

Breakfast Meeting at the HK Harbour Business Forum
25 October 2006

Virtual London

What It Is, How It Is Financed
and What Is It For

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Outline

- Preamble
- How We Build Virtual London: GIS and CAD
- Building It From the Ground Up
- The Financing: IPR and Copyright, particularly over Data
- What Is It For? Design of Many Kinds
- The Pollution Issue: The BOC Project
- Questions and Answers

Preamble: Last Night's Lecture

I am going to present a brief summary of our work with a large scale 3D model of central and greater London and how we built it and what it is

We have a digital model of Greater London. It is a representational model – it is essentially a spatial data base that we can view in 3D and fly through – this makes the data accessible.

The model was originally built for 20 sq kms in central London with 50K building blocks. It is out about 900 sq kms and contains 3.1m buildings.

FLATRON 17000



e.g. 94043

Search

My Places

- My Places
- New Placemark
- CUPUM 04
- CUPUM 05
- 3D
- Empire
- Miami

Layers

- Keyhole Community BBS
- User-Supplied Collections
- Dining
- Lodging
- Banks/ATMs
- Bars/Clubs
- Coffee Houses
- Malls/Shopping Centers
- Major Retail
- Movie Rentals
- Grocery Stores
- Pharmacy
- Gas Stations
- Golf
- Stadiums
- Parks/Recreation Areas
- Fire/Hospitals
- Schools
- Elementary School Districts



Image © 2005 EarthSat

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Pointer 40°29'60.00" N 96°29'60.00" W

Streaming ||||| 100%

Eye alt 6119.22 r

- Lodging
- Roads
- Terrain
- Dining
- Borders
- Buildings

Navigation controls including zoom in (+), zoom out (-), pan (directional arrows), and a compass. On the right, there are icons for home, print, and email.

How We Build Virtual London: GIS and CAD

Let me suggest some generic issues related to building virtual cities, and then I will show you a few of the key elements we have been using.

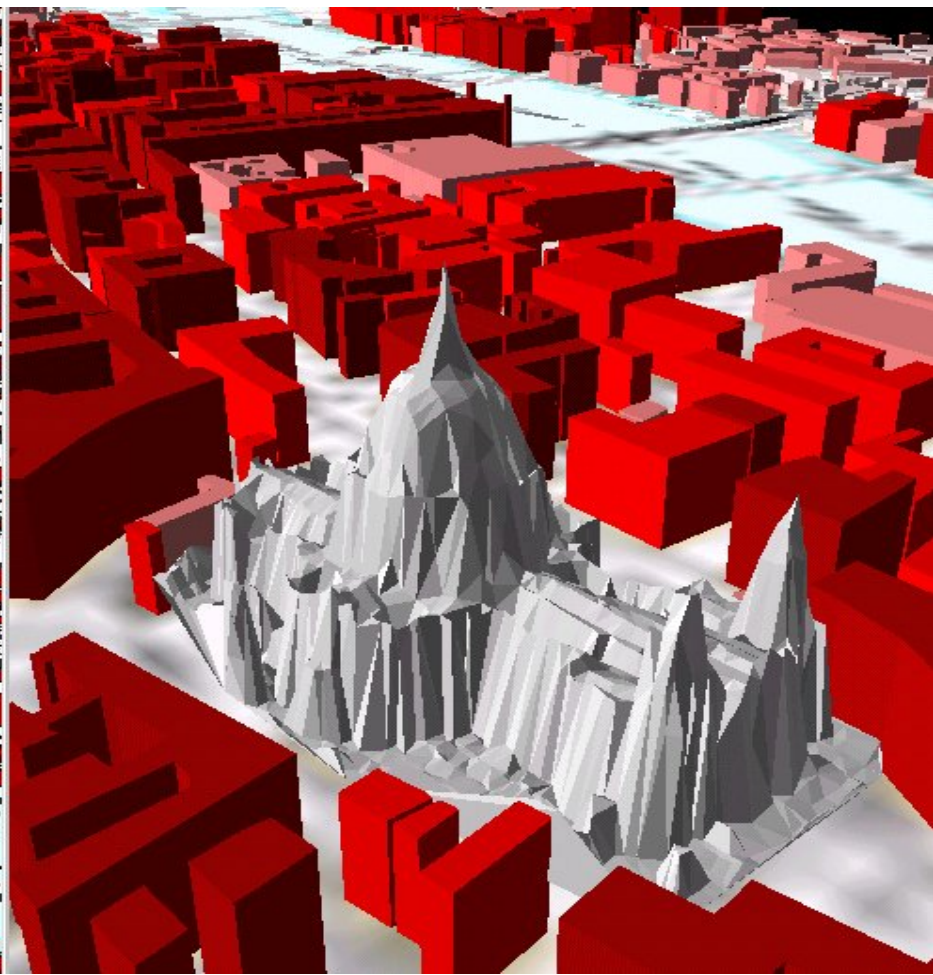
Last I will show you the model, circa 2003, which is our model of central London.

