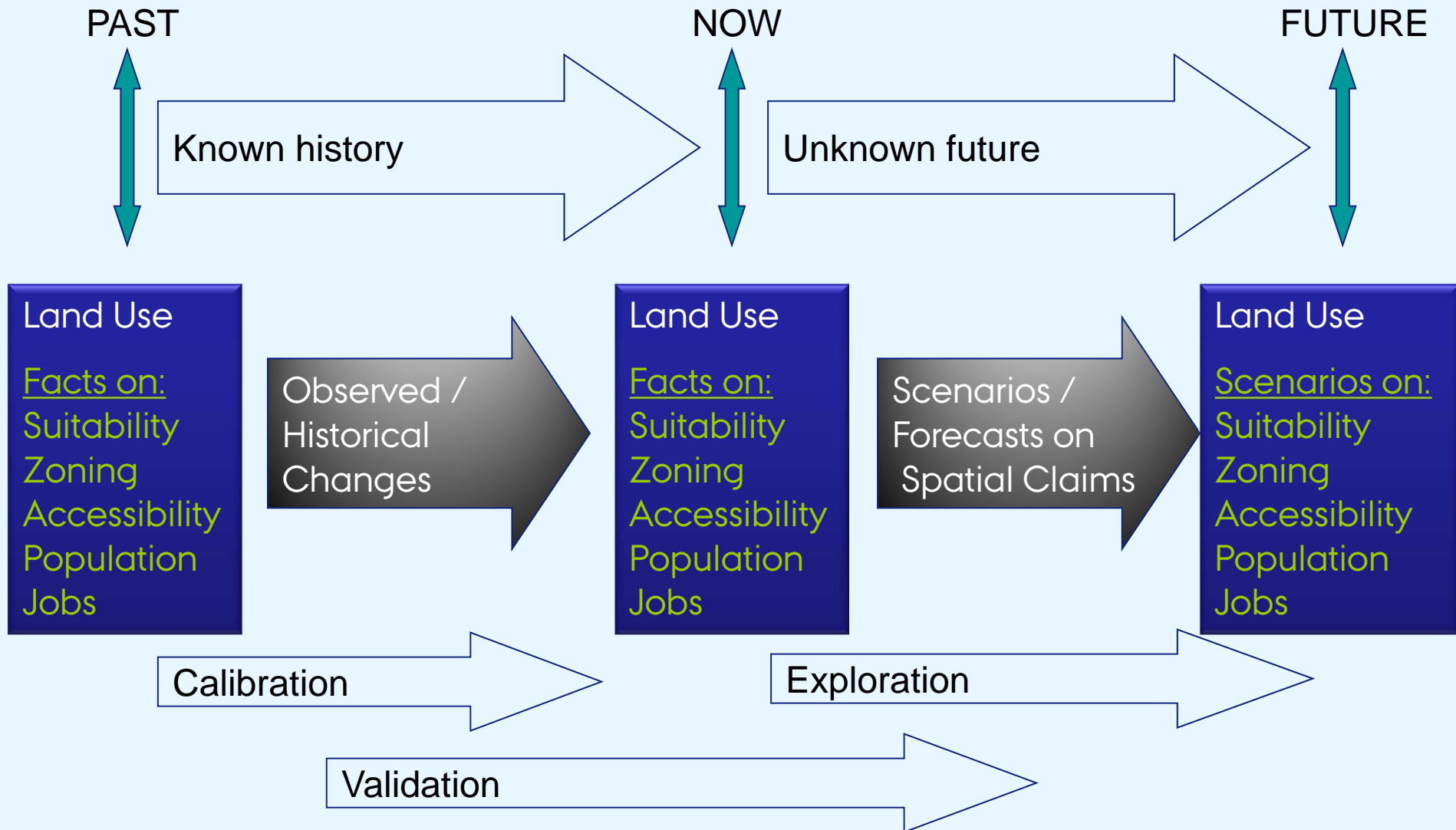


1 cell = 200 x 200 m



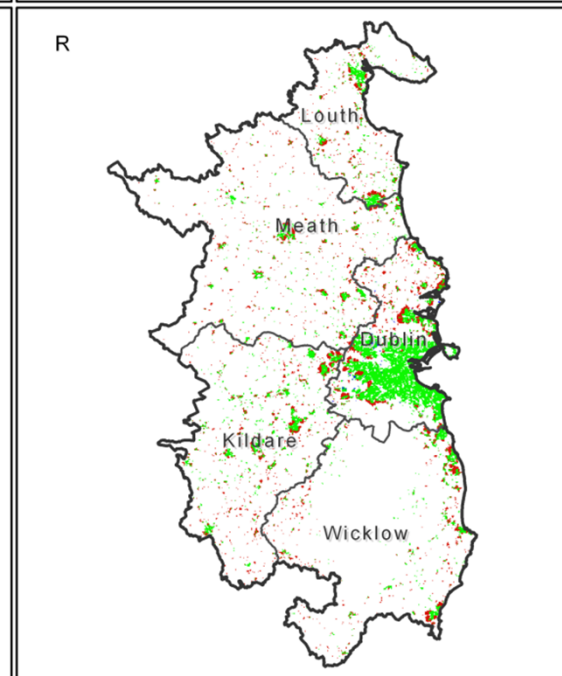
