

# Digital Cities

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December 11, 2008



There's a Digital City model behind this pretty picture...



Parsons Brinckerhoff

and its changing the way infrastructure get designed, managed and understood

**Autodesk**

Here's the world largest most state-of-the-art scale model...



Shanghai Urban Planning Museum

Expensive to build and maintain - Impossible to experience at a human scale

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Once a state-of-the-art city model experience...



University of California, Berkeley

What have we learn about building and visualizing scale models?

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How do we apply this to the digital models and real infrastructure of our future?



How do we become “model” builders, collaborators, decision makers and believers?

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Why does designing,  
building and sharing  
smart digital city and  
infrastructure models  
really matter?

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## Environmental Impacts of Cities

- Buildings Consume
  - 40% of all energy
  - 30% of raw materials
- Buildings Emit
  - 40% of greenhouse gases
  - 50% of waste output

U.S. Department of Energy,  
Center of Excellence for Sustainable Development



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## Importance of Cities

- By 2050, 6 billion+ people, (2/3) of humanity will be living in towns and cities. In 1950, there were 1.5 billion
- Between 1953 and 2000, China's population more than doubled to 1.2 billion
- 1.1 billion people in India today



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How will we better plan, design,  
construct and operate our cities  
in a more sustainable way  
for the future?

We must Change our Ways...

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## Changing our Ways



### Old Way

Analog  
Silos  
Reactive  
Error Prone  
Disconnected  
2D Paper Drawings



### New Way

Digital  
Collaborative  
Proactive  
Predictable  
Interoperable  
Intelligent 3D Models

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## Changing our Ways

**“We must build and share  
Smarter Models  
in a  
Smarter Way”**

Disconnected  
2D Paper Drawings

Interoperable  
Intelligent 3D Models

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## We must become: “A Model Industry”

Model Agencies

Model Utilities

Model Planners

Model Designers

Model Engineers

Model Contractors

Model Educators

Model Owners

Model Operators

Model Citizens



Today's Models



Yesterday's Models

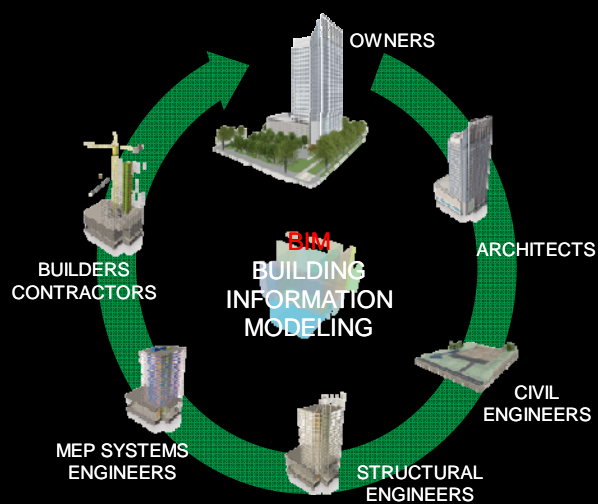
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# What is the state of intelligent modeling today ?

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## BIM

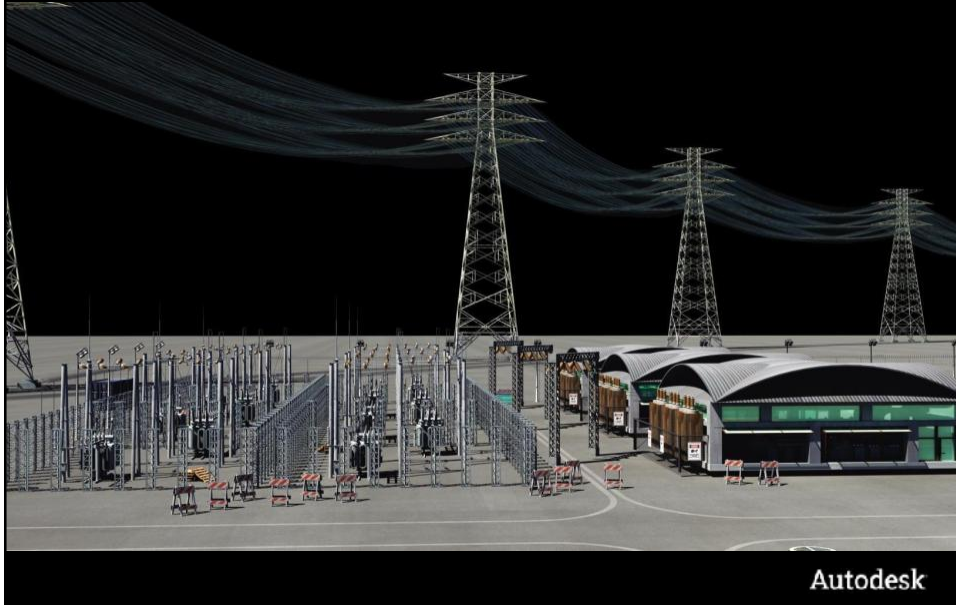
Integrated accurate 3D Models improve Design, Fabrication, Construction & Operation



