RITSUMEIKAN UNIVERSITY

SCHOOL OF GEOGRAPHY

Lecture 2:
Modelling Histories: Types and Styles:

Urban Models defined, The Urban Modelling Timeline,
What Kind of Cities, Examples of Three Model Types

Outline

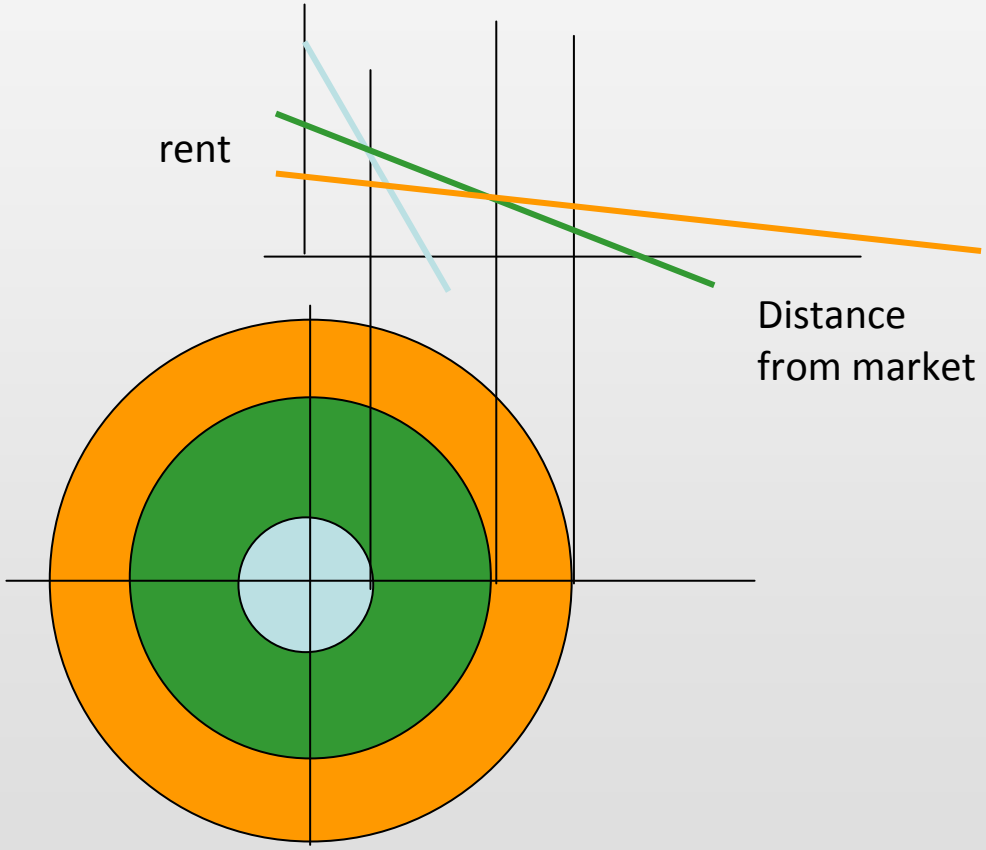
- Origins: Location Theory and Social Physics
- The Urban Modelling TimeLine
- What Kind of Cities?
- 1950s – 1970s : What Kinds of Models?
- Comparative Statics – Cities in Equilibrium
- The Quest for Dynamics: Macro Dynamics, Catastrophe, Bifurcation, Chaos
- The Move to the Micro in Space, Time and Attributes: Cells, Agents, and the New Dynamics
- Other Types: Three Examples

1. Origins: Location Theory and Social Physics

We will say more about this later this afternoon but for now some history is needed of where all these ideas come from

- Von Thunen 1826
- The German Location Theorists from Weber to Losch
- 1900 - 1930
- Central Place Theory and Christaller 1933
- The Empiricist Americans: Reilly, Stewart & Gravitation
- 1920s – 1950s: Social Physics
- The Urban Geographers 1920s +
- Isard and the Beginnings of Regional Science – the Urban Modeling Time Line begins here mid 1950s

Von Thunen's Model has everything that characterizes cities for the last 200 years or rather from pre the industrial revolution to around 1975.



Let me show you a simple model that illustrates how we can experiment with this kind of thinking because it characterizes many modelling strategies that came from the past

Urban Economic Sketch Planning - Microsoft Internet Explorer

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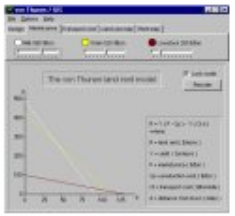
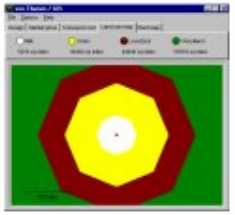
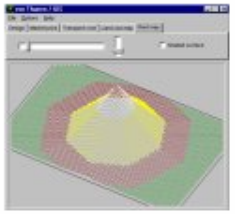
CASA

Research







Urban Economic Sketch Planning Using Complexity Theory

THE VON THUNEN MODEL - An Example of the Kind of Software that we intend to develop with the ESRC CASE Award

To illustrate what we have in mind for the proposed CASA award, Phil Steadman's sketch planning model based on the Von Thunen Model can be run from this web site. In essence what this software does is present the user with a blank homogeneous landscape on which there is a central market planted. The user can then use the ***drawing tools*** in the ***Design*** mode to add more towns, transport routes, rail routes, and non-productive land which act as constraints on the distribution of land uses. If there are no constraints then the model generates a symmetical land use pattern around the central town. The land use pattern depends on how the transport and market price lines - bid rent curves in the jargon - interact with each other. Essentially the von Thunen model assumes that land use is determined by the market price less the transport cost and from the interaction of these bid rent curves, a land use will dominate at any point a given distance from the town (or from competing towns). You can also display alter the shape of the bid rent and cost curve using sliders. You can then display the land use map and look at the map as a 3-D surface of rents. You can manipulate this surface using sliders as well in oblique projection. The various picture to the right of this screen show you the sequence of steps from a single town - the red dot in the middle of the top screen, then just the market rent cost curves, then the land use map which results, and then the surface unshaded as contours and then the shaded surface.You can also import map pictures of real places and run the von Thunen model with towns and roads etc. planted on such backcloths. You can access the drop down menus to do this and you can also change the weights that way and incorporate a fizzy distance calculations.

Have a go by clicking on this button here to access the software

Click Here

Thunen.exe

here is an example of what you get if you put some roads into the town and take out some unproductive land from the landscape

Centre for Advanced Spatial Analysis

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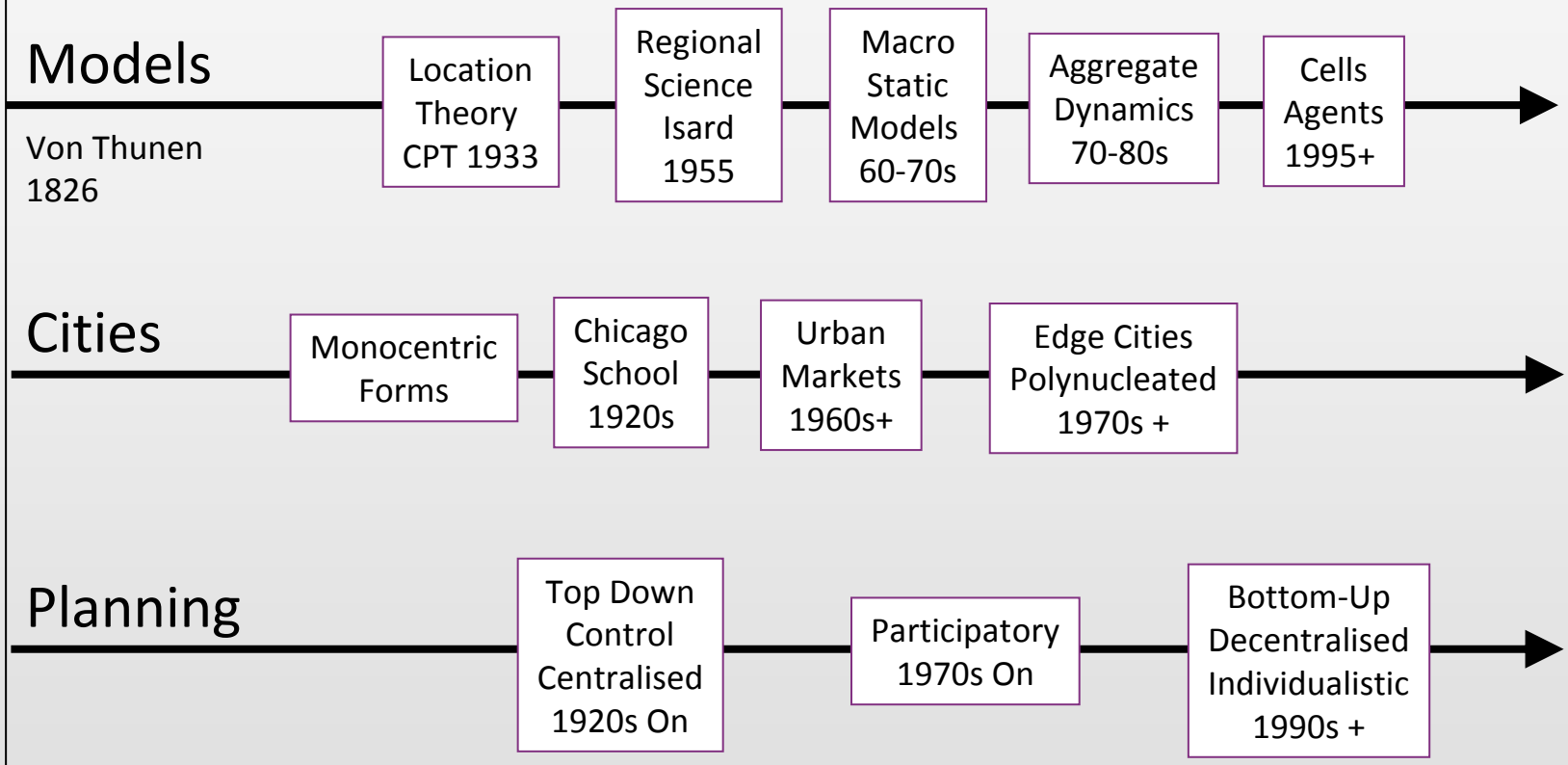
2. The Urban Modelling TimeLine



There are many time lines

3. What Kind of Cities?

Monocentric ie single centered, little choice of location – limited transport choices, strictly differentiated due to income, daily routine, homogeneous life-styles – dull !