In terms of our framework, we have a basic digital model where the surface representation of the city – its geometry – is the ‘filing cabinet’ or ‘container’ for its geography

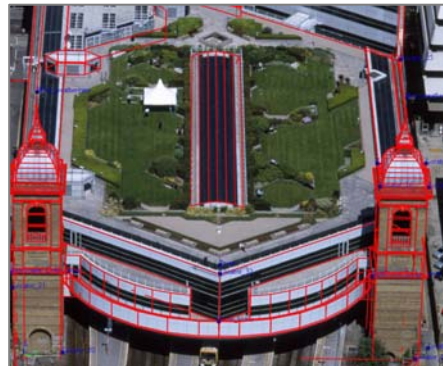
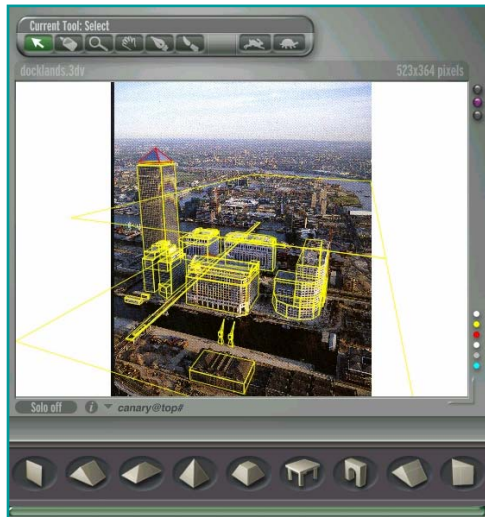
From this data base, we can visualise the city in many different ways – which we refer to as products for example

- As a full blown 3D GIS, and/or as a CAD model
- As various kinds of multimedia which are combined with the 3D model – such as photorealistic panoramas, zoomable maps and so on
- As hard copy products – as maps and printed 3D copy

Once we have a digital model, we can replicate it in different environments – on the net, on the desktop, as movies, and as hard copy.



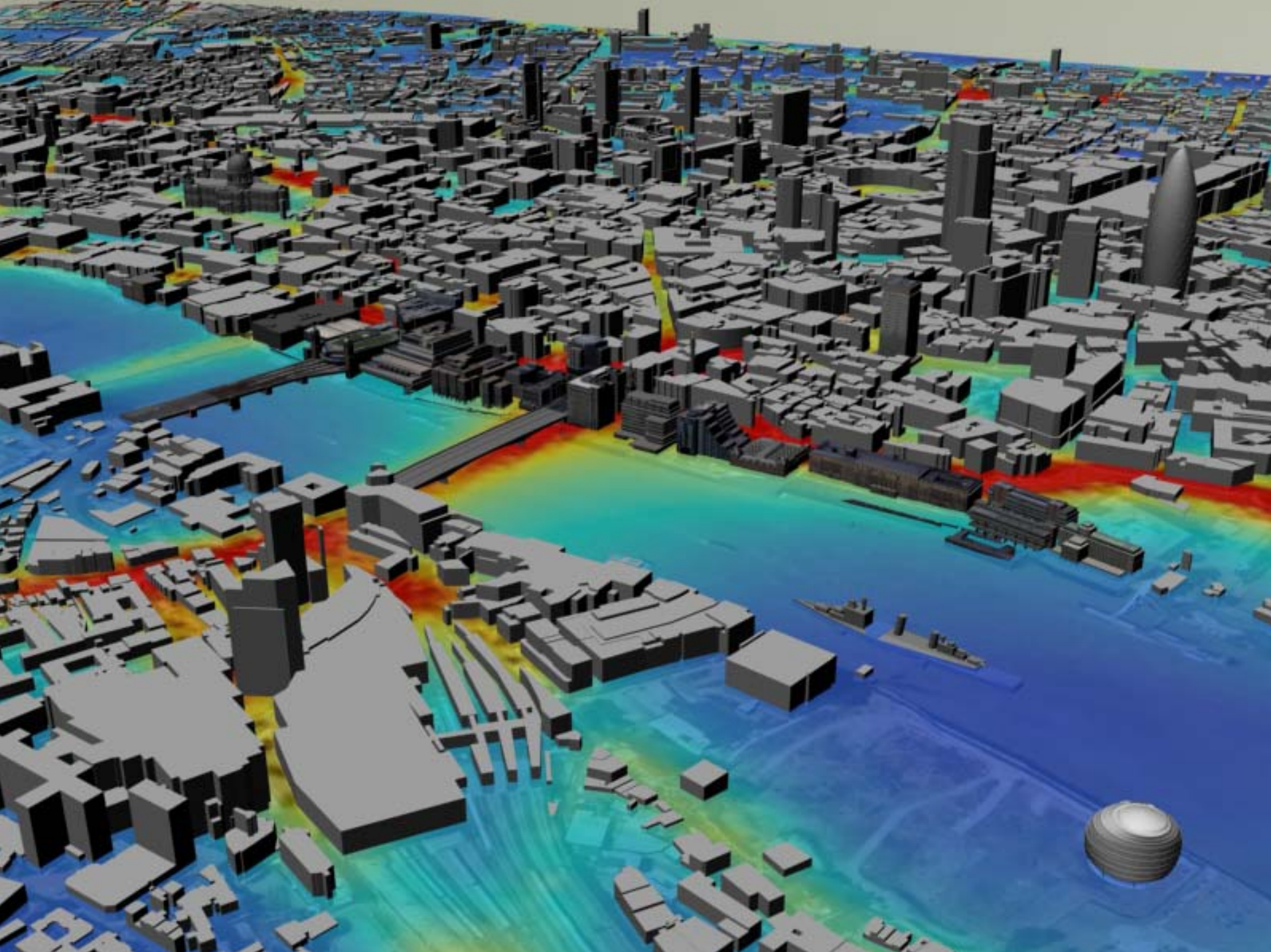
We use a lot of photorealistic rendering to detail the buildings – these are photogrammetrically correct, and we use rapid wire frame software to sketch such media into the block model e.g.