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## Utilities

From 3D substation design to infrastructure modeling and asset management



## Communities

Sustainable design for sustainable living





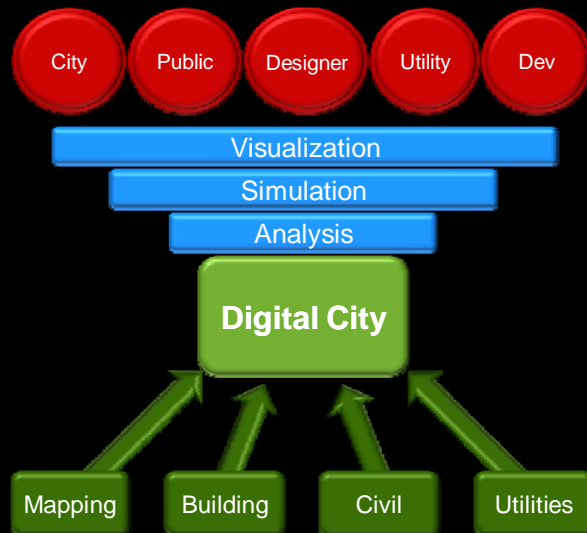
# Cities

Sustainable planning through  
asset management at a city scale



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## Autodesk's Vision for Digital Cities