This is the industrial city

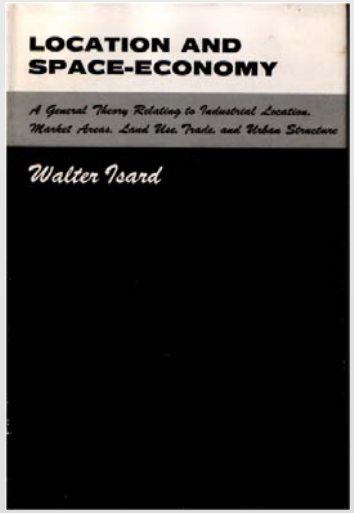
Contrast this with cities now – heterogeneous, diverse mix, less routine, less emphasis on transport to work – much greater opportunities for different locations for living

Edge cities, polynucleated forms, more like a currant pudding than a doughnut or birthday cake for a 1 year old

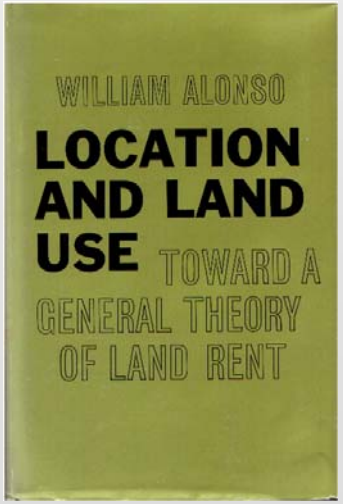
4. 1950s – 1970s : What Kinds of Models? Comparative Statics – Cities in Equilibrium

The theory was locational and gravitational, the methods were eclectic – there was a focus on urban and regional economics with transport based on the journey to work – the theory was encapsulated in key books like

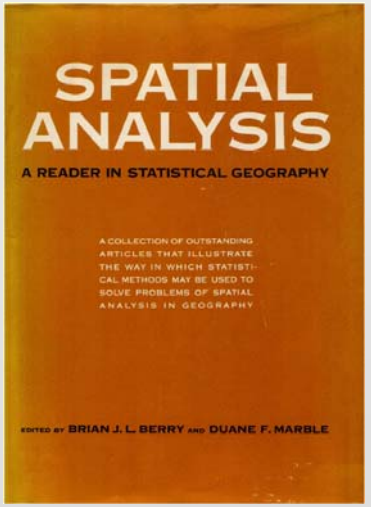
1956



1964



1968



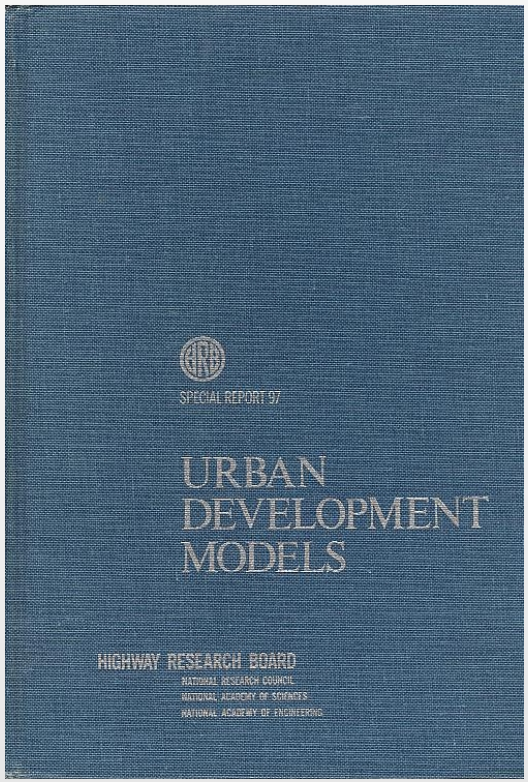
The models were cross sectional static, simulating an equilibrium based on a rudimentary systems approach which focused on physical interactions – transport and trips

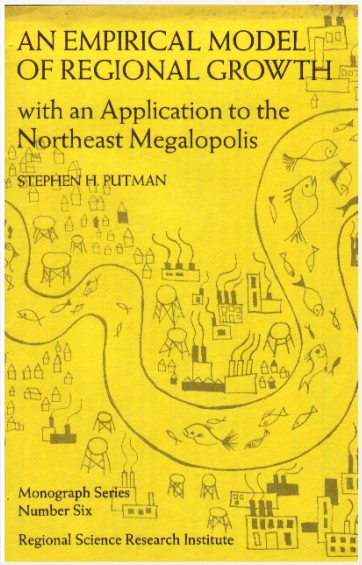
Econometric – simultaneous regression – ad hoc empiricist

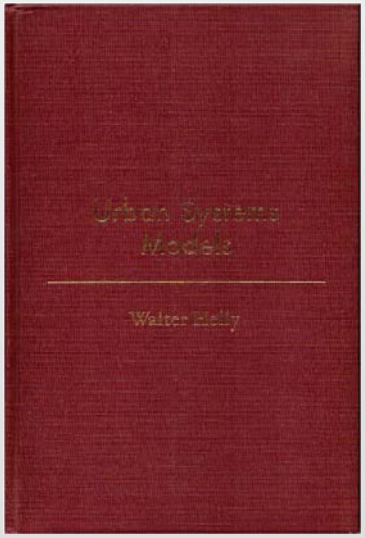
Gravitational – the Lowry Model which was a transport model embedded with an economic base or input output model

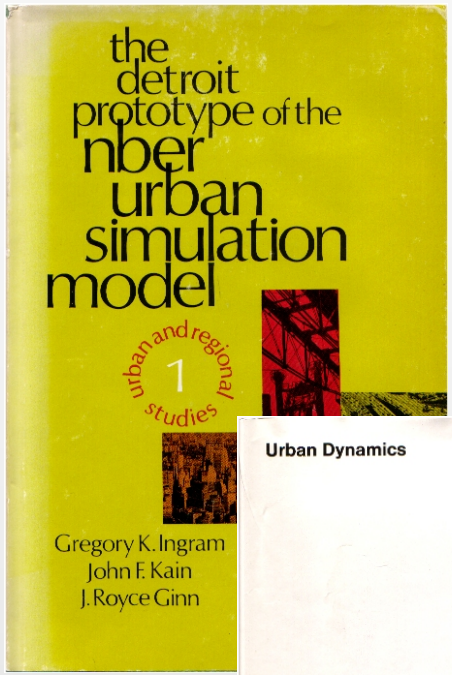
Simulation, not unlike CA and agent based – Chapin UNC

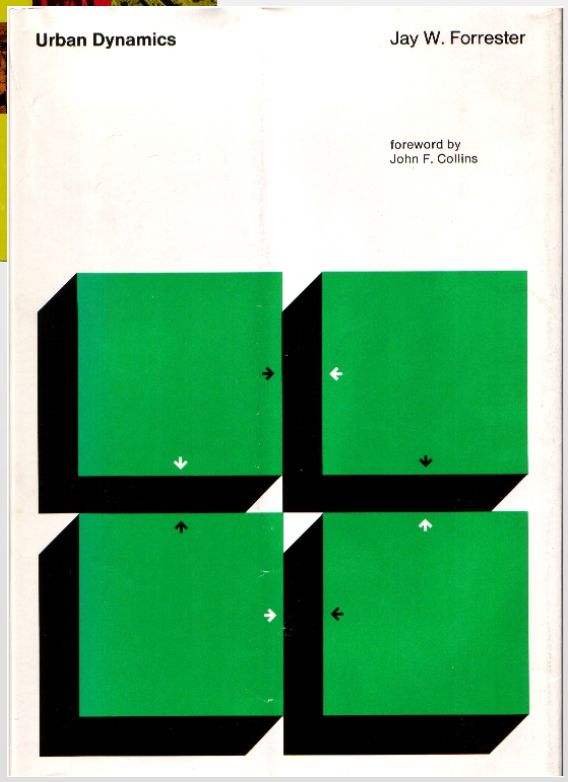
Optimization – LP models and economic optimization











The 1960s Books From the US

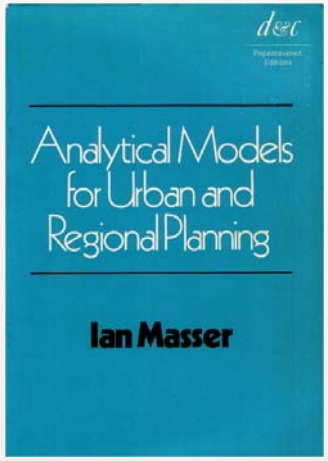
The models were strongly applied and were forced into existence through policy initiatives – by federal govt in US and by structure planning in UK

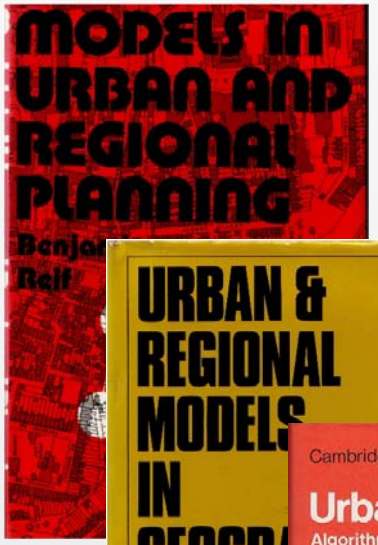
Right from the start researchers were conscious of dynamics and disaggregation – eg TOMMS model