Building It From the Ground Up

We build it in layers. First we develop a DEM – DTM digital terrain model from InfoTerra LIDAR, then we drape the Cities Revealed aerial photo of London. Then on top of this, we layer Ordnance Survey MasterMap vector parcel data on this and we extrude the parcel and street data to the heights from the InfoTerra LIDAR data.

This gives us the skeleton and we color the frame as blocks. We have ~50000 buildings over 20 square kilometers modelled. We then slot in the 30 or so detailed rendered buildings from CAD.





In fact, we are beginning to build our own model from the ground up using rapid capture for two reasons. One is the cost and copyright of data. The second is the fact that we want to integrate the process of detailed rendering of buildings at the same time as generating the geometry of buildings. We tend to think that these two issues – geometry and rendering are best kept together and not separated.

Here is what we are doing in East London in Stratford which is a key stop on the new Eurostar service out of St. Pancras and also the key retail centre adjacent to the Olympic Games 2012 site.

The Financing: IPR & Copyright, mainly Data

The digital data is invariably owned by someone else. We need of course software to 'unlock' the digital data, but this does not tend to be the obstacle.

Good map and good RS-height data can be costly. IN the UK , the Ordnance Survey which is a so-called government Trading Funds, collects and controls and sells the data. Data is sold back to govt on special licenses. Most (All?) local authorities have these. But no one can put the data or maps on the web.

Height data is provided by several suppliers but we use InfoTerra who donated the data for Phase 1, the central London model, but sold it to London Connects for the Greater London model.

Other data such as socio-economic data is in the public domain but subject to costs through govt. audit constraints and some data is from commercial vendors such as market research and targetting companies like Experian.

Pollution data tends to be in the public domain, Property data is not.

We have a very neat use of the model using this 'free software'. We now have the model out to the m25 orbital road with 3.1 million building blocks.

The 33 London Boroughs generally do not have the software to run this model but they do have the copyrighted OS data. London Connects have bought the LIDAR data.

So using Google Earth we can deliver the model 'free' to all local authorities in London: they currently have it. Can they use it? That is an educational issue. We showed what we can do earlier with the current product.

What Is It For? Planning of Many Kinds

Our model can be used for almost anything you wish to do in cities that involve understanding it or planning it.

First Complex Queries – this is a data base.

How about: “Show me all the buildings owned by Japanese Banks within 10 minutes walk of Bank Station which have view of Tower Bridge?”



Second New Layers:

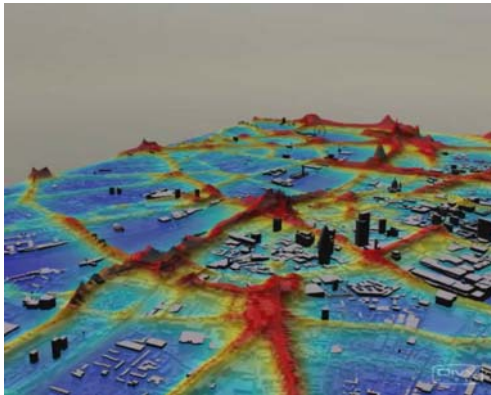
Flooding: what happens if the Greenland Ice cap Melts and the North Atlantic rises by 10 meters?