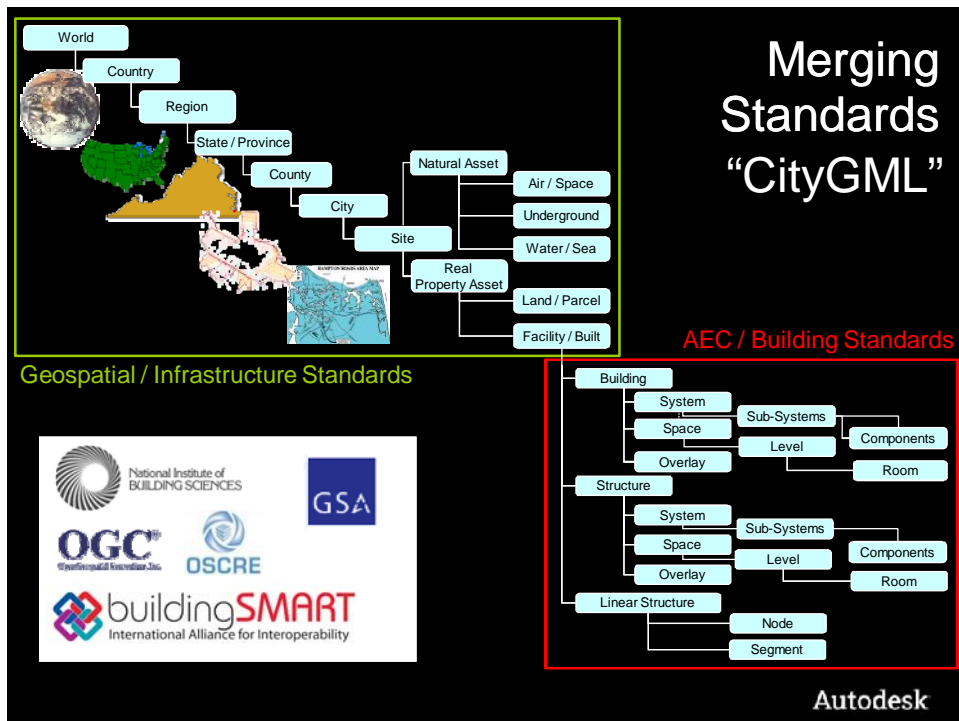
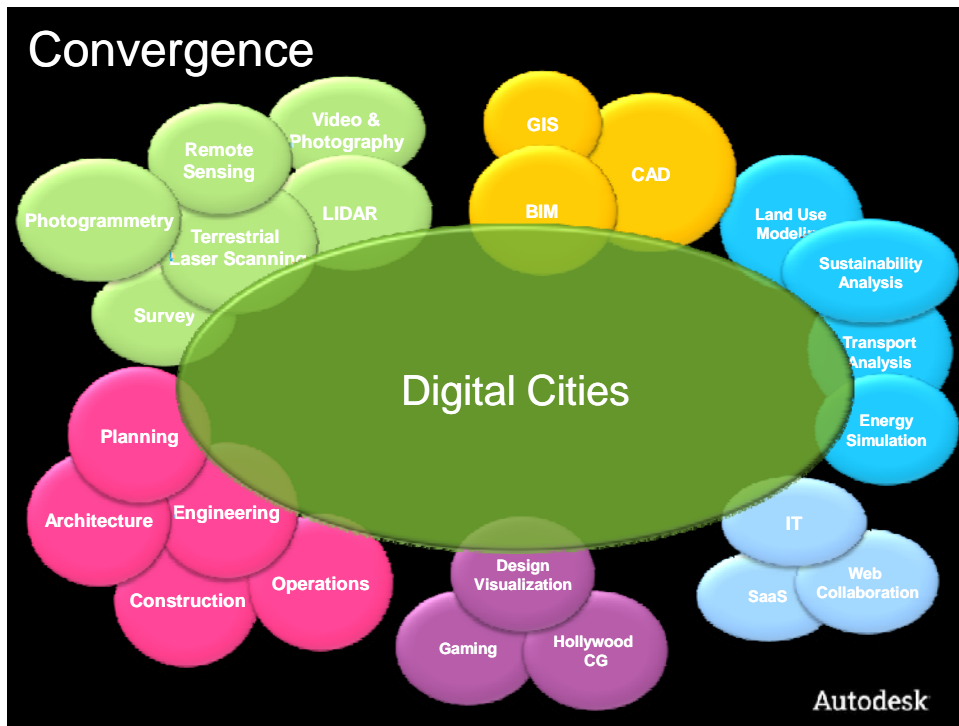


**Aggregate**  
data from multiple sources

**Simulate**  
visualize and simulate outcomes

**Collaborate**  
share internally and externally

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## CityGML - The Digital Cities Standard

LOD 0 – Regional  
Digital Terrain Model

LOD 1 – Massing model  
Blocks without roof structures

LOD 2 – City / Site model  
Textured, differentiated roof structures

LOD 3 – Detailed Site model  
Exterior Architecture details

LOD 4 – Interior model  
"Walkable" architecture models



Thomas Kolbe, U Bonn Germany

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## Today's 3D GIS Models

Good for general massing and planning purposes



Weak on design accuracy and integration of BIM and Visualization

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## Today's 3D Visualization Models

Their animations help tell and sell projects



Their models aren't re-used after the initial sale

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## Today's Digital City Models