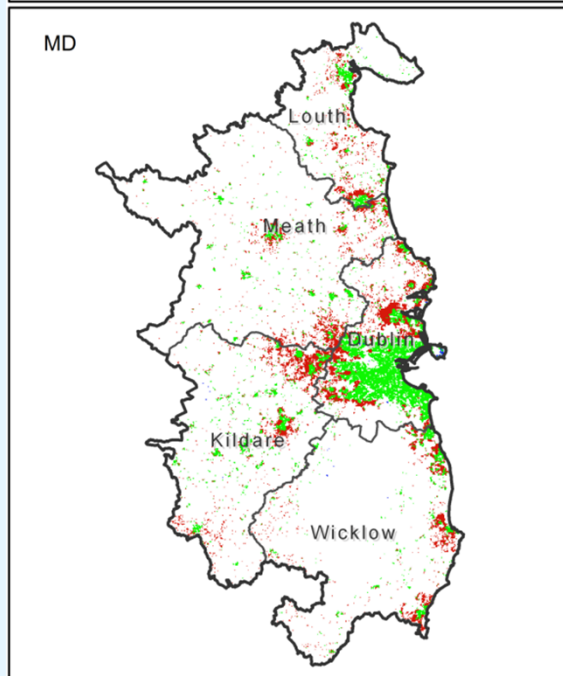
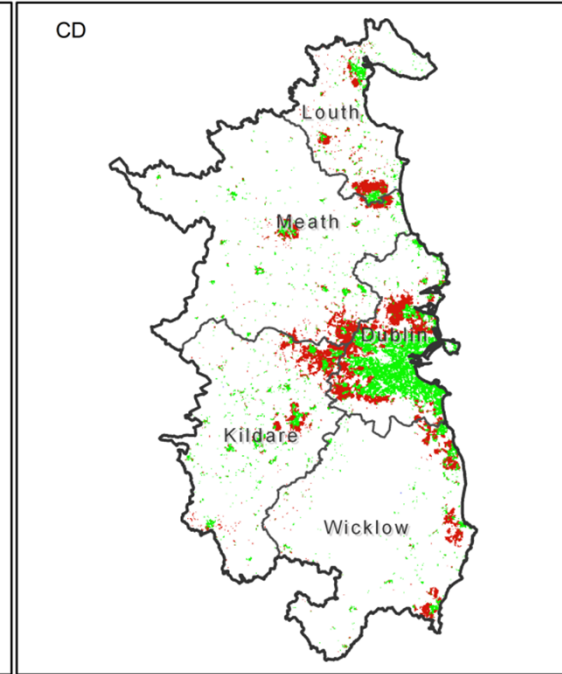