Air Pollution: can we show air pollution in the model?

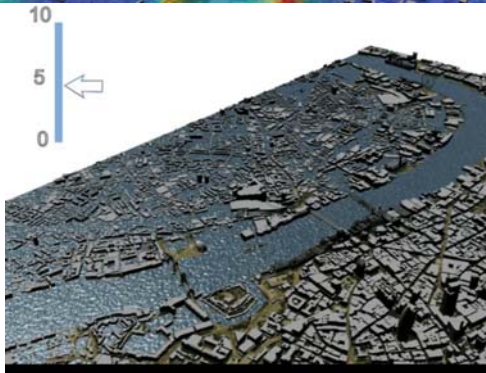
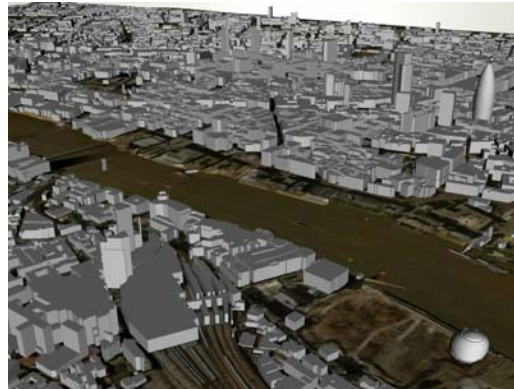
What can we see if we put a new high building into Central London and break the 50 year old policy that St. Pauls cathedral should not be overshadowed?

Let us see some applications – air pollution flooding and the impact of high building

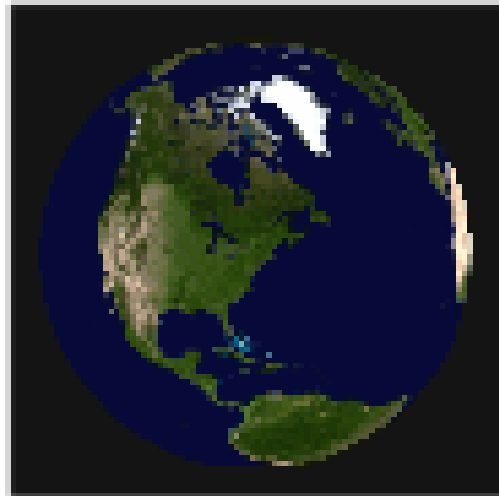
Pollution



High Buildings Swiss Re



Flooding
And in Virtual Earths



which we show below

The Pollution Issue: The BOC Project

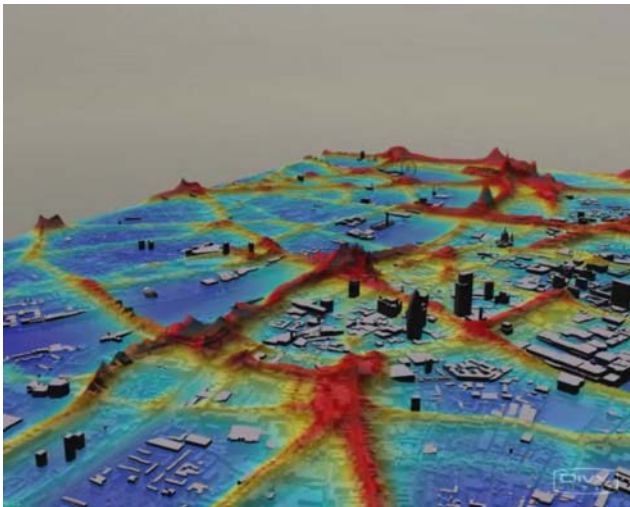
There is a detailed monitoring network of sensors across London based on about 70 supersites. These provide data on many pollutants that are sensed and reported hourly and piped to a web site.

The data can then be ported to a hydrodynamics model (ADMS) which spreads the pollutants to the streets and links this to traffic counts.

The data and predictions are visualized in the same GIS that we use: ArcGIS.

This means that we can layer the pollution surfaces into the 3D model.

We have a project with BOC and Kings College which visualises the data in 3D and this is on the web site that Kings maintain daily for London financed by the GLA. Here are a movie of one of the surfaces.



London Air Quality Network :: Welcome to the London Air Quality Network » 3-D Map of Air Pollut - Microsoft Internet Explorer

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KING'S College LONDON


University of London

The London Air Quality Network

Home Bulletins Monitoring Sites Statistics Episodes Local Authorities Pollution Guide Statistical Tools Graph Tools Reports Download Data News

You are on this page: 3-D Map of Air Pollution in London

Air Quality in your area



To see current pollution levels in your area enter your postcode in the box below, or select your borough. Then choose the bulletin and press 'Show Air Pollution'.