Convergence of CAD, BIM, GIS, Visualization and Collaboration



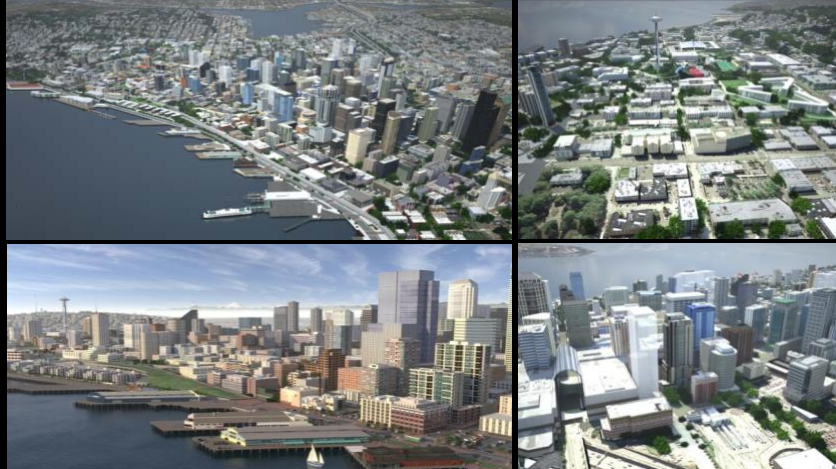
Combination of different models, users and decisions making scenarios

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## Today's Digital City Models

Show us exactly what cities will look like and precisely how they will work



Enable re-use of an accurate shared model across multiple projects and agencies

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## Digital Cities Example

Seattle

From early models and visualizations starting with base maps



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## Digital Cities Example

Seattle

To detailed and design accurate infrastructure base models



WSDOT / Parsons Brinckerhoff

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## Digital Cities Example

Seattle

- Capture the right model details and represent them in their real-world context
- Allow all people to see and experience projects before they are real
- Leverage data from BIM for operations and maintenance



Accurate Building Information



Analyze Critical Views



Visualize Proposed Development



Set in Design Context



Simulate Street Level Experience

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# Digital Cities Example

Seattle

Urban Design - Infrastructure Rehabilitation - Utility Relocation



WSDOT - Parsons Brinckerhoff

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# Digital Cities Example

Sacramento

Urban Design - Infrastructure Rehabilitation - Transit Oriented Development



California High-Speed Rail Authority / NC3D

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## Digital Cities Example

Portland

Urban Design - Infrastructure Rehabilitation - Transit Oriented Development

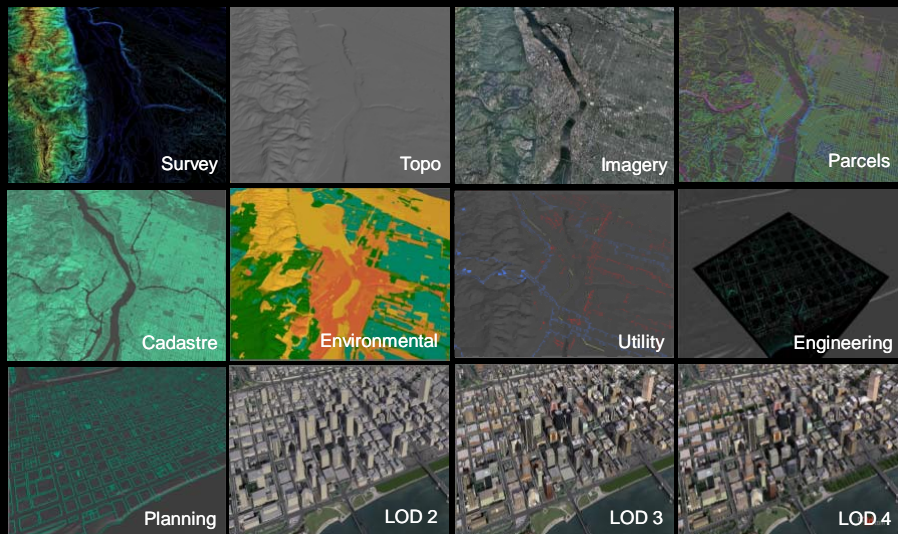


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## Digital Cities Example

Portland

“Simple to do if your Digital House is in order”



