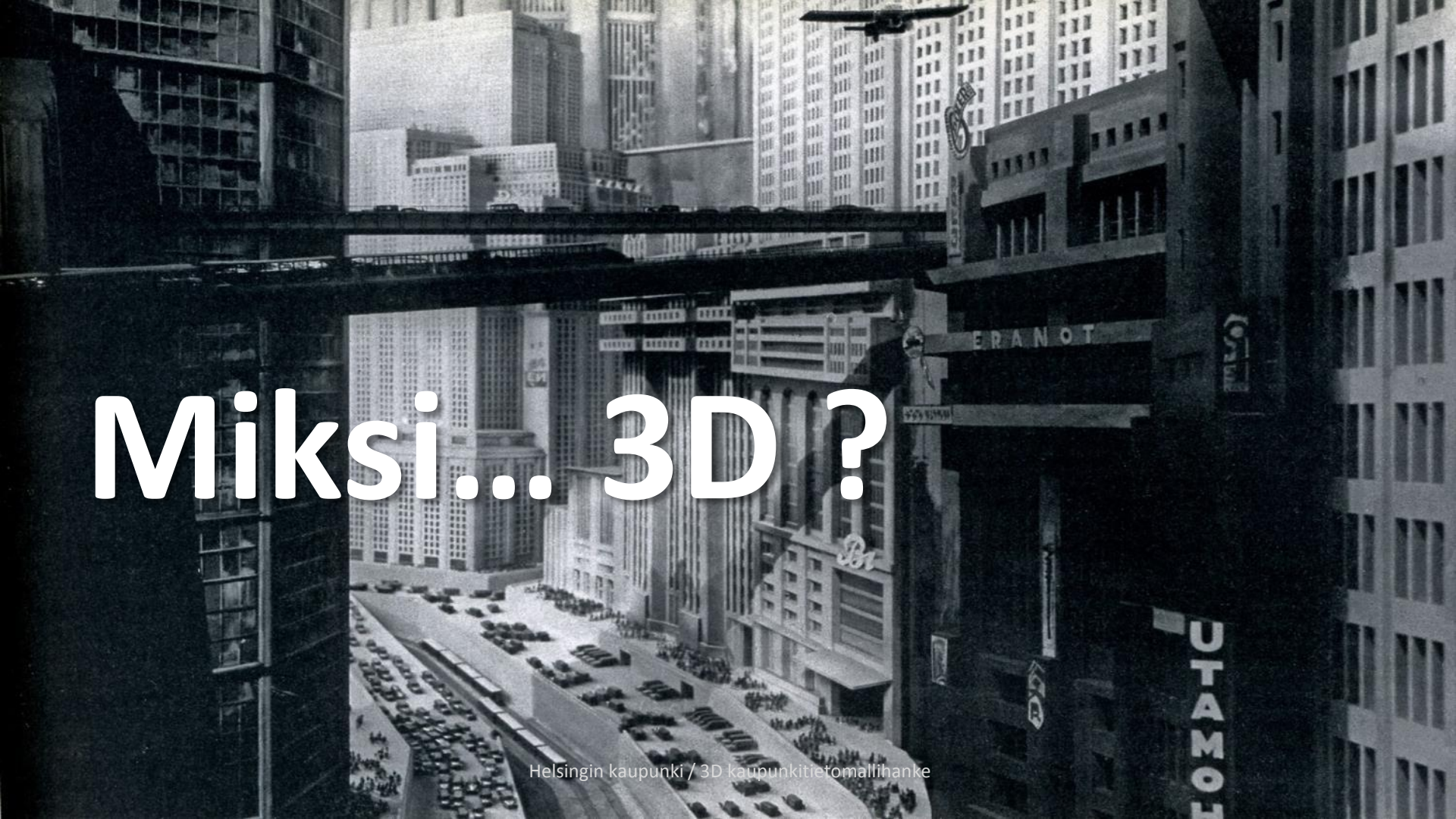


3D+ HELSINKI

3D kaupunkitietomallihanke
Enni Airaksinen / Kari Kaisla / Jarmo Suomisto



HELSINKI 3D+



Miksi... 3D ?

Helsingin kaupunki / 3D kaupunkitietomallihanke



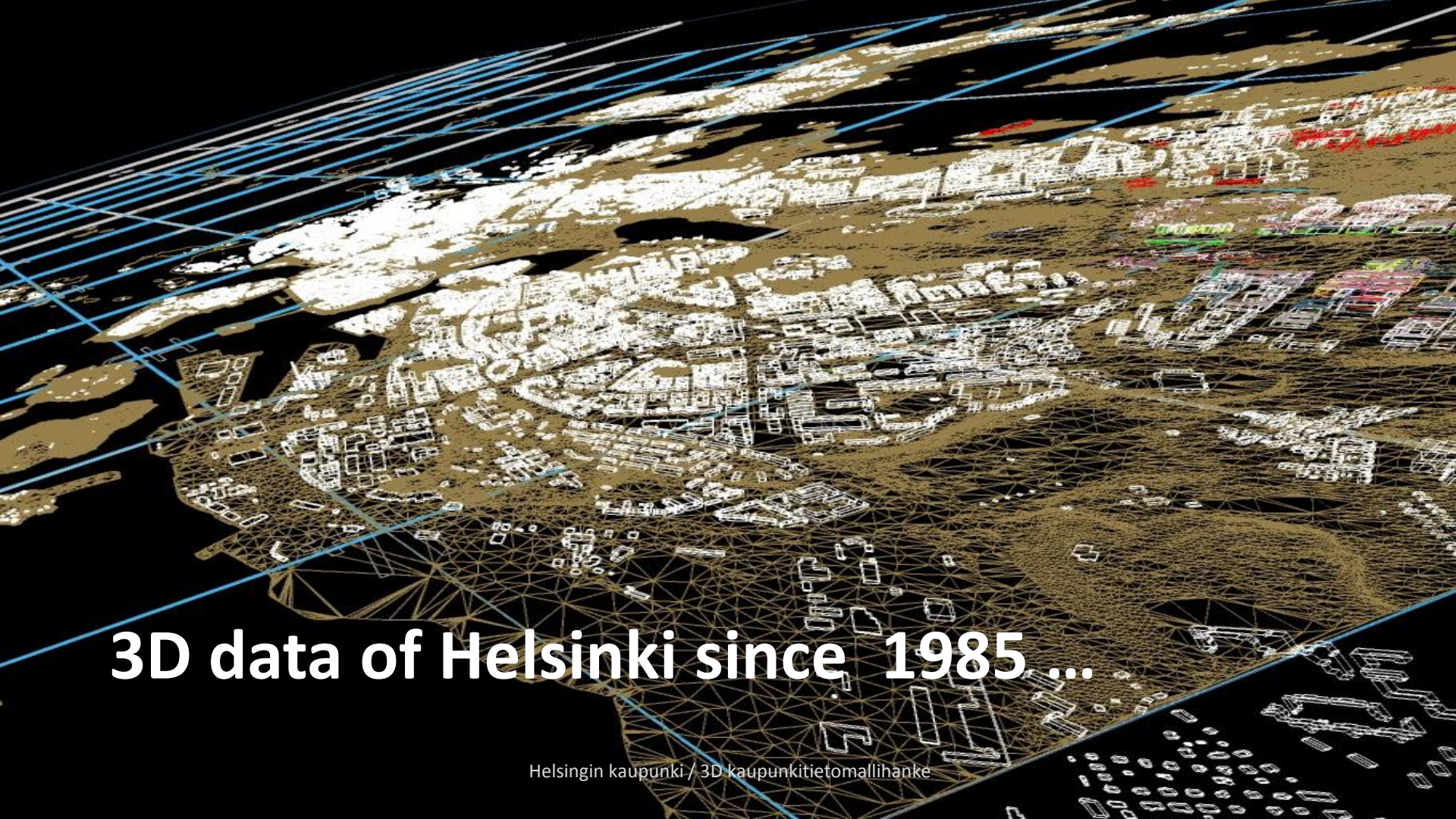
Helsingin kaupunki / 3D kaupunkitietomallihanke