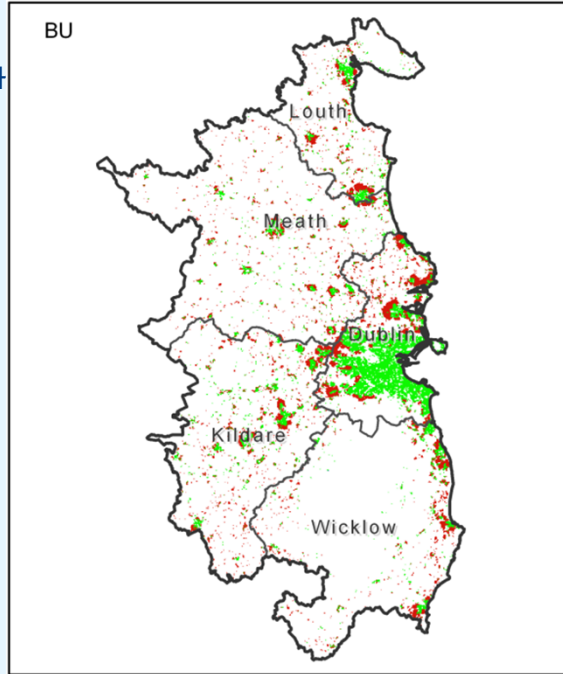
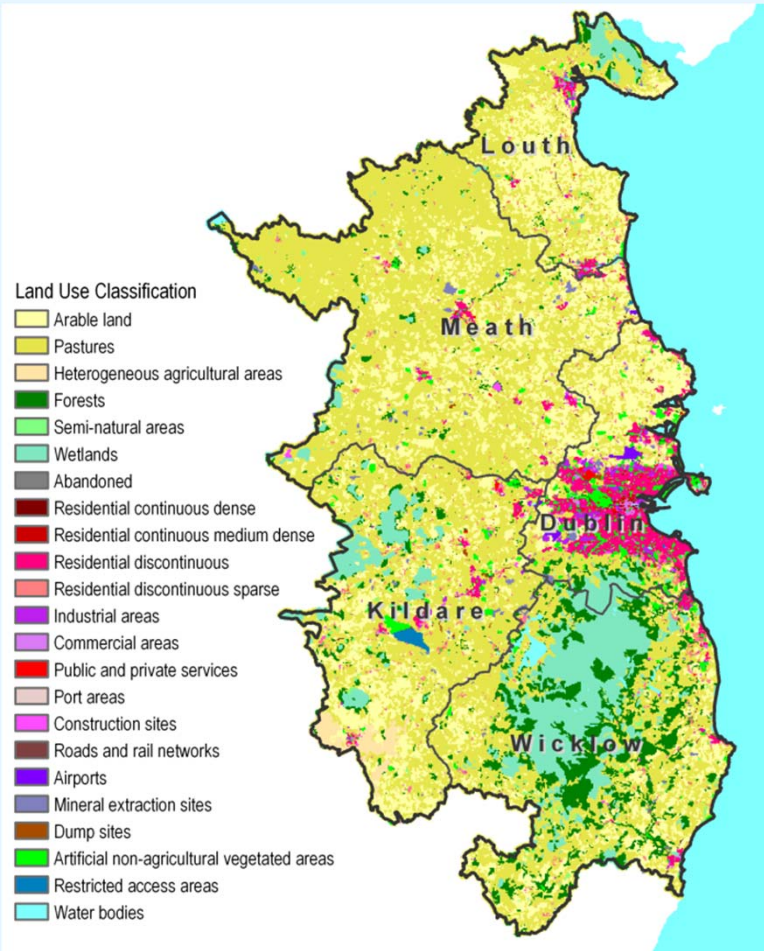