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## Digital Cities Example

Chemnitz

Timeline Created Using  
Historical Topographic Data



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## Digital Cities Example

Chemnitz

Global Illumination & Realtime Visualization



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## Creating Digital Cities

London



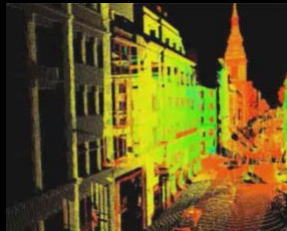
High Resolution Orthophotos



3D Massing Model



Geo Referenced Parcel Data



Terrestrial Laser Scanning



Detailed Building Textures

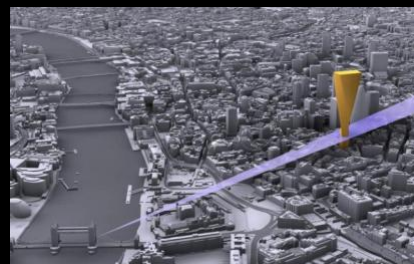


Oblique Photo Textures

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## Analyzing Digital Cities

London



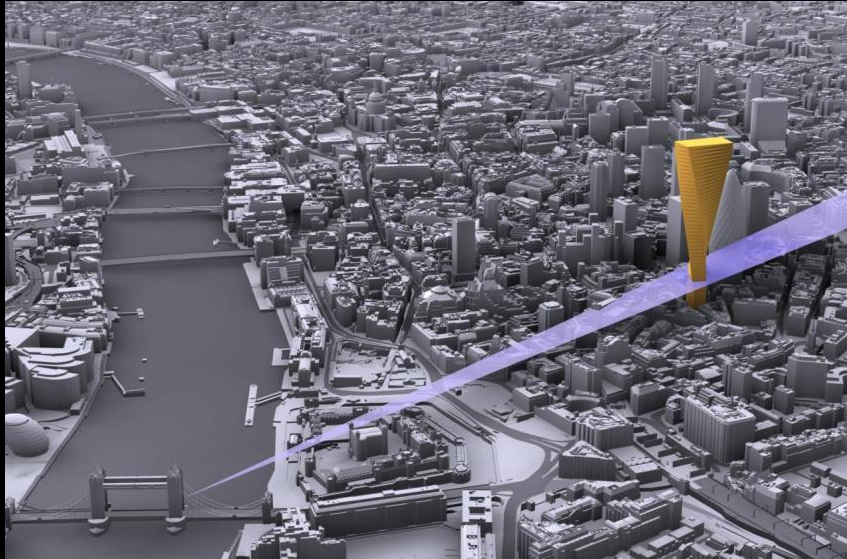
- Proposed commercial and residential high rise development
- View cones show allowable height limits for the building
- City simulates and verifies view protection ordinance using accurate 3D model

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## Analyzing Digital Cities

London



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## Analyzing Digital Cities

San Francisco

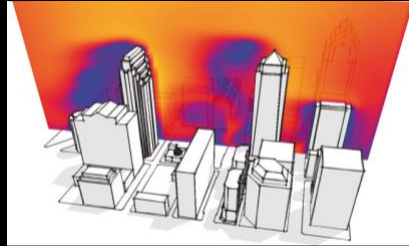


Traffic Operations

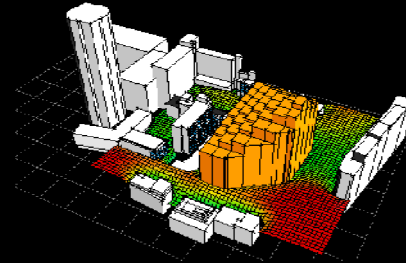
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## Analyzing Digital Cities