“3D data have the potential
to generate **\$13 billion** in
new benefits annually.”

—Snyder, GI, 2012, The 3D Elevation Program—Summary of
Program Direction
U.S. Geological Survey (Fact Sheet 2012-3089)



HELINKI 3D+

A 3D point cloud visualization of a city, likely Helsinki, showing buildings, roads, and terrain. The data is represented as a dense collection of points, with some areas highlighted in blue and red. The perspective is from an elevated angle, looking down on the city.

3D data of Helsinki since 1985 ...

Helsingin kaupunki / 3D kaupunkitietomallihanke

1999 Kamppi-Töölö 3D-simulator

LOD 2 + new developments



Jarmo Suomisto / City of Helsinki / 3D City Information Model



3D-model + game engine [RealMation]



Real-time simulator in exhibitions

Master Plan 2002



2003 Pasila

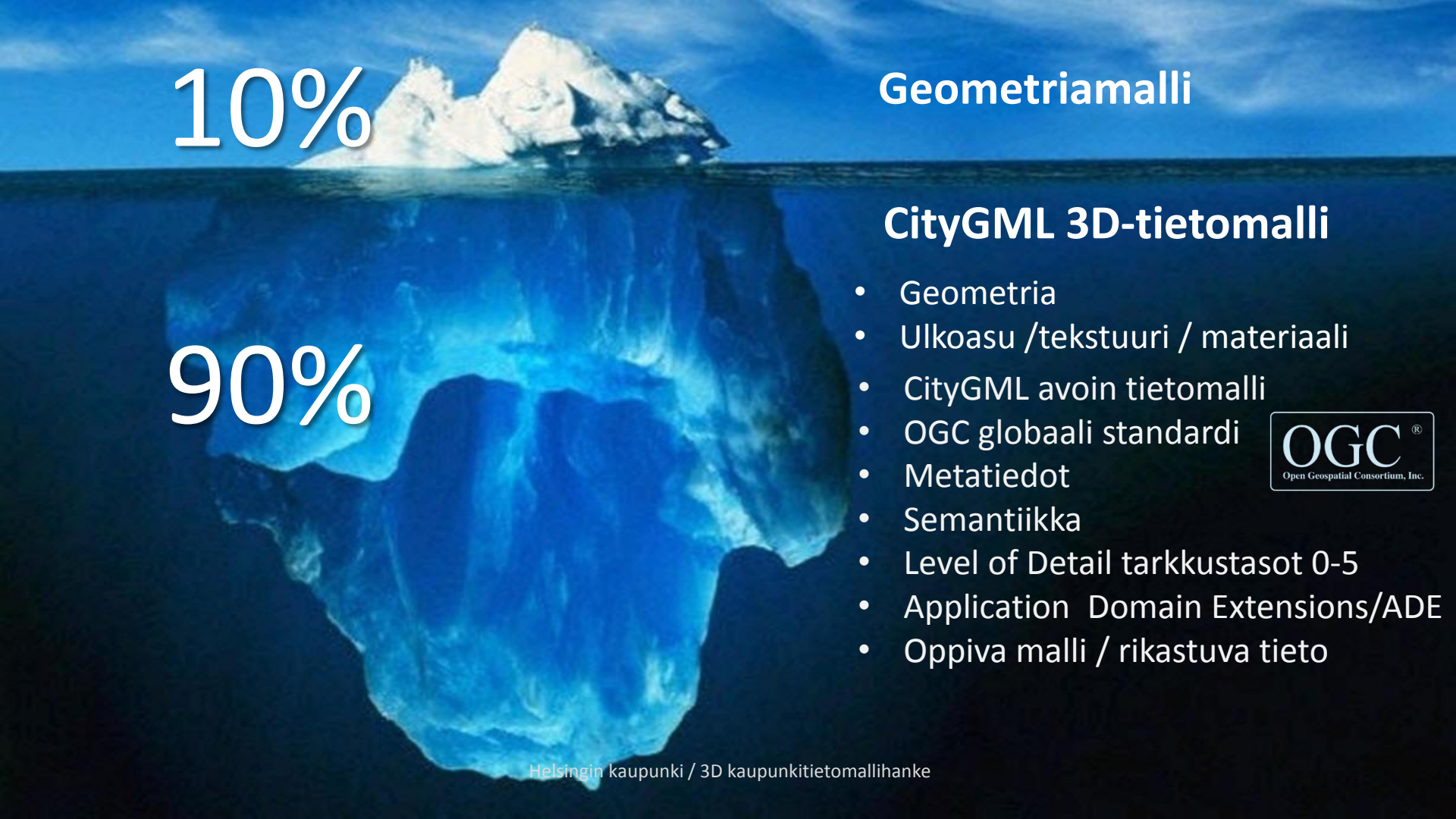
3D model
Design alternatives
Real-time-simulator



Järmo Suomisto / City of Helsinki / 3D City Information Model

GEOMETRY MODEL ?

INFORMATION MODEL ?

An iceberg floating in the ocean. The small tip above the water is labeled '10%' and 'Geotriamalli'. The large submerged part is labeled '90%' and 'CityGML 3D-tietomalli'.

10%

Geotriamalli

90%

CityGML 3D-tietomalli

- Geometria
- Ulkoasu /tekstuuri / materiaali
- CityGML avoin tietomalli
- OGC globaali standardi
- Metatiedot
- Semantiikka
- Level of Detail tarkkustasot 0-5
- Application Domain Extensions/ADE
- Oppiva malli / rikastuva tieto



A screenshot from a video game showing two parachutists with orange parachutes descending over a city. The city features a river, a bridge, and various skyscrapers under a cloudy sky. The text 'CityGML' is overlaid on the right parachute, 'IFC' on the left one, and 'InfraGML' inside a cloud shape in the center.