Developing and using the model



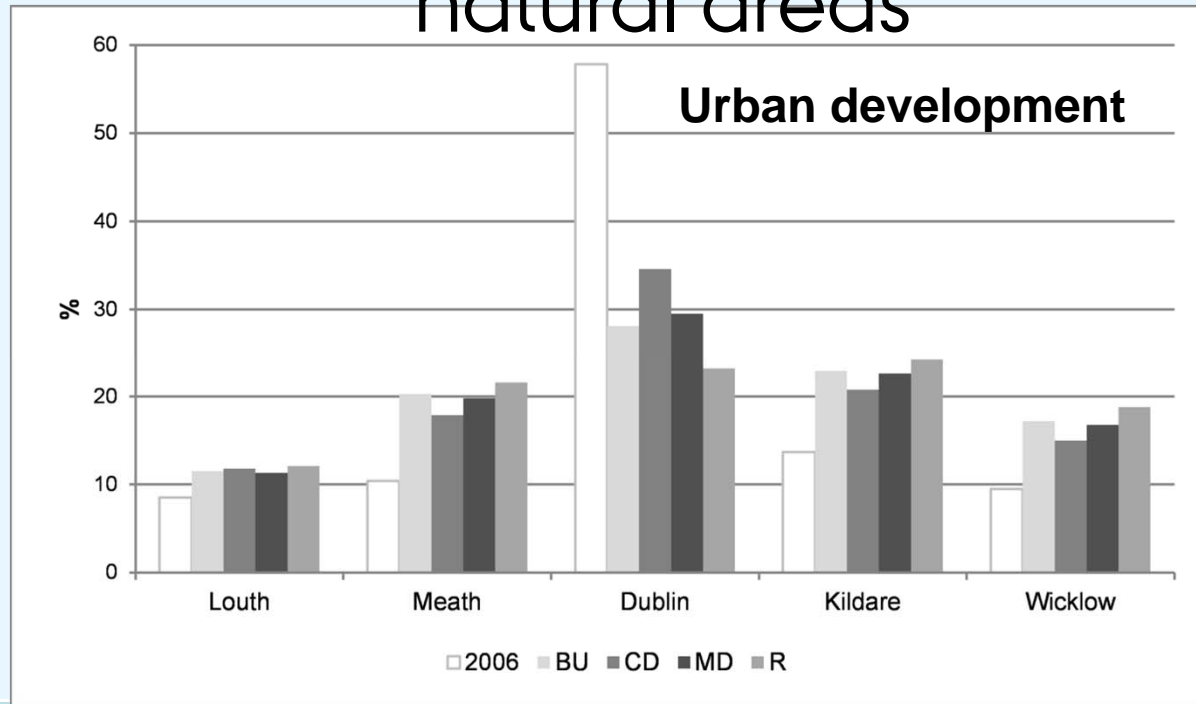


GDR: 2006-2026





Indicators: urban development and loss of natural areas



Urban areas vs. Natural areas

Urban Scenarios (%)

Total urban areas in GDR

BU	CD	MD	R
86.2	89.2	89.3	51.8

Loss of total natural areas in GDR

-5.6	-5.8	-5.8	-3.4
------	-------------	-------------	-------------

Total urban areas in Dublin Co.

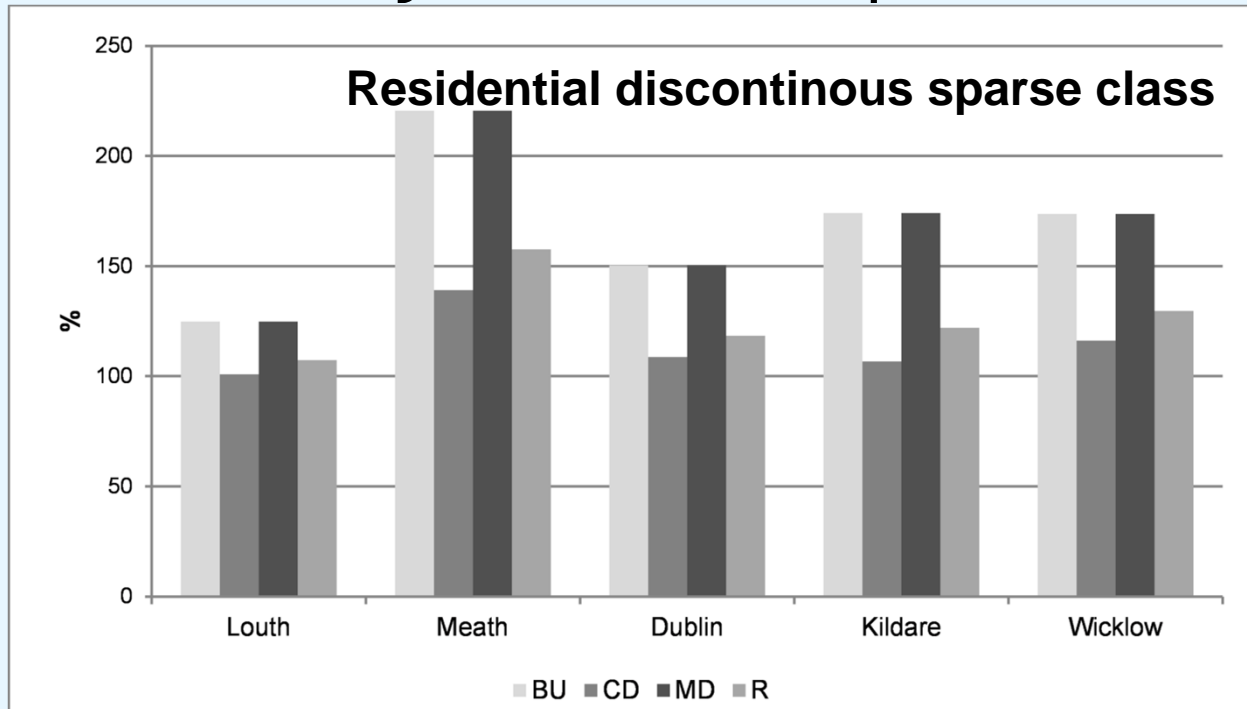
41.8	53.4	45.6	20.8
------	------	------	------

Loss of natural areas in Dublin Co.