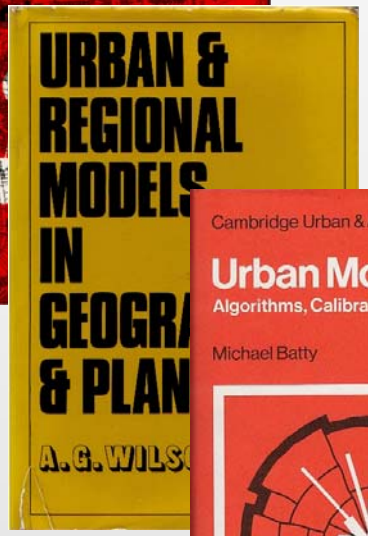
There was massive consolidation of these styles into the Lowry model framework in the late 1960s and 1970s

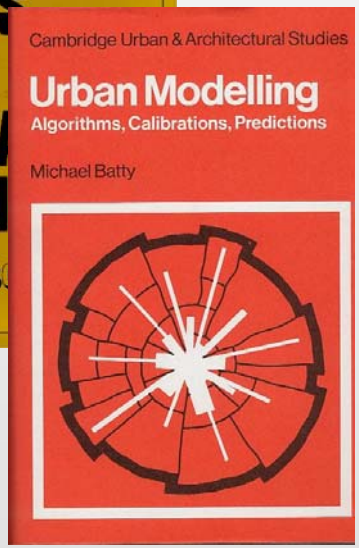
Not much new innovation but a research program was put in place only to find that fashions changed

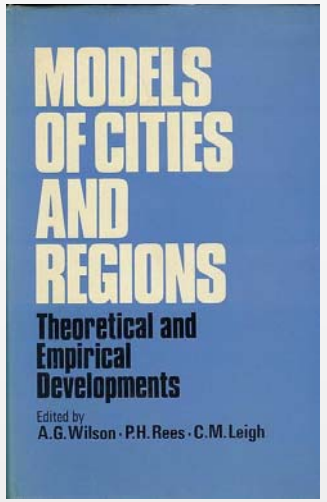
Optimization was pursued as a paradigm showing the strong top down focus of model use in planning

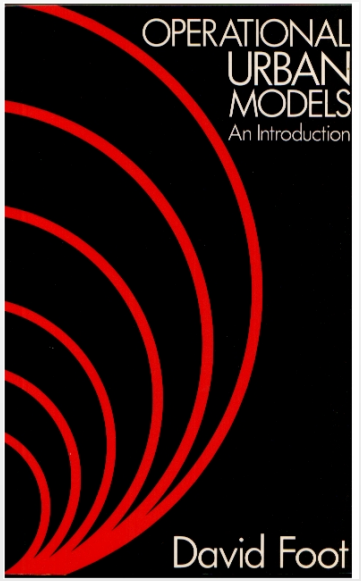


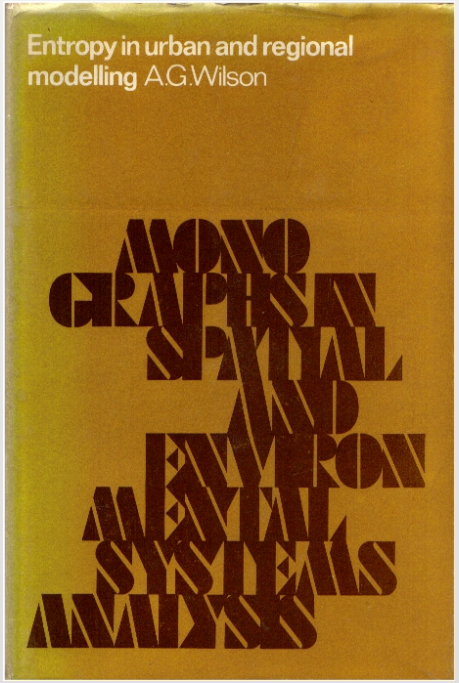


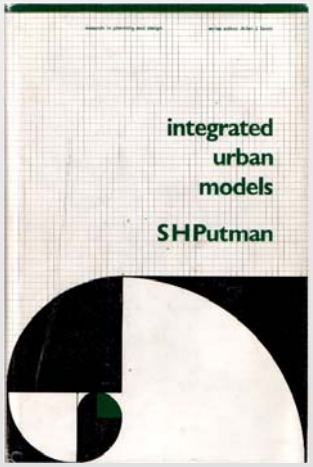












The largely UK contributions, the 1970s

And the contributions into the 1980s as these kinds of models began to slide out of fashion ….

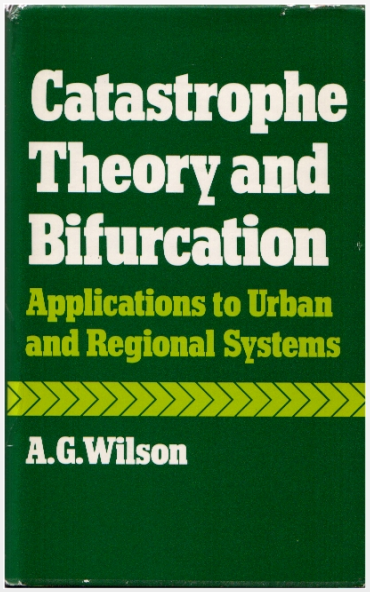
5. The Quest for Dynamics: Macro Dynamics, Catastrophe, Bifurcation, Chaos

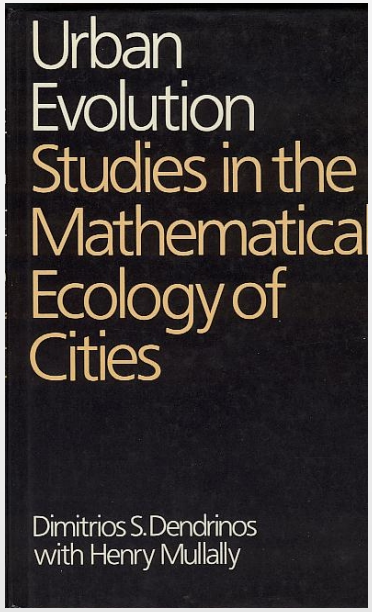
A concern for macro-dynamics – catastrophe theory – Wilson – embedding spatial interaction models in logistic style equations, 1977 + Note it was macro not micro

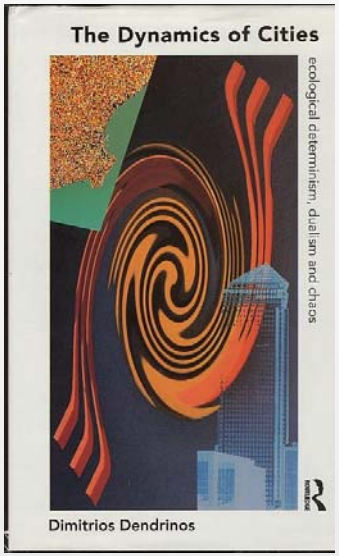
The Allen-Prigogine initiatives 1977 +

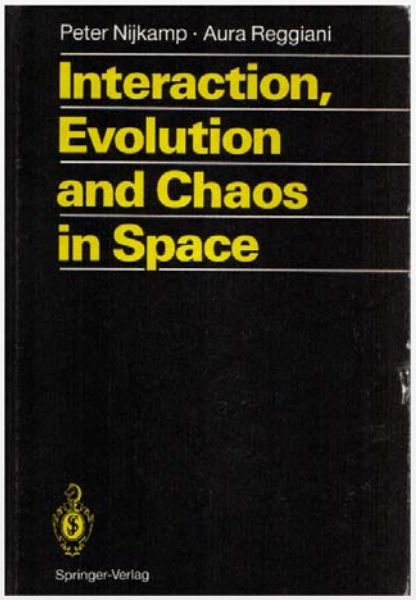
The Dimitrios Dendrinos Development of Lotka Volterra Models

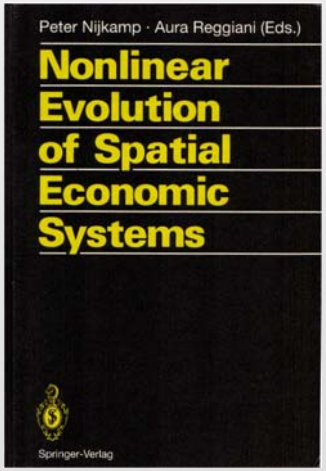
Later Developments of Chaos Theory – Nijkamp and Reggiani

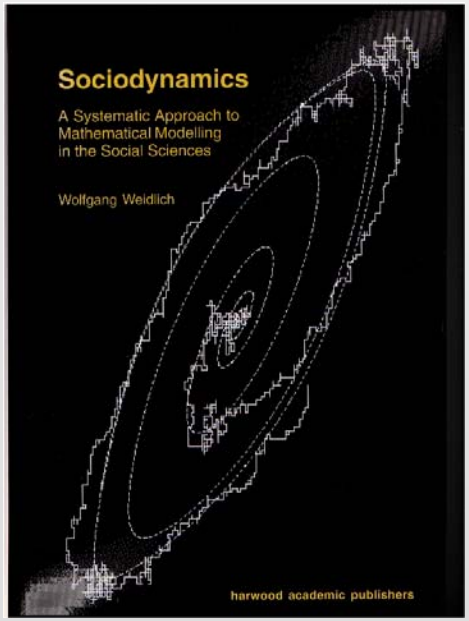












Here are some of the contributions

6. The Move to the Micro in Space, Time and Attributes: Cells, Agents, and the New Dynamics

I must stress that there are many, many ideas and models and theories that have impacted on this field that I have not covered – all the planning techniques etc and all the urban and regional theory in economic terms.

But the wave of concern for macro dynamics also began to work itself out and there is much less focus on this now.