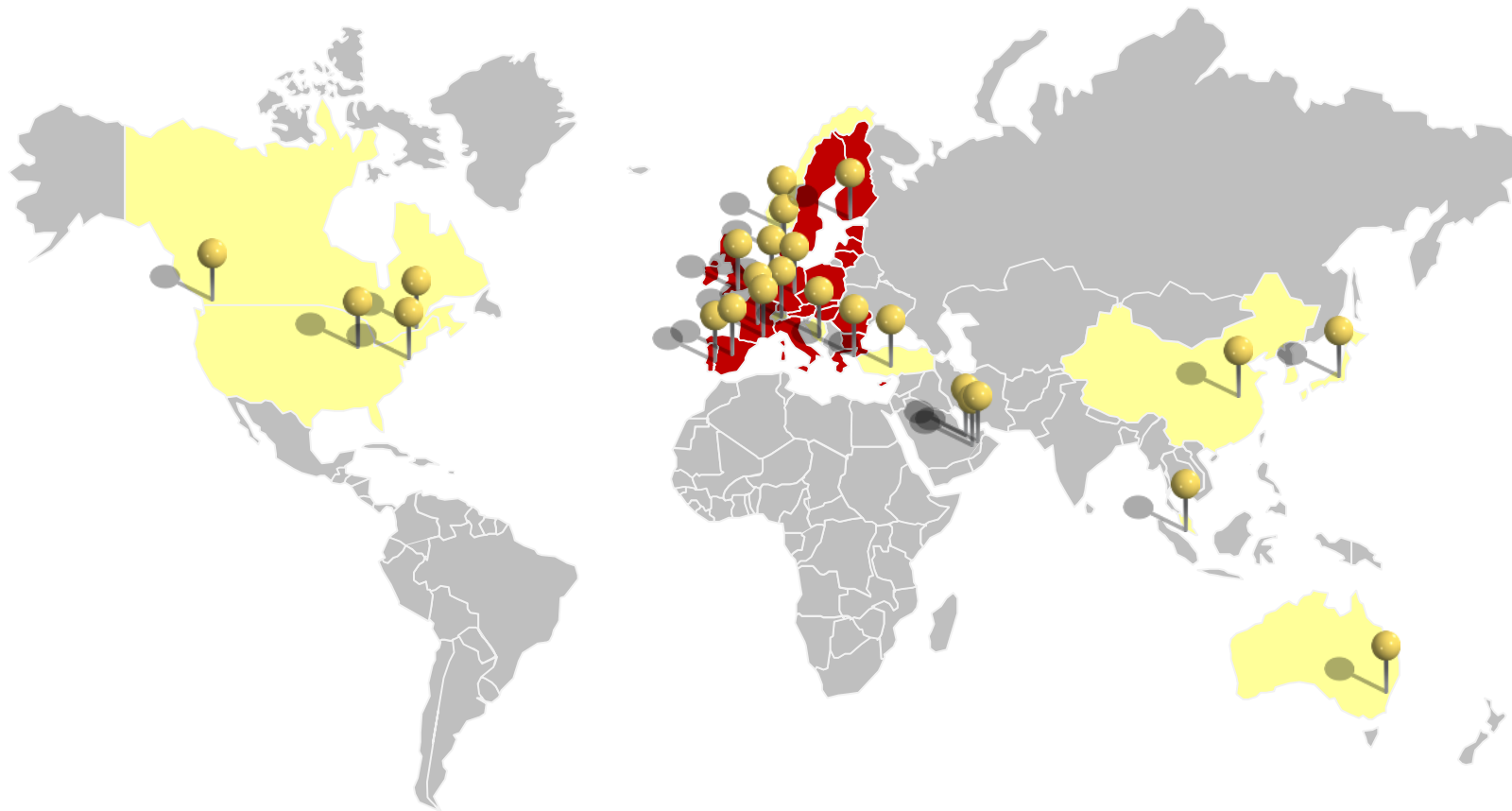
CityGML

IFC

InfraGML

Standards and parachutes work best when they are open !