Enter a postcode: ?

or
select an area: (choose on map)

All of London

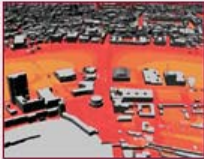
then

select a bulletin: Now ?

Show Air Pollution

3-D Map of Air Pollution in London

Introduction



- This 3D model shows air pollution across 63 sq km (9km x 7km) of central London.
- It allows users to visualise air pollution in the areas that they work, live or walk.
- Pollution concentrations are shown for 2003 and predictions of future air quality can be viewed to 2010 clearly showing the improvements arising from air quality abatement measures.
- Transport planners can identify the most polluted parts of London. Urban planners will be able to see how building density affects pollution concentrations in the City and other high density areas.
- The facilities can also be used by students to understand pollution sources and dispersion characteristics.
- Please note the 3D map has a minimum PC and bandwidth specification for optimum viewing and requires the Flash player plugin for your browser which can be downloaded here.
- The 3D model has been optimised for WVAI accessibility, allowing the model to be controlled with the keyboard. The controls are listed below:

*Tab key to move through controls
I key zooms map in
O key zooms map out
Left arrow key/mouse wheel moves forward*

Latest News

- Recent Episode:**
PM10 mid October 2006 [view ...](#)
- Air Quality Measurements from the Elmbridge Borough**
Historic air quality measurements from Elmbridge Borough Council can now be accessed [more ...](#)
- Air Quality In London 2005 and mid 2006 – Provisional**
A summary of provisional measurements of air quality in London during 2005 and up [more ...](#)

Quick Links

- 3D Maps of London
- Download Data
- AQS Objectives
- About the LAGN
- Local Authority Pages
- Wind Plots

Sponsors

start Network Connections Eudora - [In] UCL Centre for Adv... London Air Quality N... Internet 06:26



CREDITS

UCL please to answer any questions and respond to any comments.
CASA Centre for Advanced Spatial Analysis