-21.1	-26.9	-23	-10.5
-------	--------------	------------	--------------

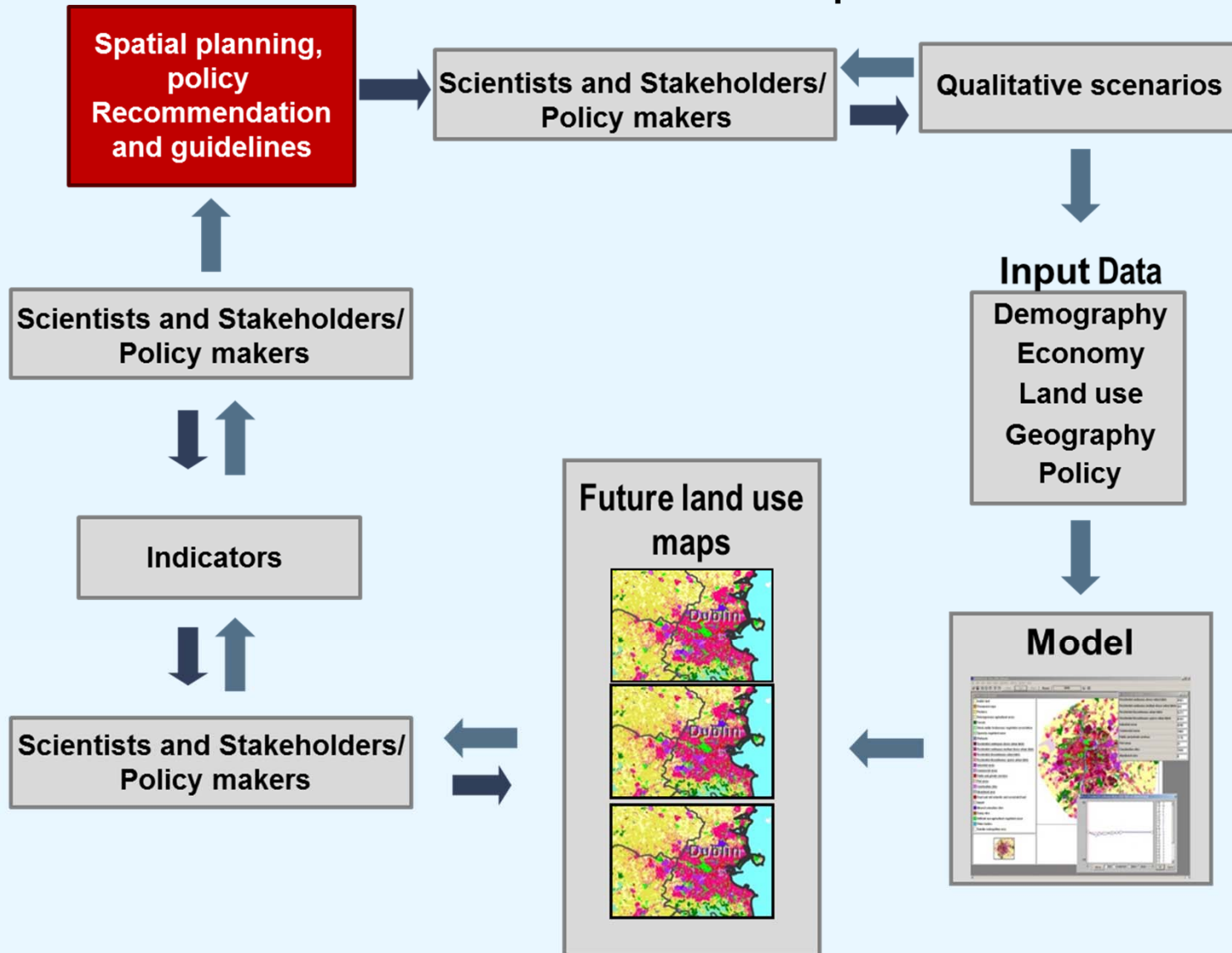


Indicator: Urban growth and sprawl



Counties	Growth by Scenarios (%)			
	BU	CD	MD	R
Louth	216.5	223.4	218.0	173.5
Meath	267.9	253.0	269.4	207.2
Dublin	141.8	153.4	145.6	120.8
Kildare	243.7	234.8	246.8	191.1
Wicklow	256.5	241.2	259.0	203.1

Scenarios and indicators are tools for policy-makers/stakeholders/planners





Conclusions:

- Demand for different urban land uses & increasing accessibility are key elements responsible for urban development;
- Using scenarios and indicators is a way to evaluate several future environments in order to monitor sustainable development trends;
- Urban simulations and critical indicators offer a useful approach of understanding the effects of urban and regional planning policies.



Thank you!!