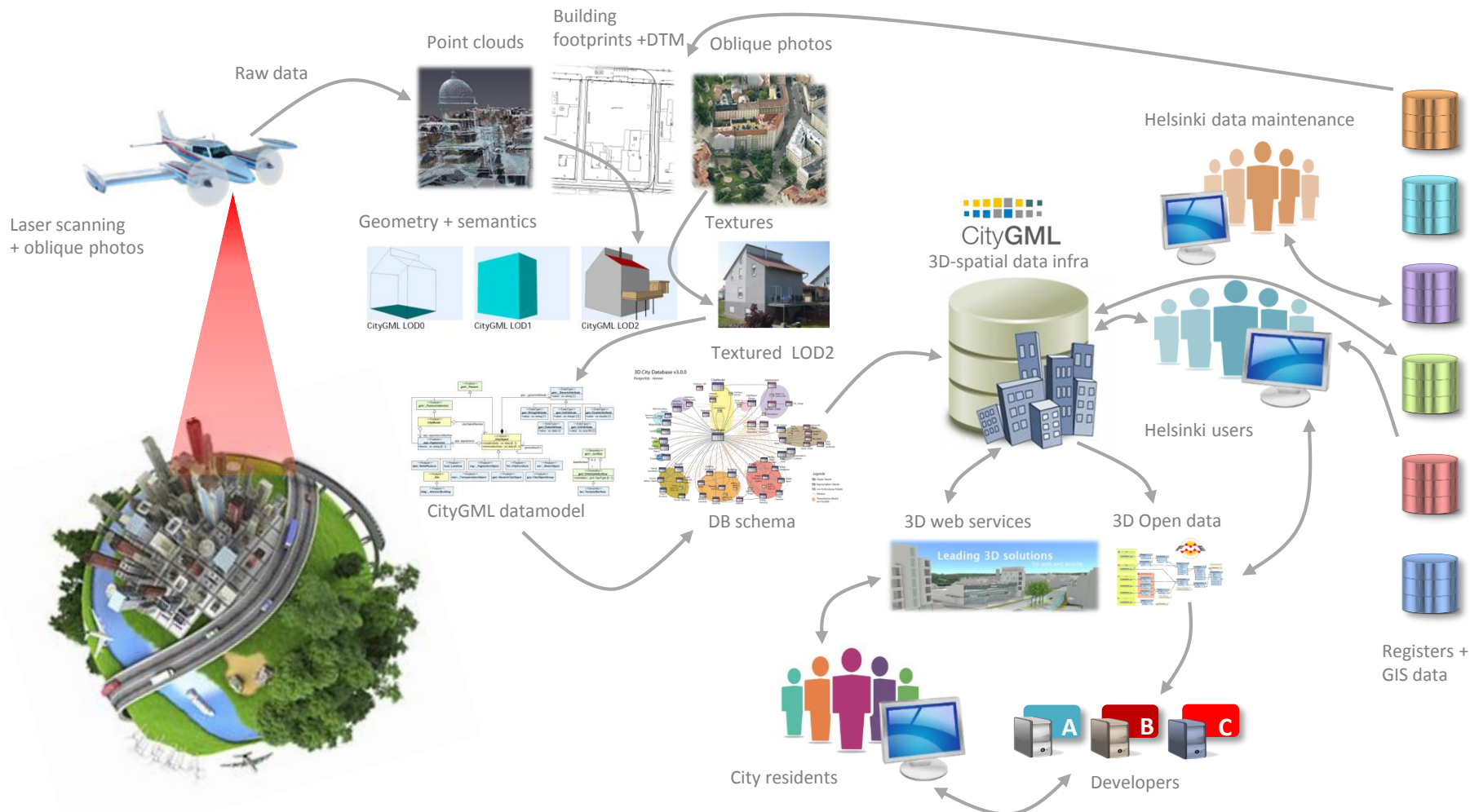
CityGML World Map





3D+ HELSINKI

- ICT-kehityshanke 2015 – 2017
- Monikäyttöiset mallit koko kaupungin alueesta
 - Teksturoitu semanttinen tietomalli / CityGML
 - Mesh-malli [OBJ / 3MX / S3C / KML]
 - MINECRAFT-Helsinki
- Kaupunkimallit myös avoimena datana
- Tietopalvelu avataan marraskuussa 2016
- Hyötykäytön pilottiprojektit yhteistyössä mm.
 - Helsingin Yliopisto
 - Aalto-yliopisto
 - Tampereen Teknillinen Yliopisto
 - Technische Universität München
 - EU/Climate-KIC / Low Carbon City Lab
 - Kaupunkimalliverkosto
 - Hampuri / Helsinki / Rotterdam / Singapore / Wien
 - KSV / KV / HKR / Auerakentaminen
- Projektipäälliköt kari.kaisla@hel.fi jarmo.suomisto@hel.fi



PISTEPILVET 2015

LAS-ASPRS-20pist./m²-1Tt

ORTO- ja VIISTOKUVAT 2015

50 000 kpl / 10 Tt

Orto, nadiiri (RGB, CIR), viisto

Keilaus ja ilmakuvaukset touko-heinäkuu 2015

- ”Koko” Helsinki, n. 400km²
- Kuntaliiton tarjouspyyntöpohjat soveltaen ”3D-kaupunkitietomallinnusta (LoD2) varten”
- Mittausluokka 1e
- GNSS/INS
- Maastomittaukset, kaupunki

Keilaus

- Kaupunkimallin geometria (rakennukset, maasto, puut)
- ASPRS-luokitus
- Tiheys 20 pistettä/m²
- Lentokorkeus 475m/530m
- Sivupeitto 50%, avauskulma 35°