Essentially my own work during the 1980s was largely in reskilling myself in computer graphics and my work on fractals was not focused directly on urban models per se

The concern for detail at the micro scale has come from a sea change in the way we look at the world, from the top down, from an ordered world in equilibrium to one which is full of pulsating change driven from the bottom up

Why did we never think that way in the first place? I am not going to answer that question – at one level it can't be answered but it is having quite dramatic effects on how we think about a science of cities

Here are some reasons – first the focus on bottom up thinking, second the idea of time and change, not equilibrium – far from equilibrium, third better data, better computers, fourth heterogeneity not homogeneity, fifth representation as neutral objects – grids, pixels, raster, GIS

The elements of complexity theory are key to the new modes or representation which focuses on emergence

This quest began with cellular automata models as key examples of emergence which were methods to generate fractal morphologies

Recently the idea of mobile cells or agents has come onto the agenda

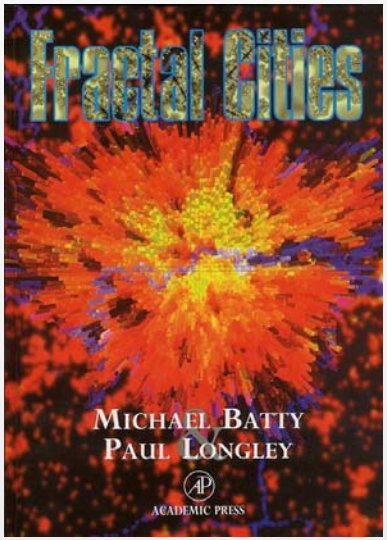
The biggest problems of these class of models is that they are far richer than any of their predecessors and they break the rule of parsimony – they are hard if not impossible to calibrate in their pure form

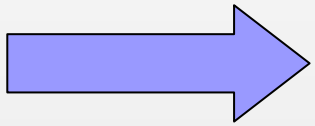
They also deal with interaction rather poorly and generally fail to grasp the appropriate notions of action at a distance

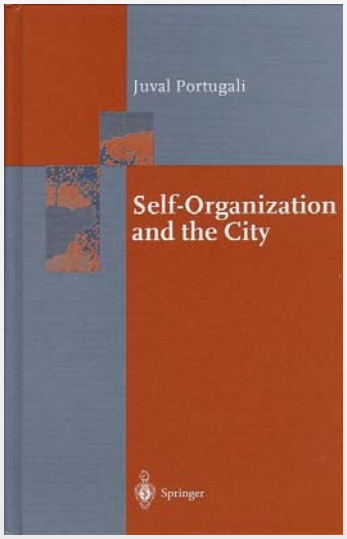
The cell size is a problem too in terms of states and land uses

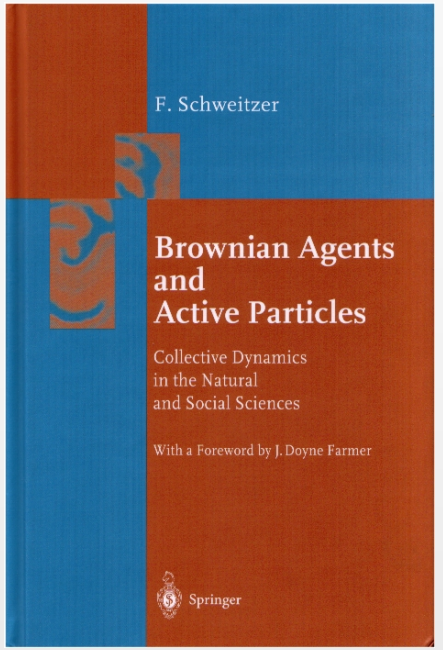
They tend to be physicalist and the rules of behavior are problematic

But this is an exciting area as this meeting will show and here are some examples of what has been done so far

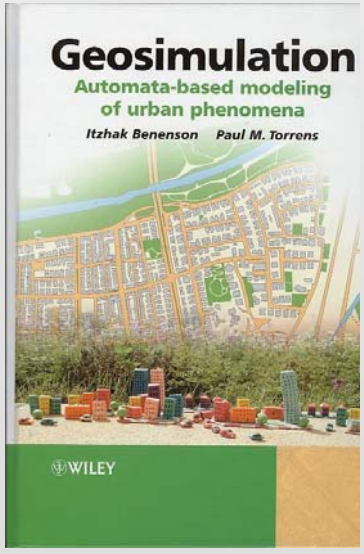


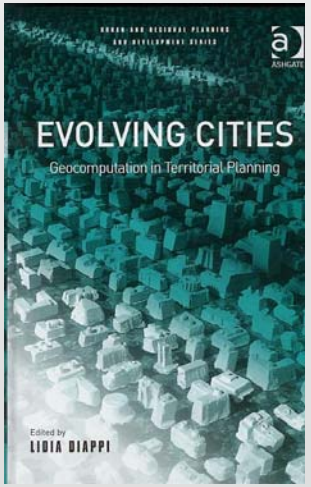






Some samples of what is being synthesised. Note that urban models per se is no longer the focus – it is now a science of cities or a tool box





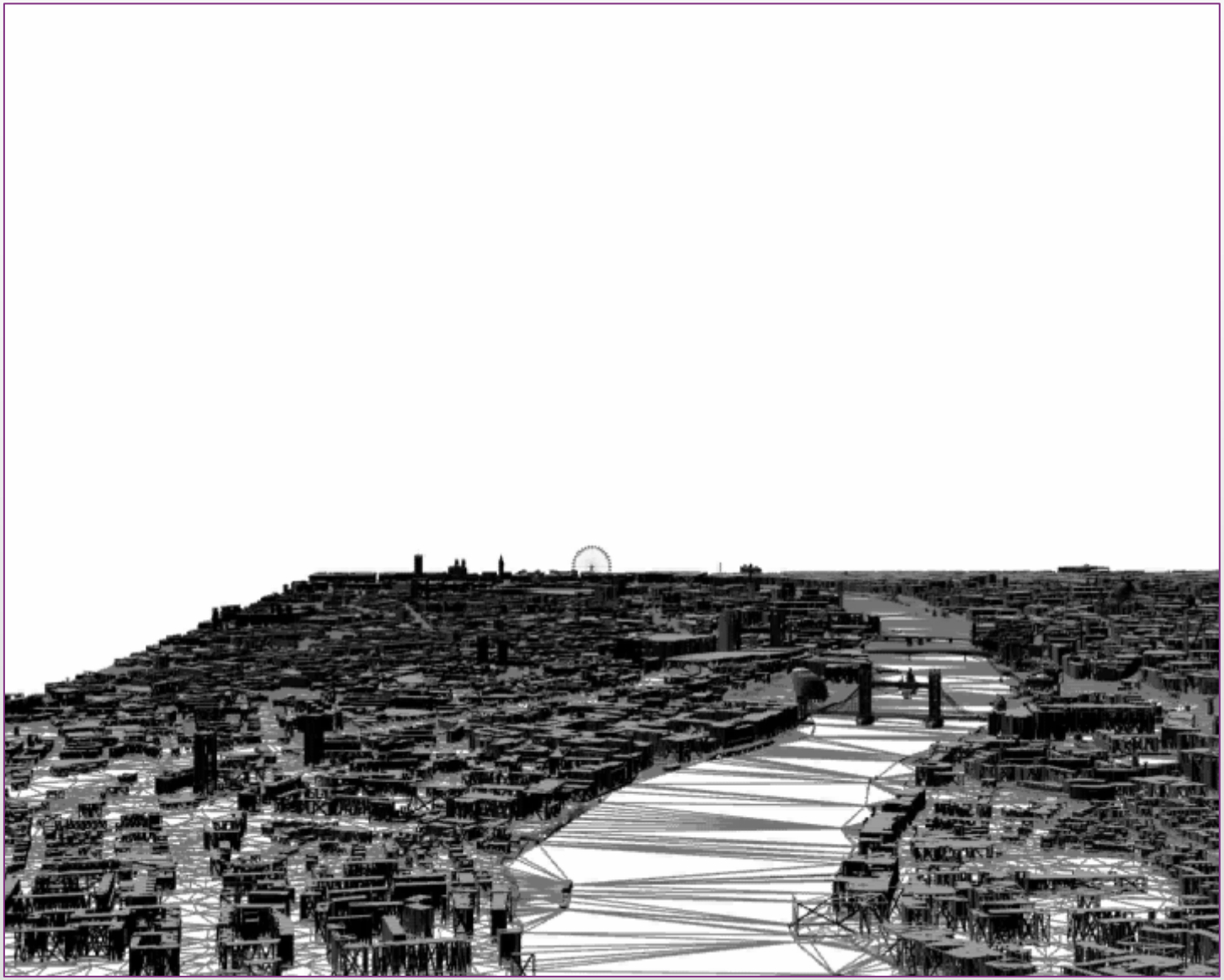
7. Other Types: Three Examples (that merge into each other)

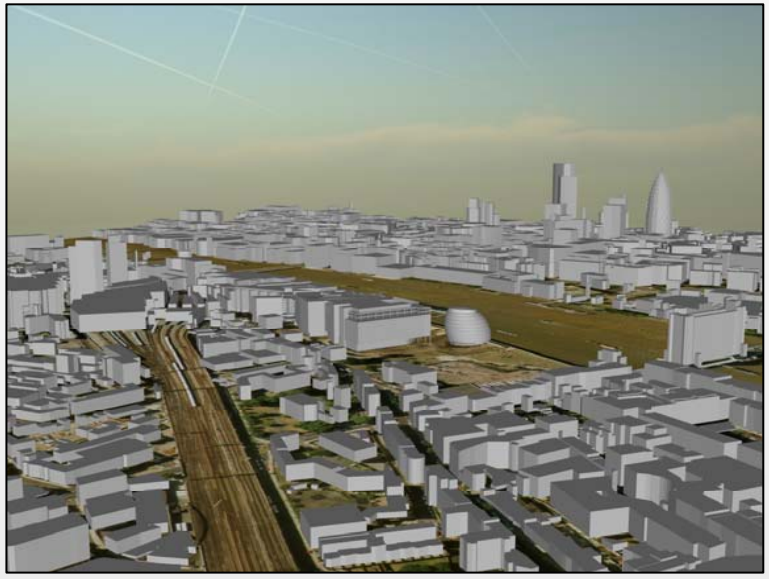
Iconic Modelling: architect's models, toy models but all models are toys of a kind in that we learn from them