The Architects of Virtual London: *Dr. Andy Hudson-Smith & Steve Evans*

Questions & Answers

The Computer Scientists: *Richard Milton & Chris Parker*

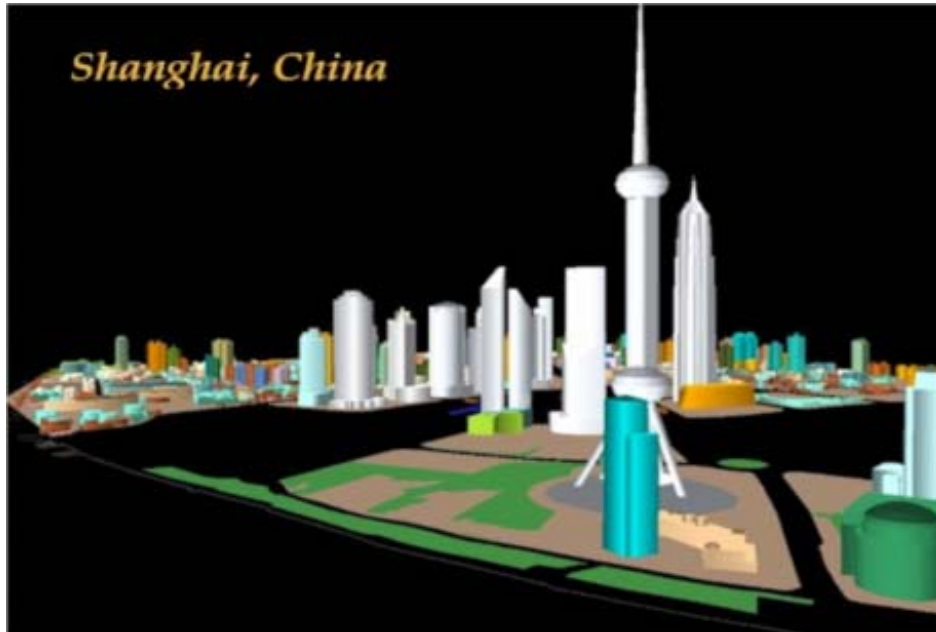
PhDs: *Michelle Sunm & Duncan Smith*

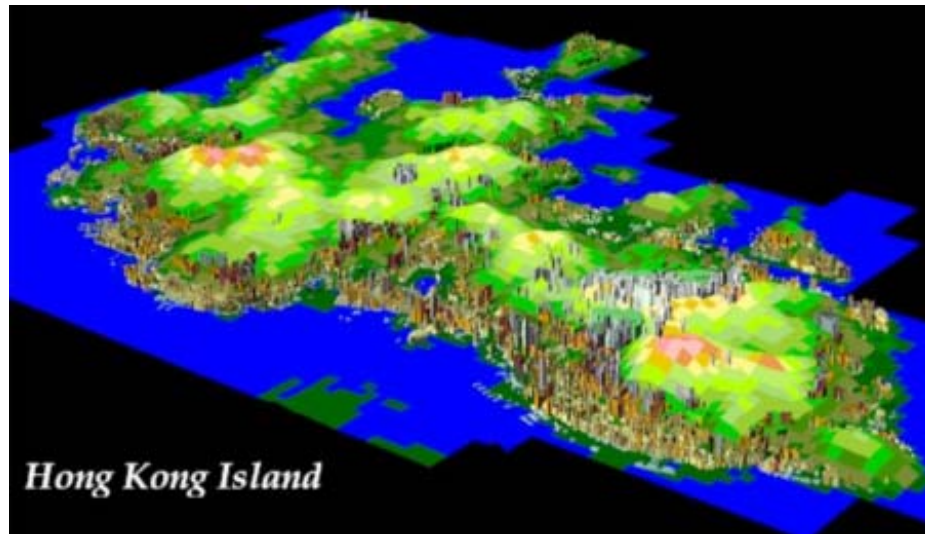
Our Web Designer: *Sonja Curtis*

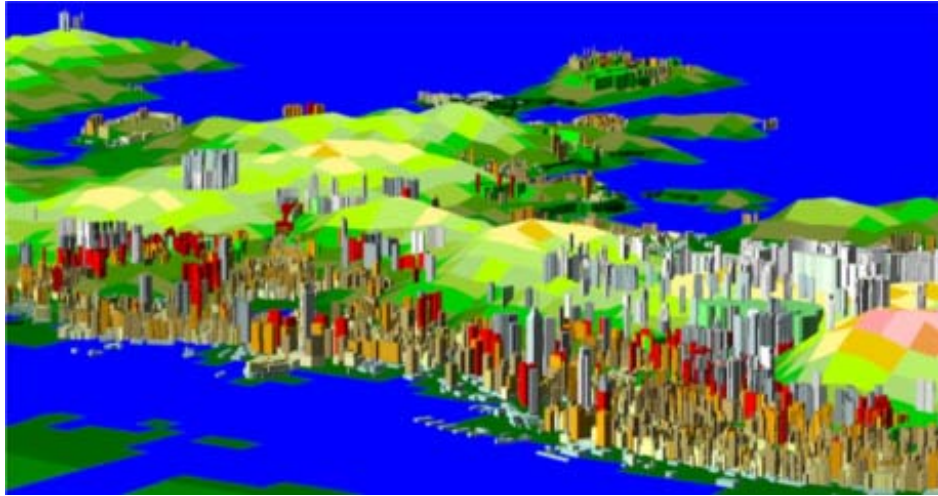
Our Sponsors: *Alex Bax & his GLA group; Steve Pennant and London Connects; ESRI (Redlands/UK); Ordnance Survey; InfoTerra; BT; ESRC; UCL*