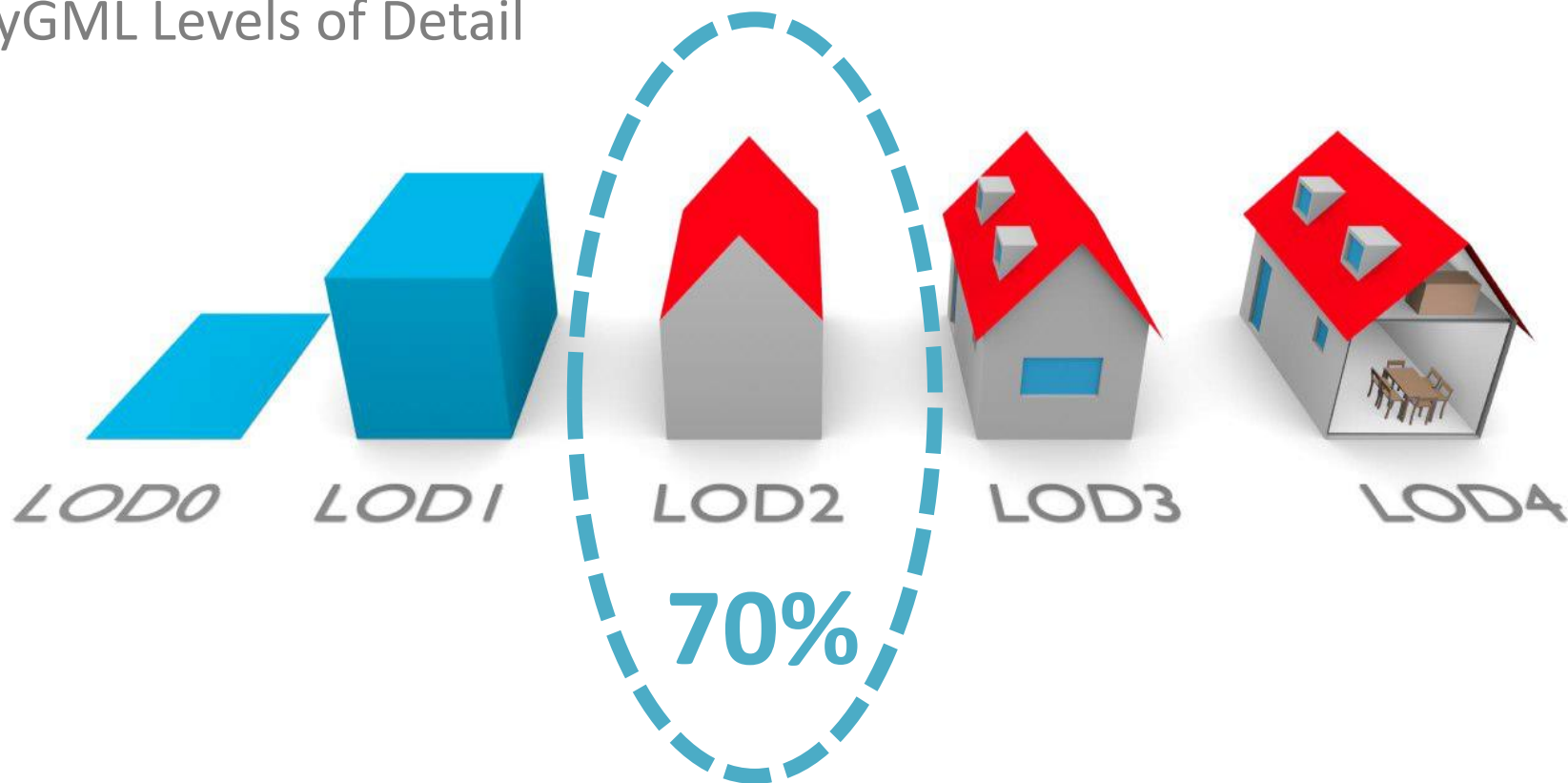
Kuvaukset

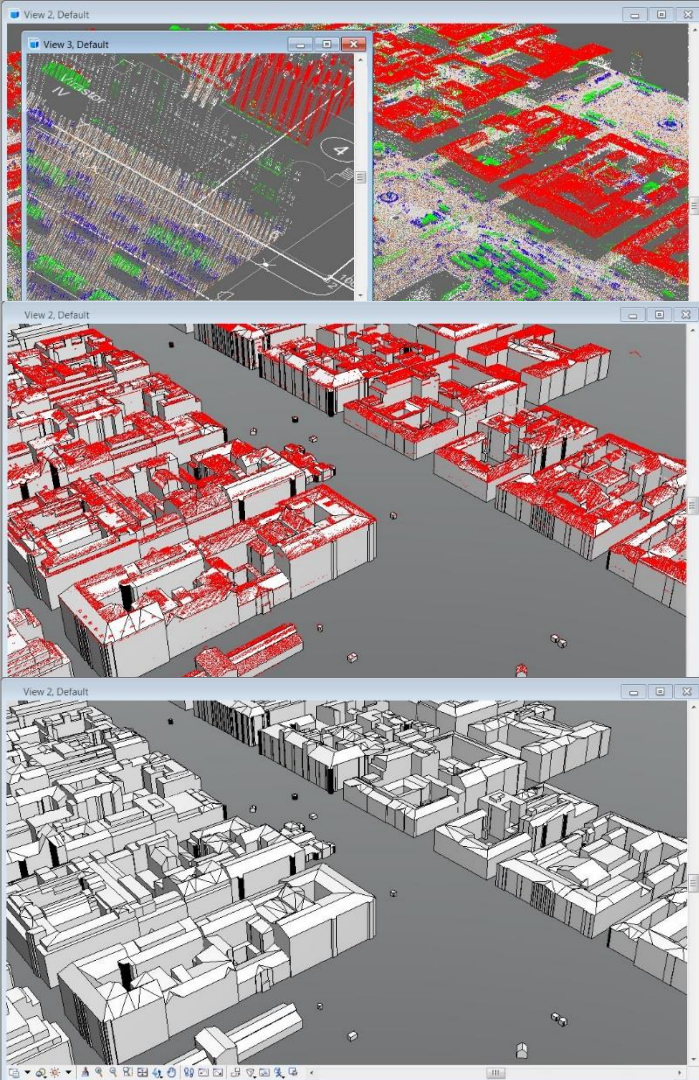
- Kaupunkimallin teksturointi, verkkomalli, viistokuvapalvelu
- Viiden kameran järjestelmä (Microsoft Osprey, mittakamera)
- Nadiiri (RGB, CIR) ja neljä viistokameraa
- Lentokorkeus 1370m
- Maastoresoluutio n. 10cm
- Sivupeitto 65%, pituuspeitto 80%

Rajoitukset

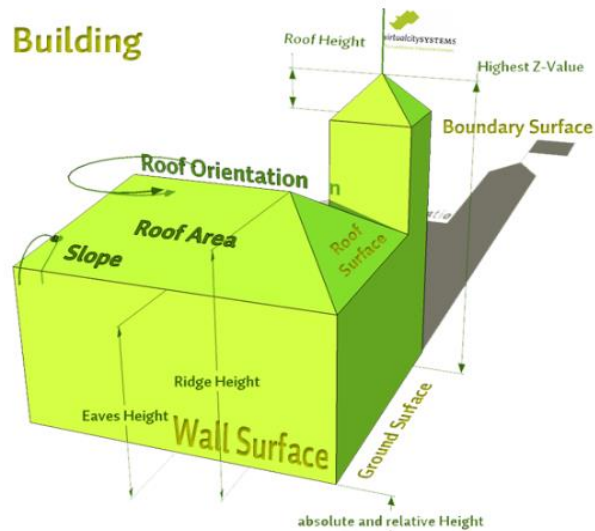
- Sää, lennonjohto, aluevalvontalaki, ...