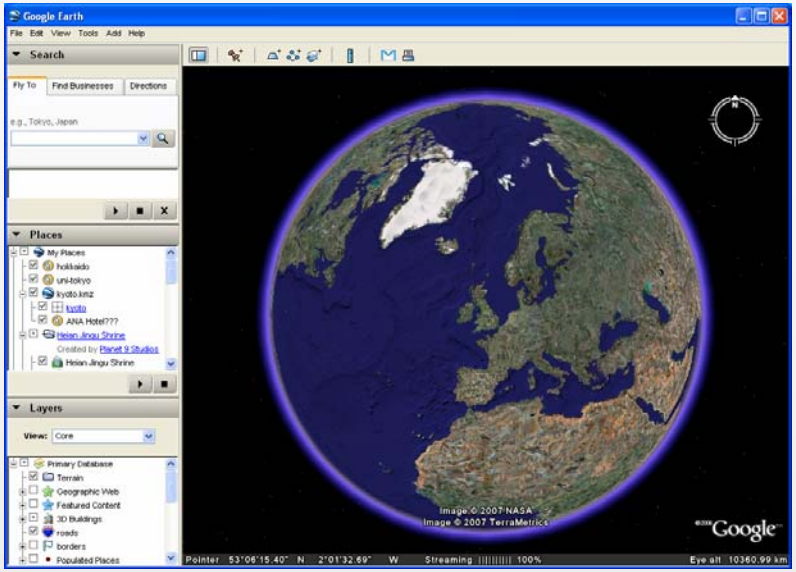
We never anticipated that these kinds of near physical as opposed to symbolic or abstract model being made 'digital'. But in fact the whole of the reality has become digital

To give you an example, we can take a model of a city – say London – build the geometry digitally – then have it on the desktop of in **Google Earth**, and then push into a CAD-CAM machine and print it out in 3D – these are the stages in building such digital iconic models

Let me show you how it works ……



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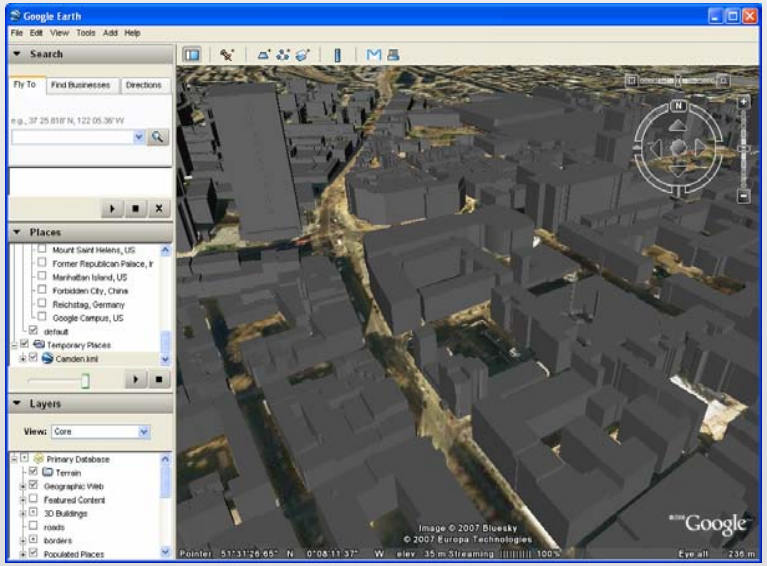
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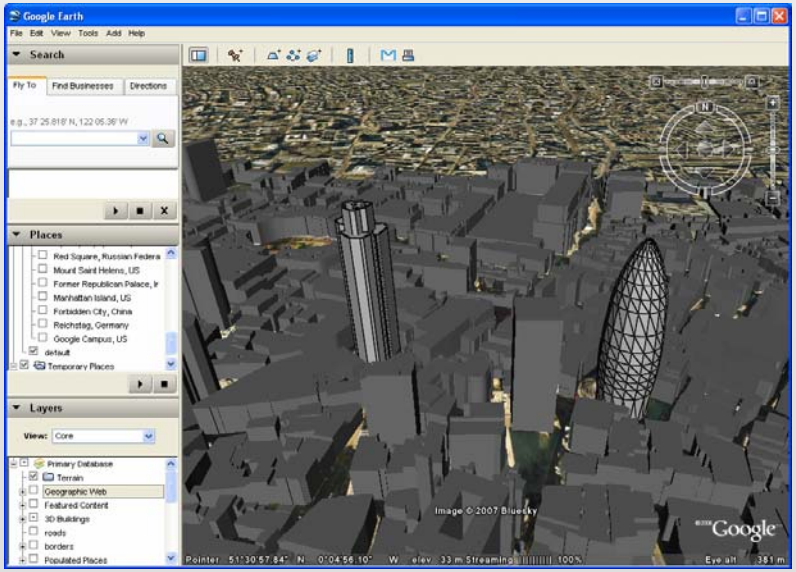
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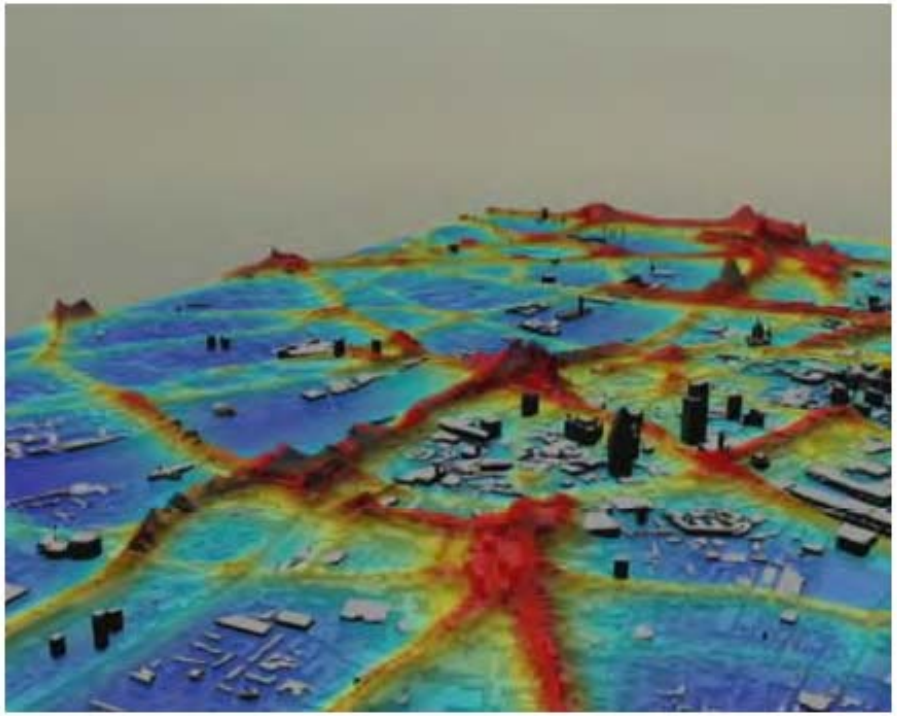