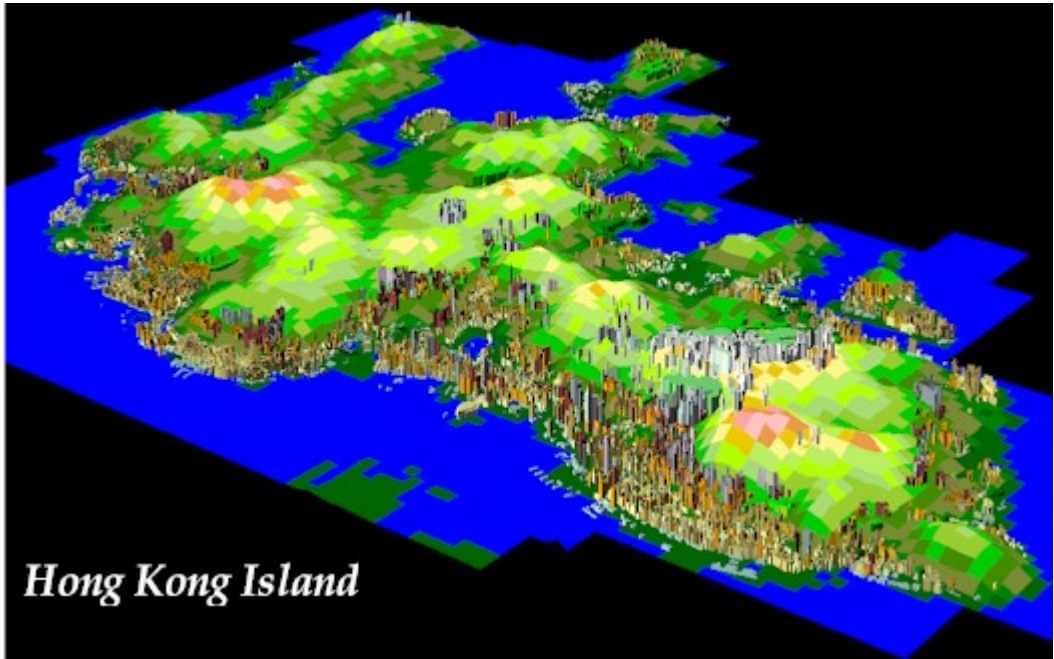
New Material is updated weekly on
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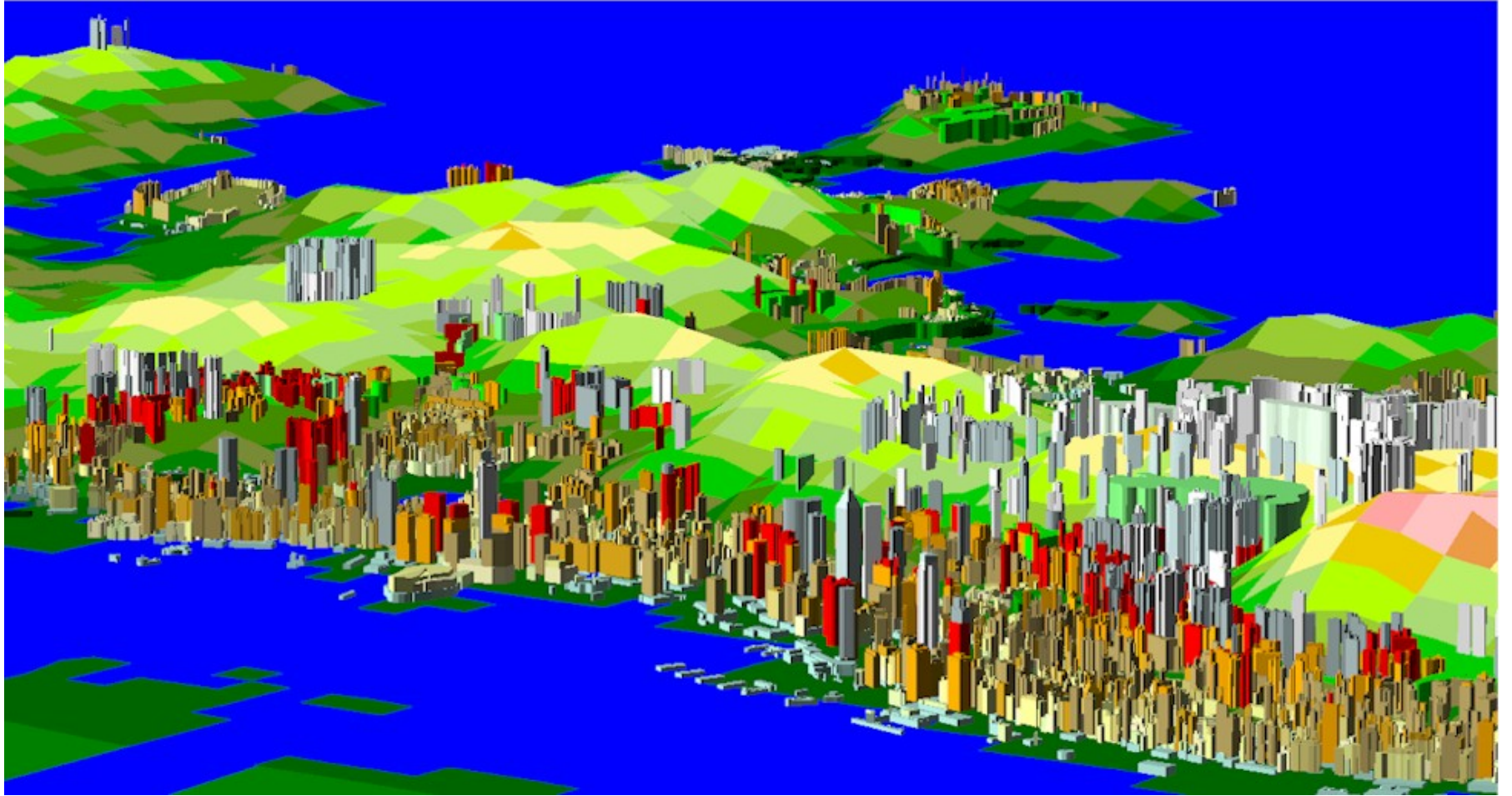