CityGML Levels of Detail

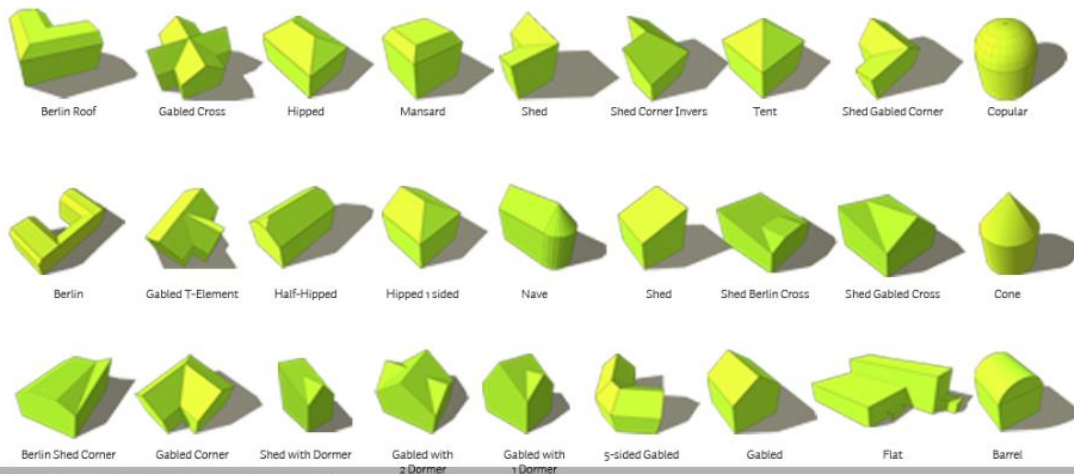




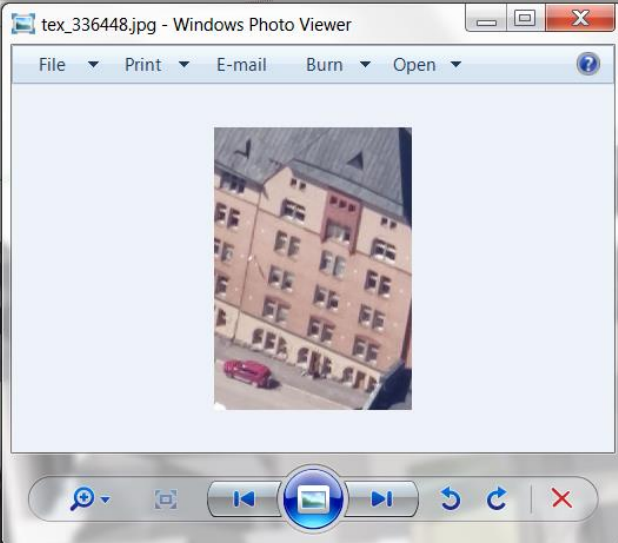
Building



- CityGML semantic
- SHP & CityGML attributes



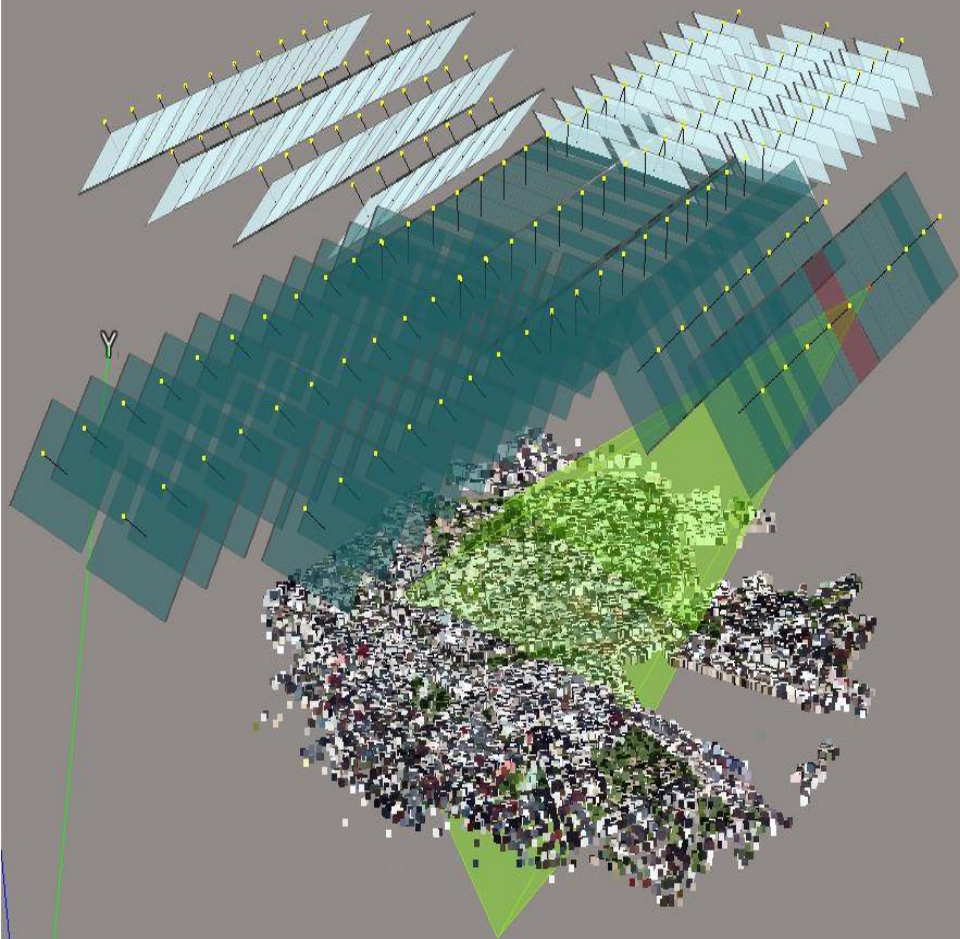
Creation of LoD 1 and LoD 2 building models



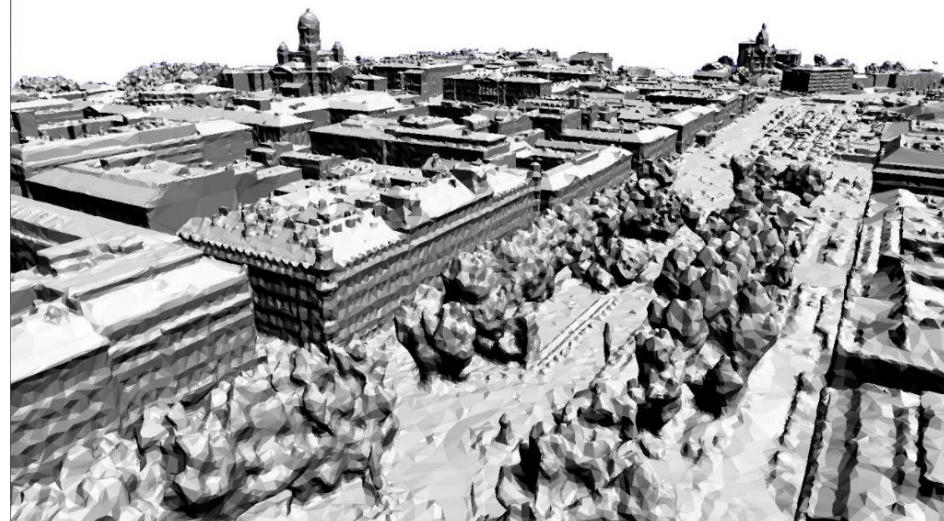
Feature Information	
Property	Value
Part 4: IFMEFace	
Name (encoded: utf-16)	surfaceMember
Geometry Traits (4)	
Sidedness	1-sided (front)
Front Appearance Reference	'165' to appearance named 'tex_336448' (
Diffuse Color	1.0, 1.0, 1.0
Texture Reference	164
Texture Wrap	Repeat Both
IFMERaster	
Min Extents	0.0, -240.0
Max Extents	168.0, 0.0
Resolution (Columns x Ro...	168 x 240 Pixels
Origin	0.0, 0.0
Spacing	1.0, 1.0
Rotation in Radian CCW	0.0, 0.0
Cell Origin	0.5, 0.5
Affine Transform	1.0, 0.0, 0.0, 0.0, -1.0, 0.0
Number Of Bands	3 Bands
Band 0 (RED8)	
Band 1 (GREEN8)	
Band 2 (BLUE8)	
Area: IFMEPolygon	
Name (encoded: utf-16)	exterior
Geometry Traits (3)	
citygml_lod_name (encoded:...	exterior
gml_geometry (encoded: utf...	LinearRing
gml_id (encoded: utf-16)	BID_0b6136a6-33a2-42cc-bf19-1b74fc22
Linear Boundary	Yes
Convex	No
Orientation	Left Hand Rule
Boundary: IFMELine (9 Co...	(25498234.888, 6672752.7259999998, 10.6
Closed	Closed In 3D
Measures (2)	fme_texture_coordinate_u, fme_texture_cc
Coordinates (9)	Coordinate Dimension: 3
0	25498234.888, 6672752.7259999998, 10.6
1	25498233.827, 6672769.5120000001, 10.6
2	25498233.827, 6672769.5120000001, 30.2