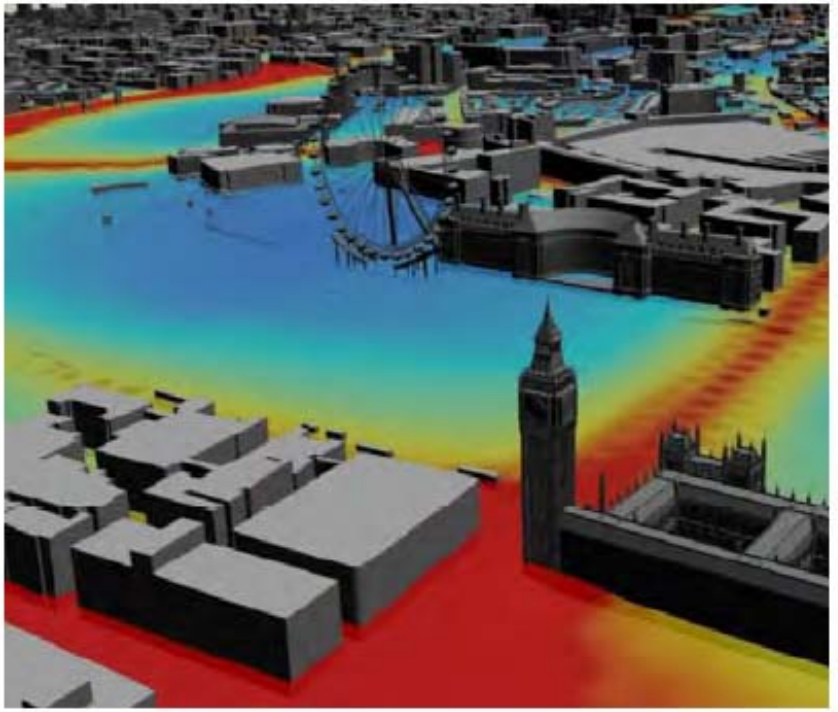

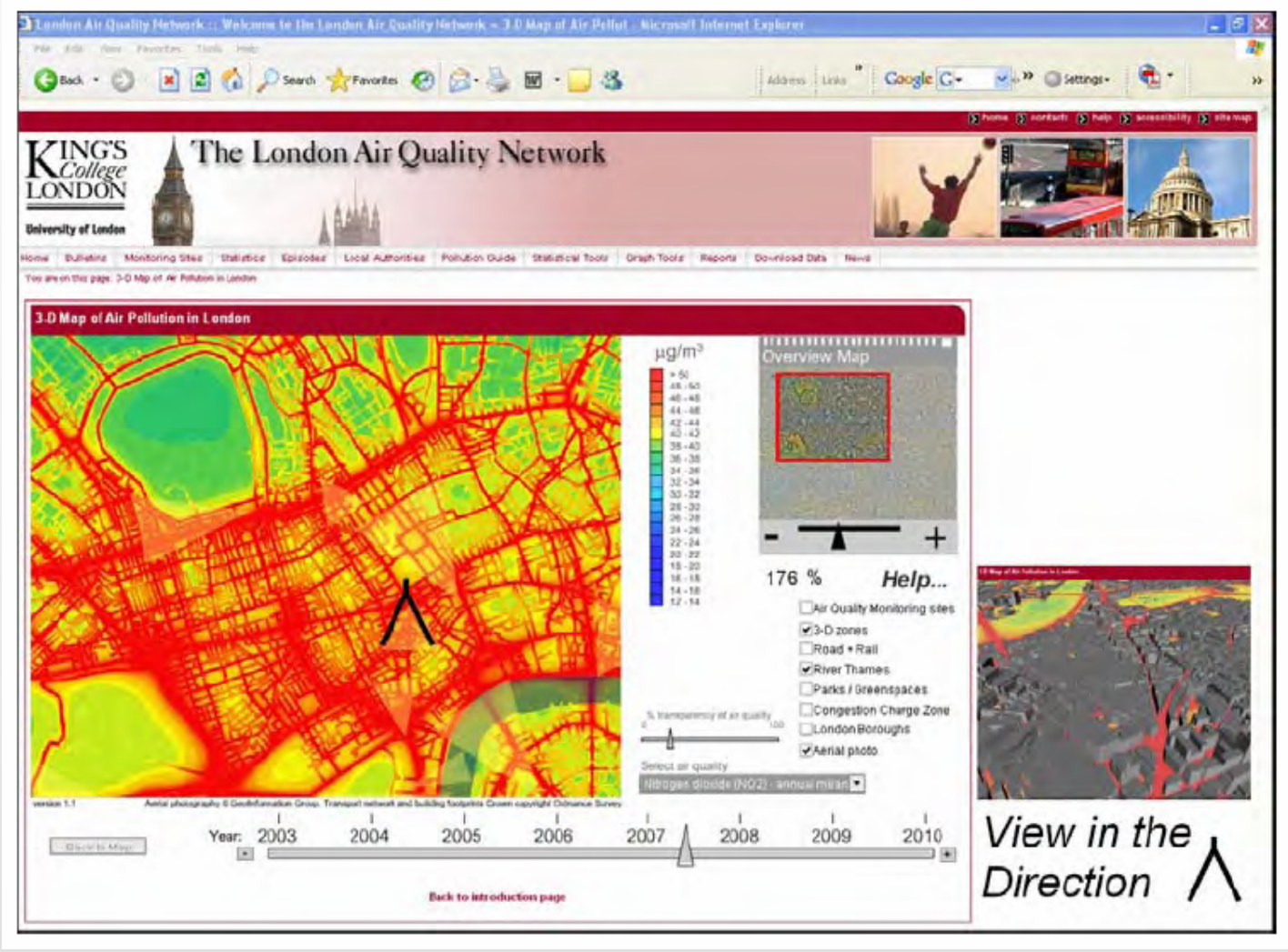

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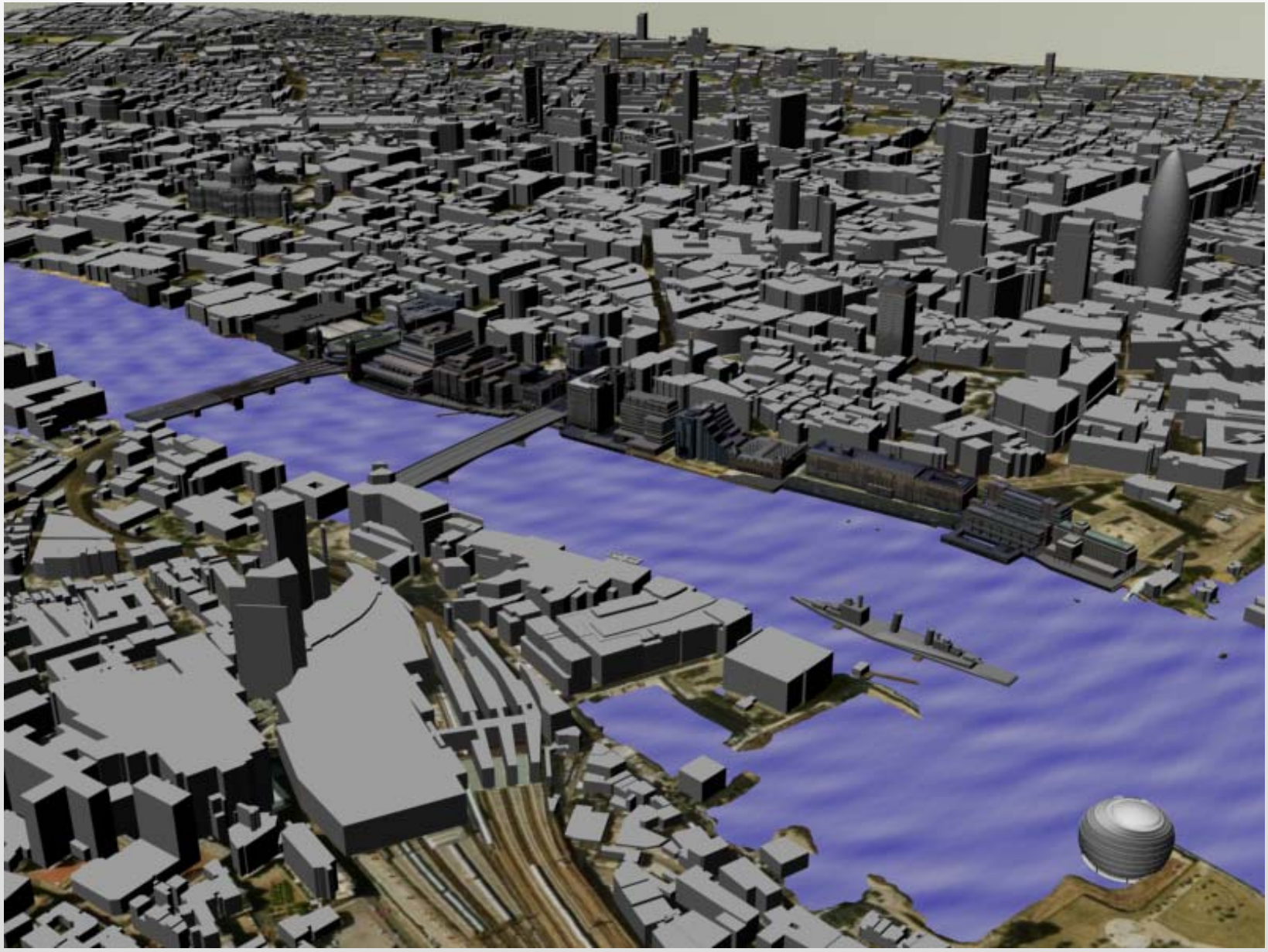