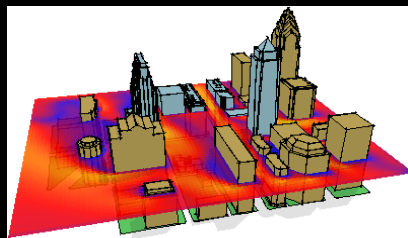
Ecotect



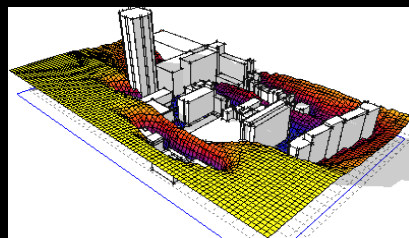
Air Flow



Right to Light



Prevailing Winds



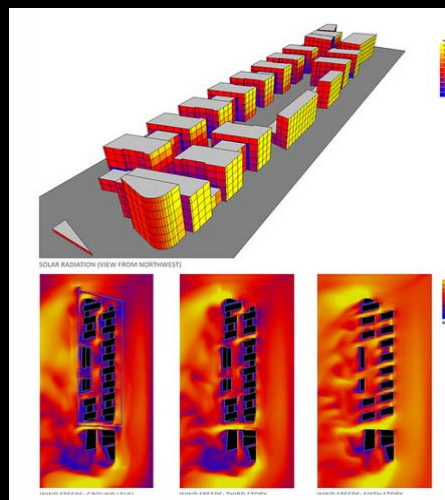
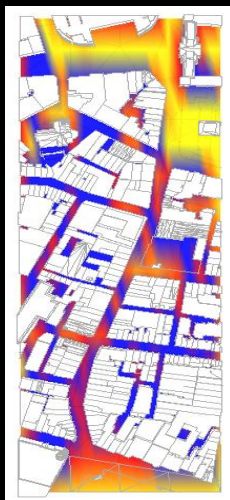
Solar Radiation

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## Analyzing Digital Cities

Ecotect

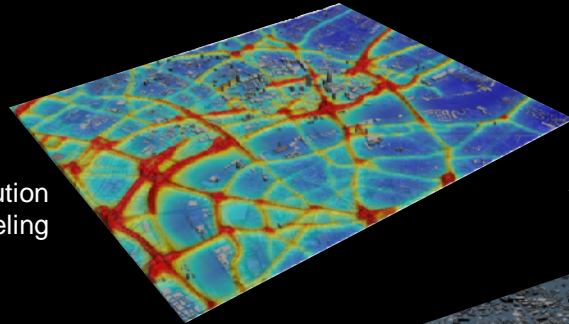
How do we analyze beyond individual projects and look at entire cities?



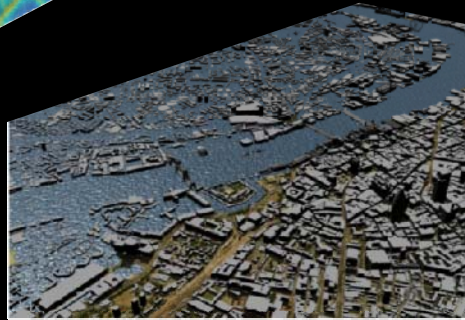
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## Analyzing Digital Cities

Pollution  
Modeling



Flood  
Simulation

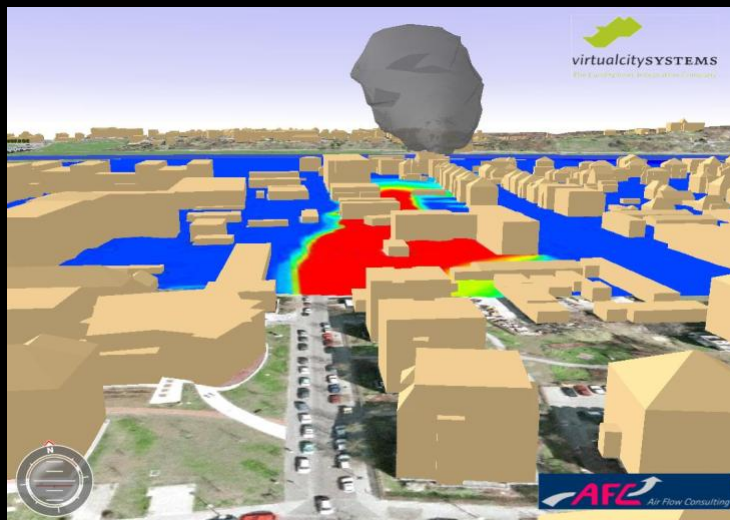


Centre for Advanced Spatial Analysis, University College, London

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## Analyzing Digital Cities

Urban Environmental Scenario Modelling: Toxic Fumes Spread



virtualcity SYSTEMS

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## Analyzing Digital Cities

Urban Environmental Scenario Modelling: Toxic Fumes Spread



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“Become a **Model Planet**”

[www.autodesk.com/digitalcities](http://www.autodesk.com/digitalcities)

Thank You !

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