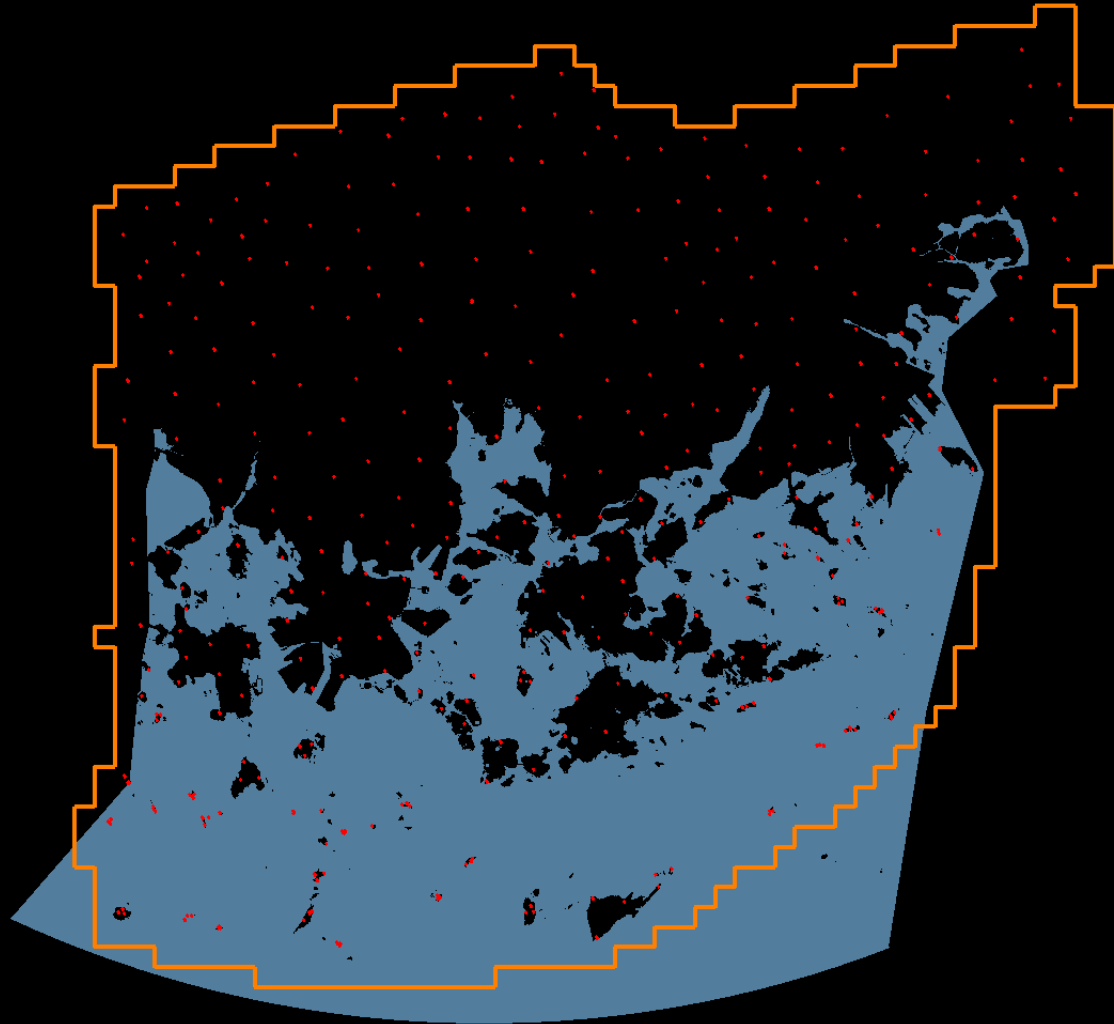
Mesh-model



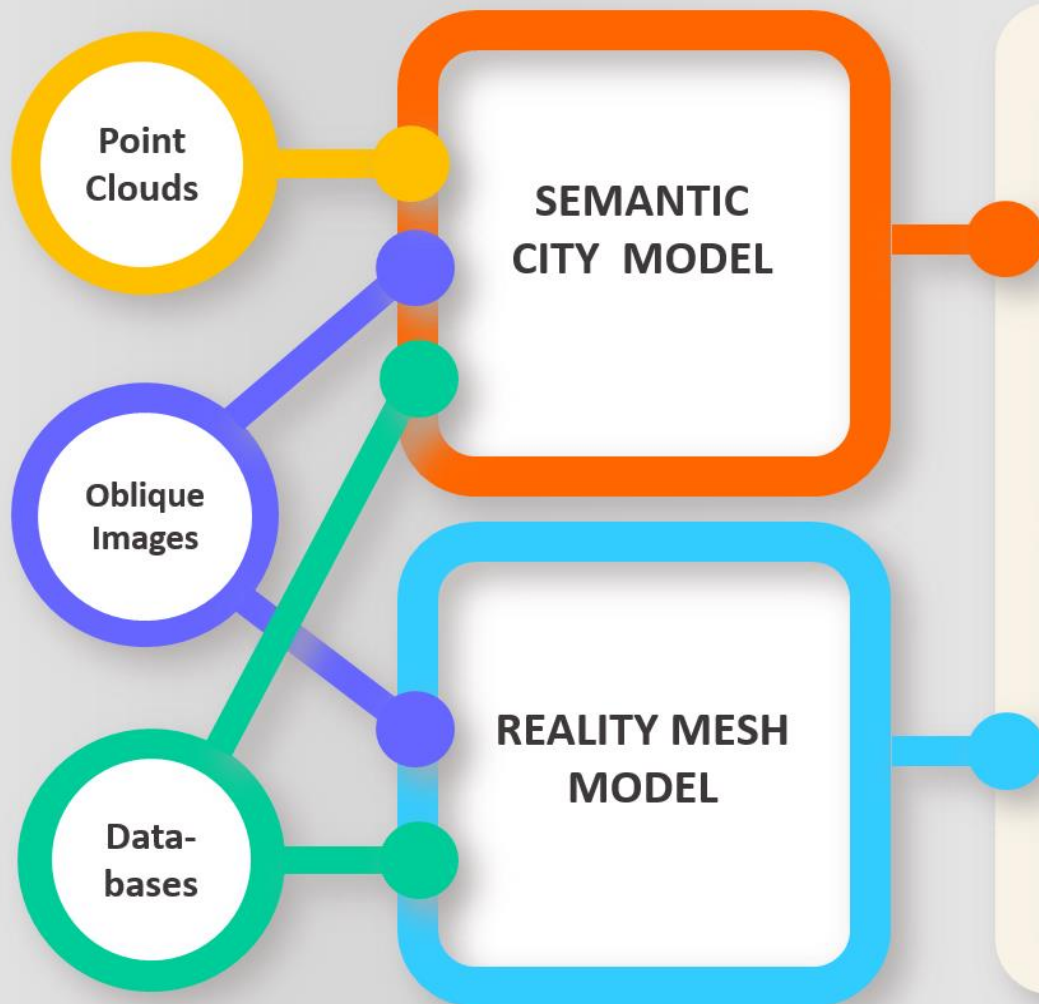
Helsingin kaupunki / 3D kaupunkitietomallihanke



Tukipisteet







UTILIZATION PILOTS PORTFOLIO

3D INFRASTRUCTURE

- 1 Open Data On-line Service
- 2 Model maintenance processes
- 3 Intranet Oblique Foto & LAS service