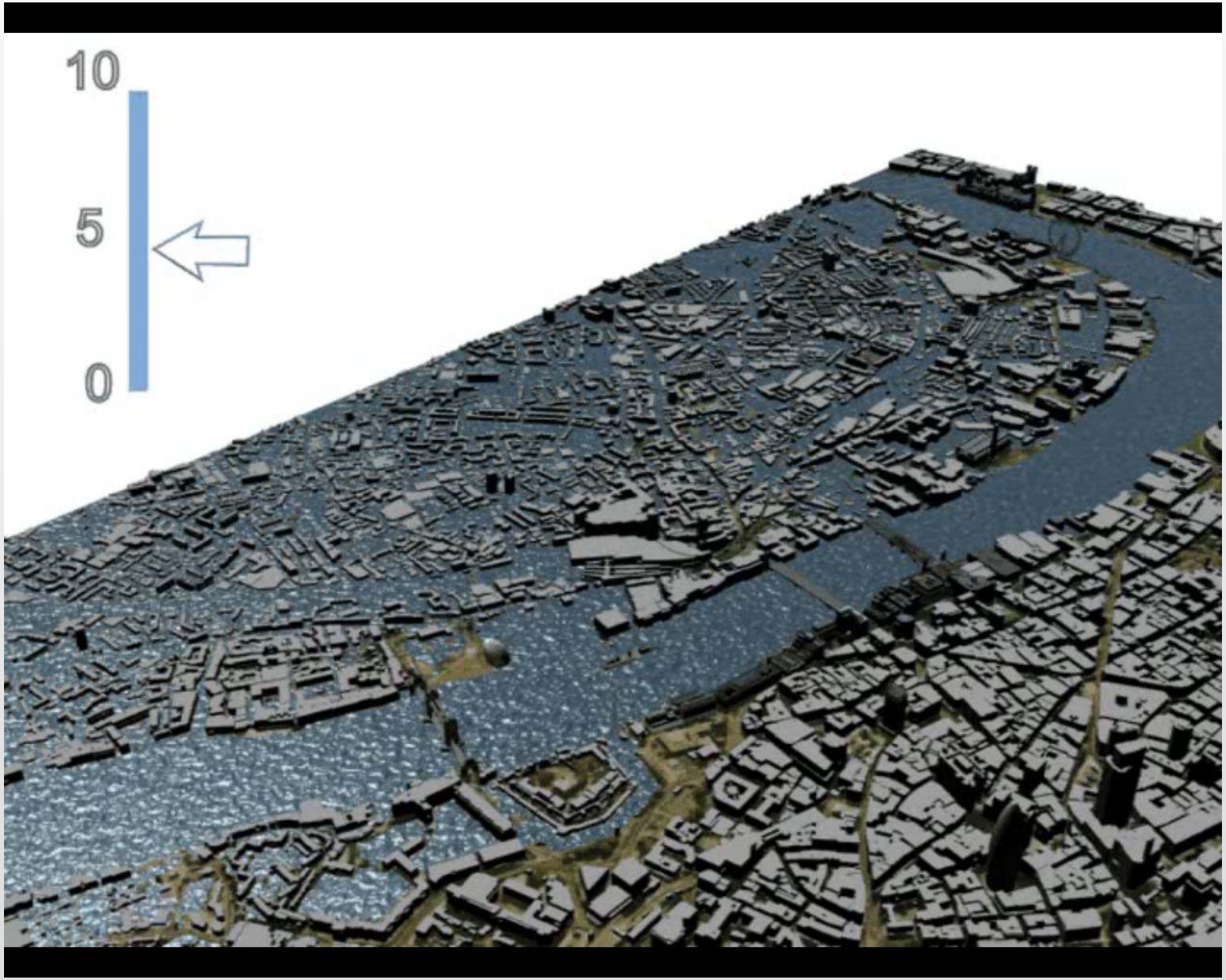
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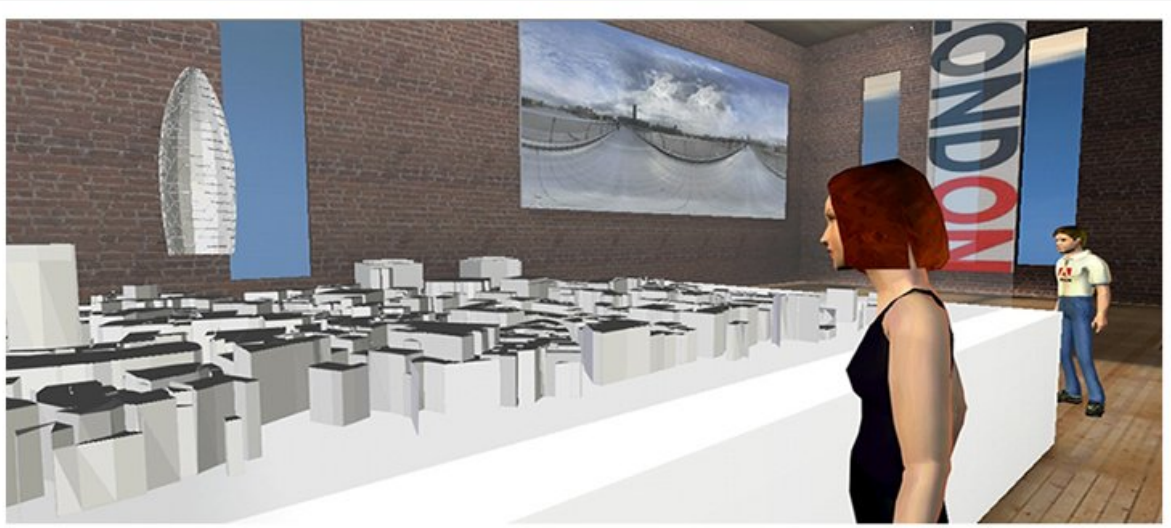
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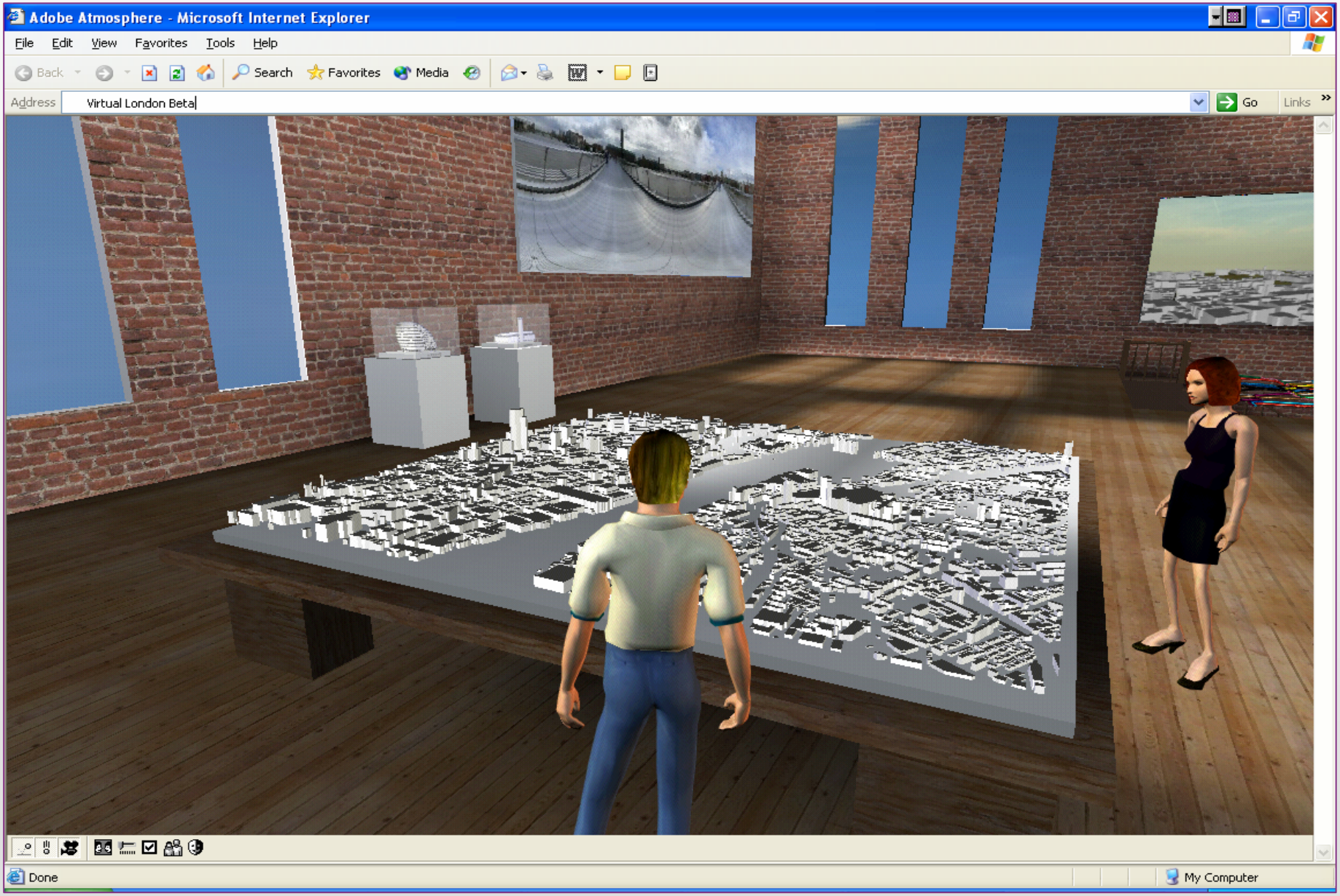
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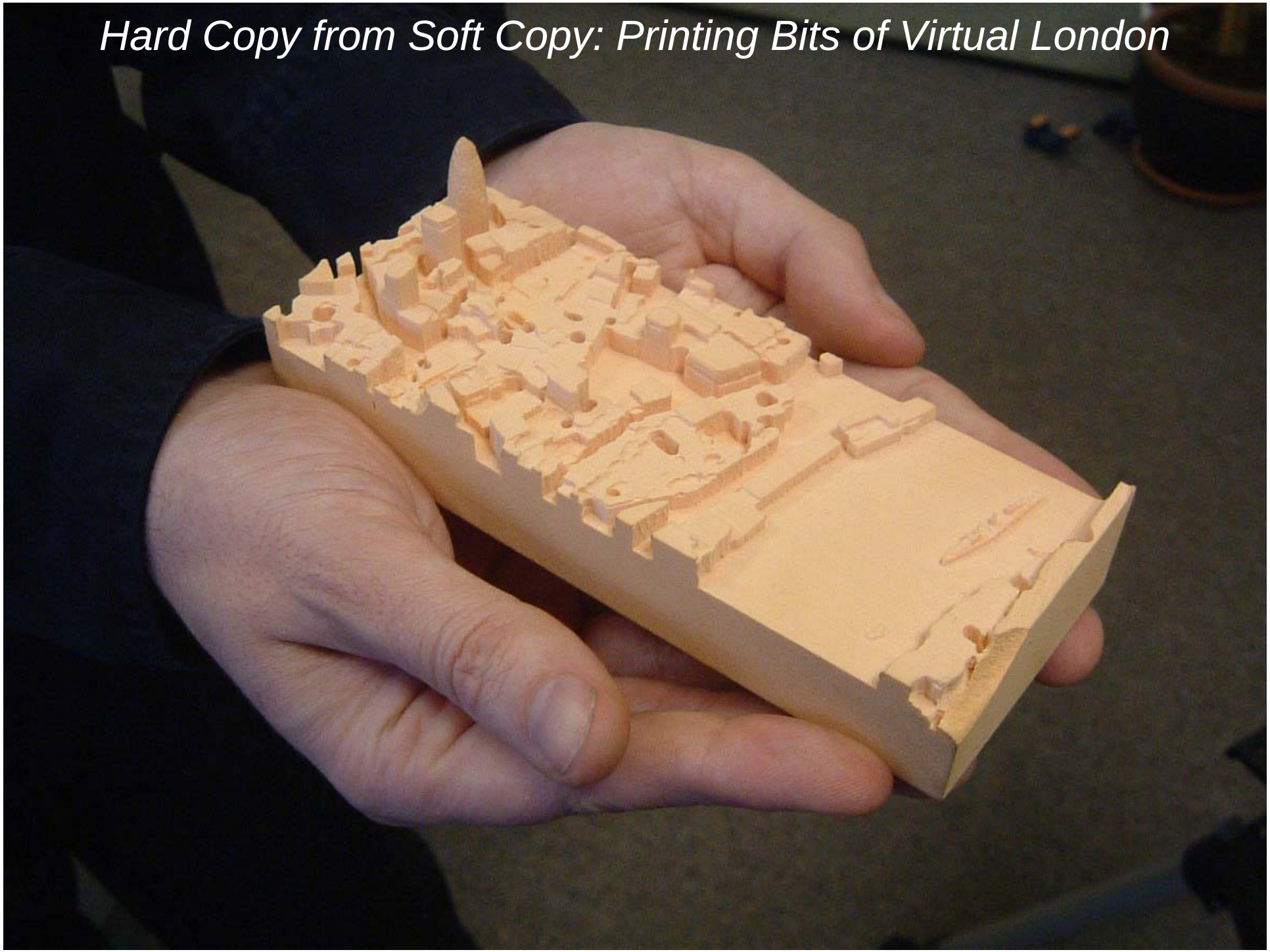
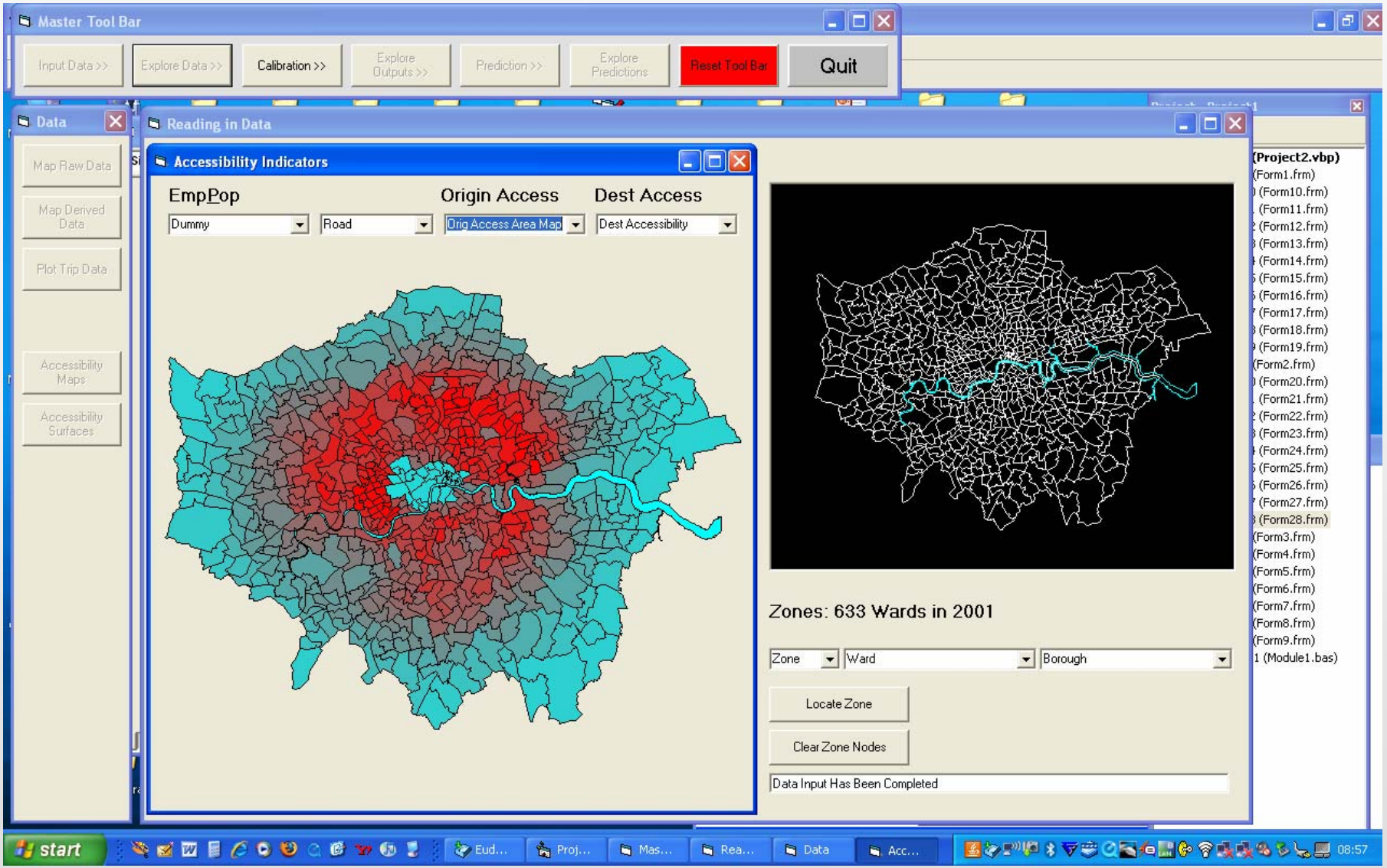
Hard Copy from Soft Copy: Printing Bits of Virtual London