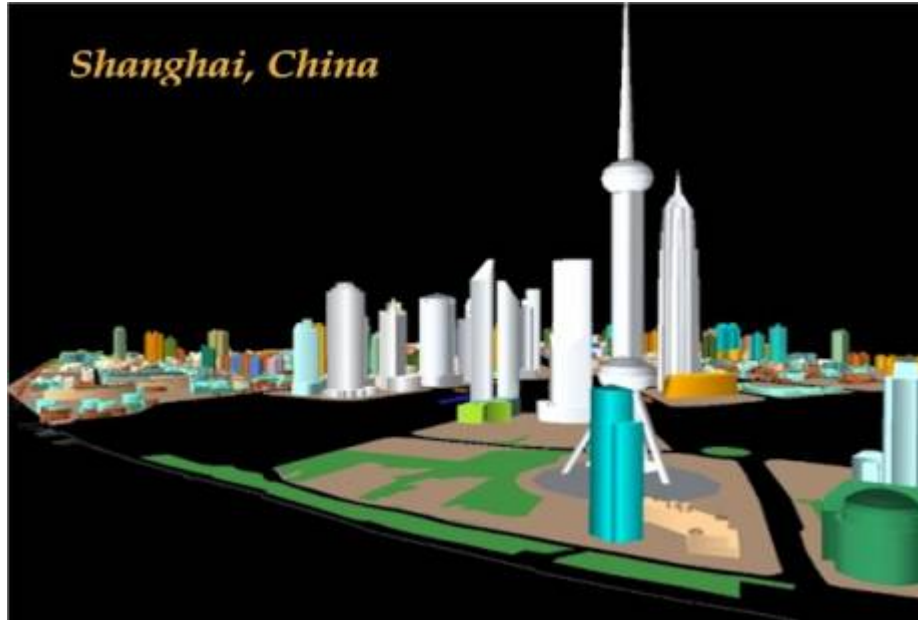




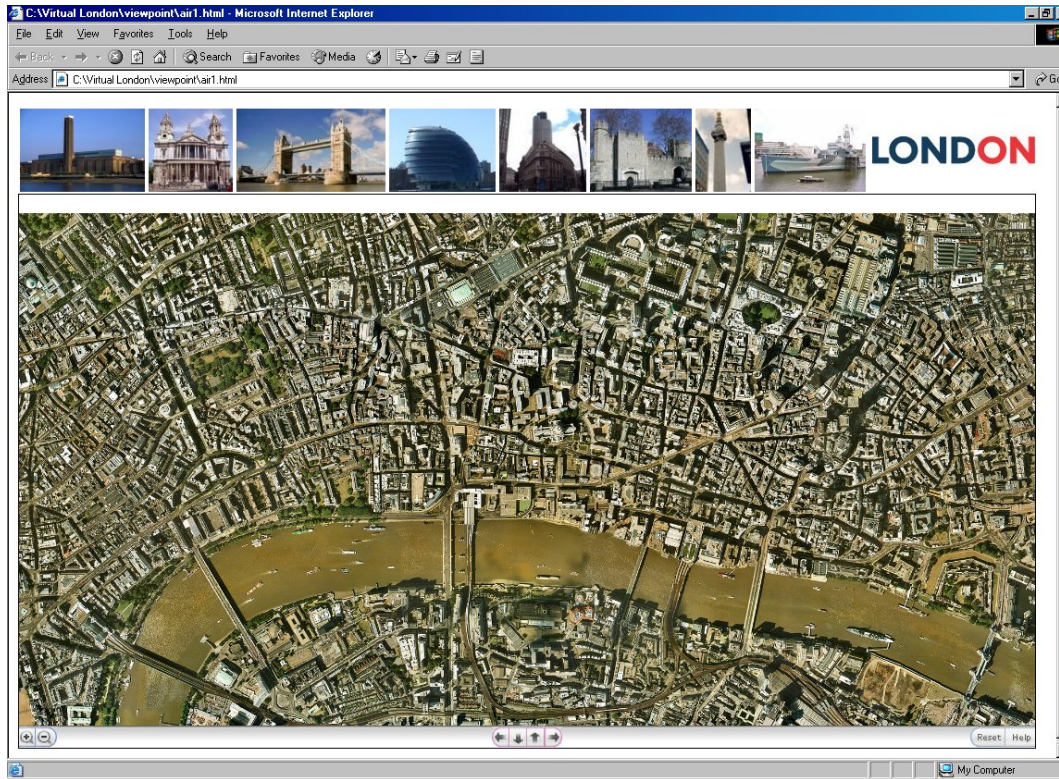
Hong Kong Island



Shanghai, China



We also use zoomable maps within the interface with rapid delivery over low band width lines



Let me now show you an example of some of this within virtual London before I then tell you how we built it, what is in it and who it is for