Master Tool Bar
Input Data >>
Explore Data >>
Calibration >>
Explore Outputs >>
Prediction >>
Explore Predictions
Reset Tool Bar
Quit
Data
Map Raw Data
Map Derived Data
Plot Trip Data
Accessibility Maps
Accessibility Surfaces
Reading in Data
Accessibility Indicators
EmpPop
Origin Access
Dest Access
Dummy
Road
Orig Access Area Map
Dest Accessibility
Zones: 633 Wards in 2001
Zone
Ward
Borough
Locate Zone
Clear Zone Nodes
Data Input Has Been Completed
(Project2.vbp)
(Form1.frm)
(Form10.frm)
(Form11.frm)
(Form12.frm)
(Form13.frm)
(Form14.frm)
(Form15.frm)
(Form16.frm)
(Form17.frm)
(Form18.frm)
(Form19.frm)
(Form2.frm)
(Form20.frm)
(Form21.frm)
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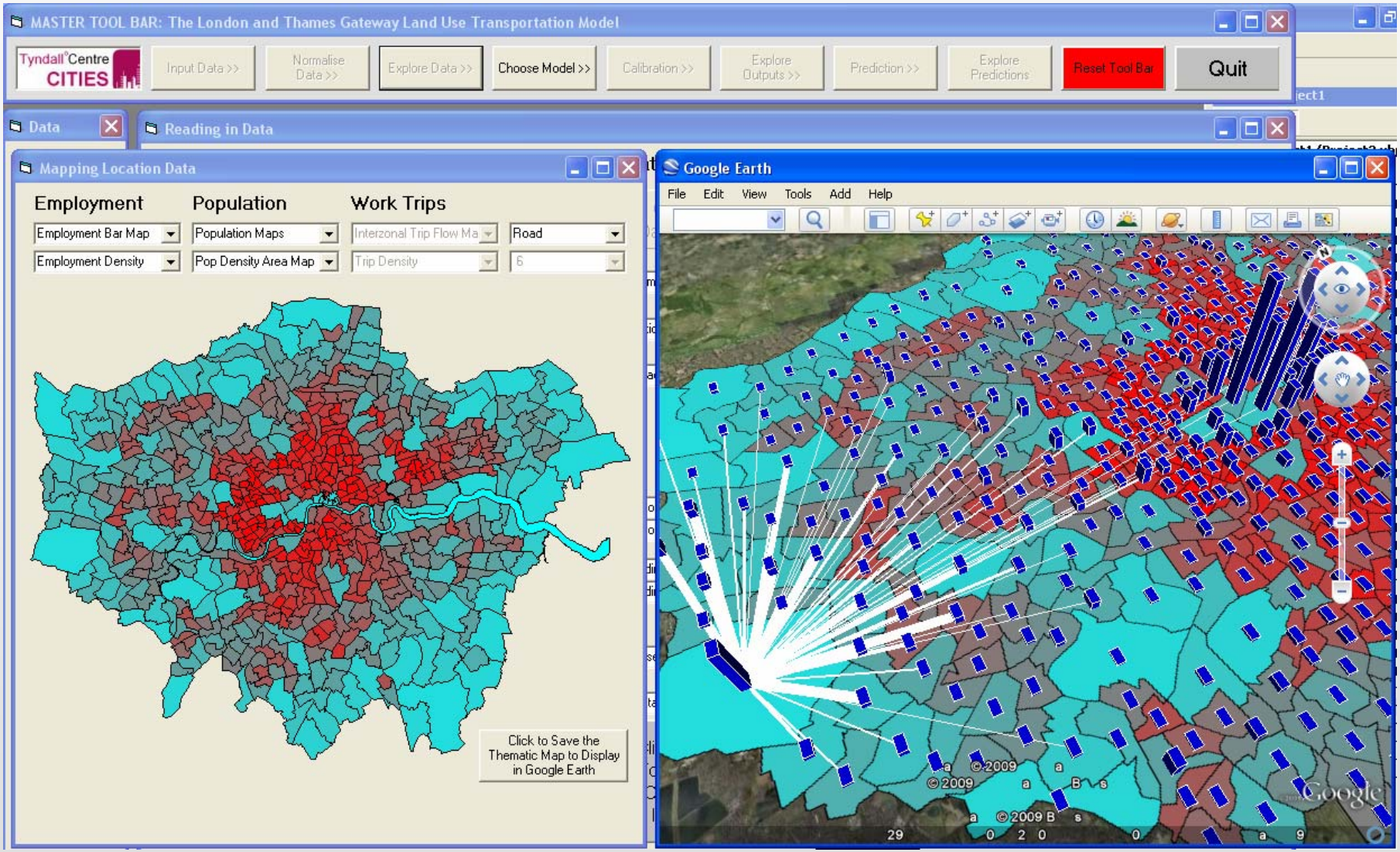
(Form25.frm)
(Form26.frm)
(Form27.frm)
(Form28.frm)
(Form3.frm)
(Form4.frm)
(Form5.frm)
(Form6.frm)
(Form7.frm)
(Form8.frm)
(Form9.frm)
(Module1.bas)
start
08:57


MASTER TOOL BAR: The London and Thames Gateway Land Use Transportation Model
Tyndall Centre CITIES
Input Data >>
Normalise Data >>
Explore Data >>
Choose Model >>
Calibration >>
Explore Outputs >>
Prediction >>
Explore Predictions
Reset Tool Bar
Quit
Data
Reading in Data
Mapping Location Data
Employment
Population
Work Trips
Employment Bar Map
Employment Density
Population Maps
Pop Density Area Map
Interzonal Trip Flow Ma
Trip Density
Road
6
Click to Save the Thematic Map to Display in Google Earth
Google Earth
File
Edit
View
Tools
Add
Help
©2009
Google

Conclusions so far

Iconic and symbolic models are beginning to connect up

A great deal of this is moving from reflected time to real time – building models on the fly – encoding this knowledge into the web

Web 2.0 and web 3.0 technologies – if you have not had enough then come to my lecture at 6pm to see some of these ideas in action

More and more of this knowledge is being packaged and cut and sliced in different ways – look at what is going on in GIS

***To Read*:** well I haven't given you any references on iconic modelling as these are easy to understand but you could look at my PSS article – the one for the last lecture at the end of the web page

Questions?