PROCESS DEVELOPMENT

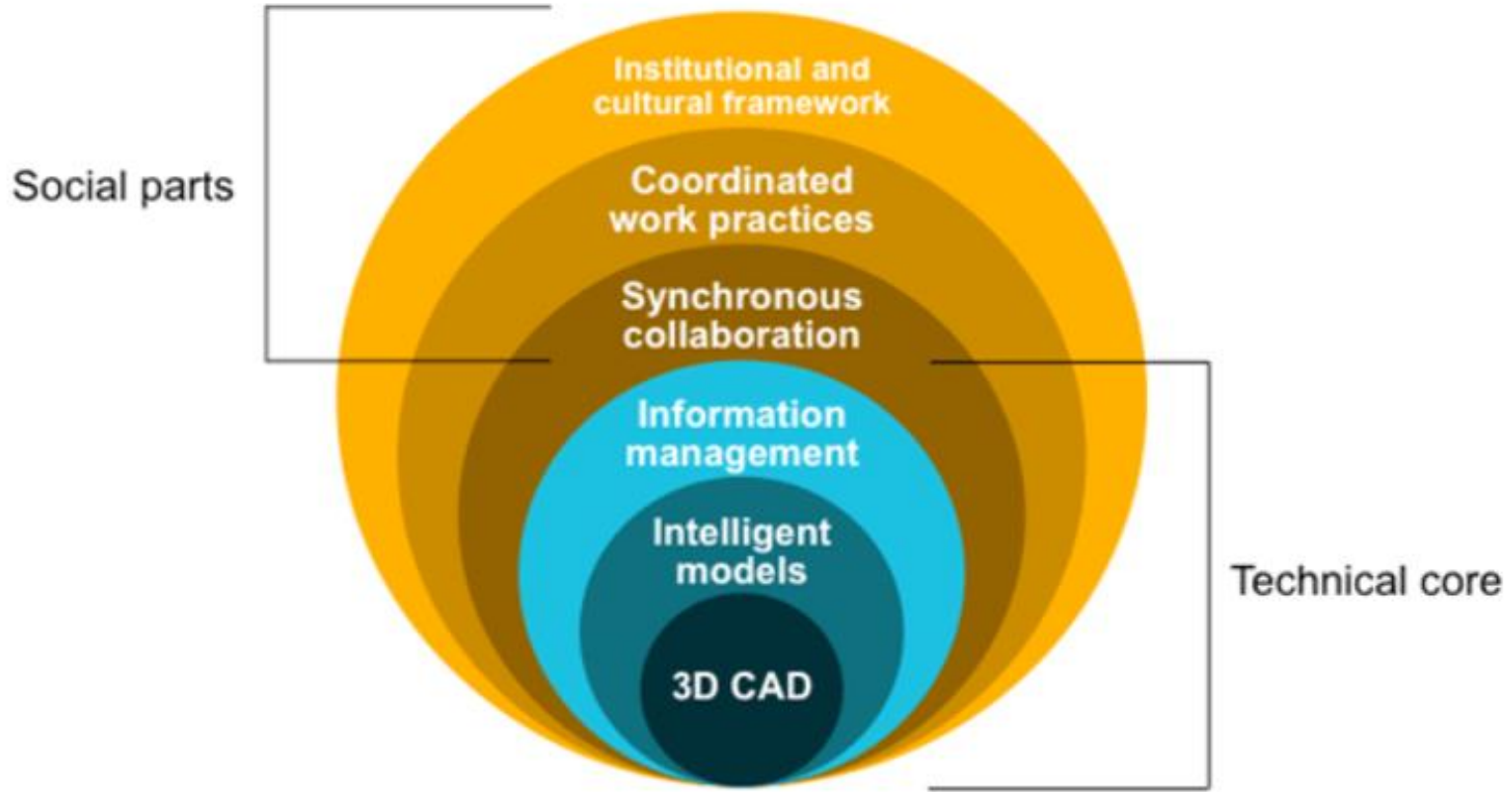
- 4 CityGML/InfraModel/IFC Collaboration
- 5 3D Virtual Parks
- 6 Underwater Citymodel

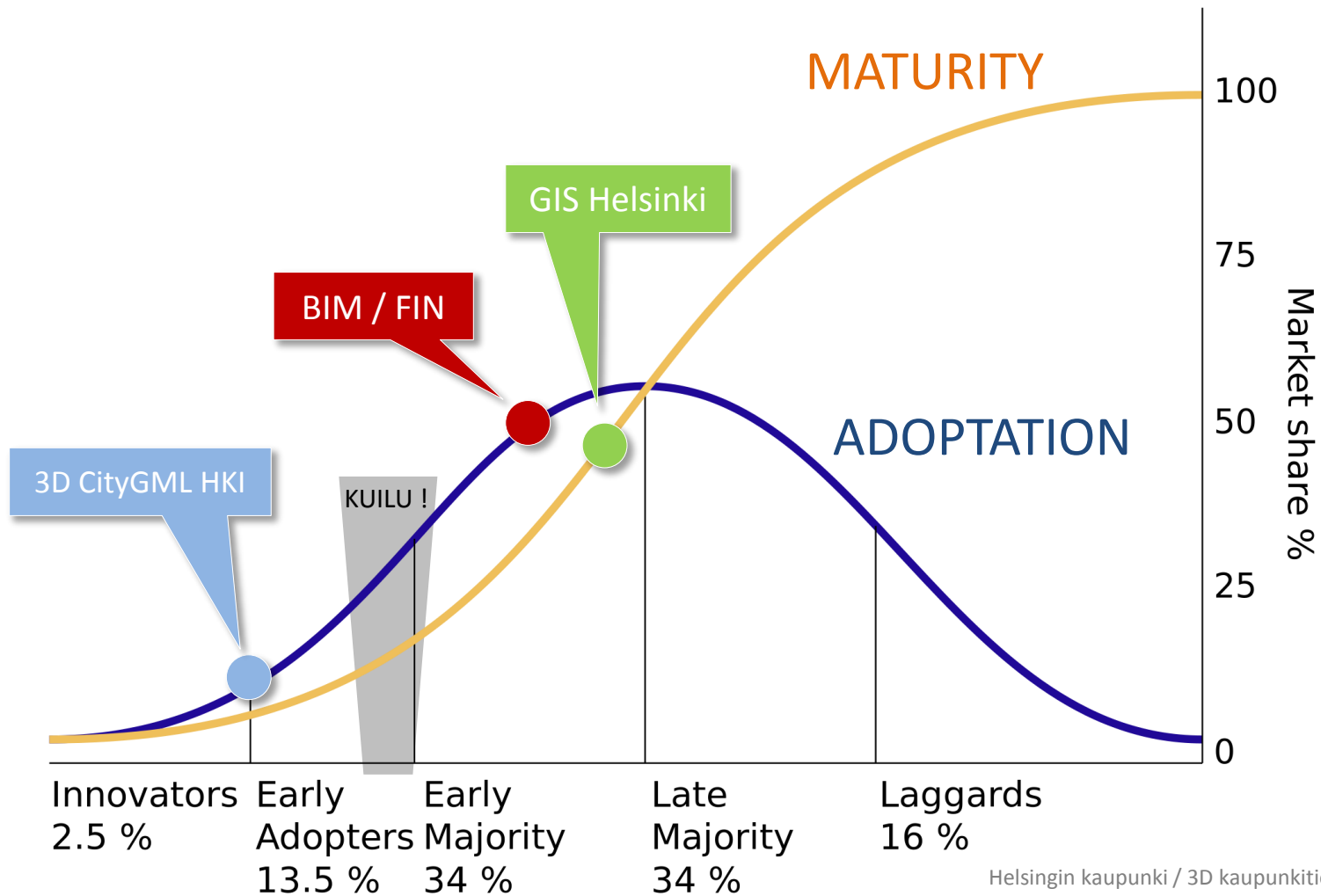
SMART SOLUTIONS

- 7 Citizen Interaction Platform
- 8 Underground Service Tunnel Marketing
- 9 Intelligent Streetlight Simulation

URBAN ANALYTICS

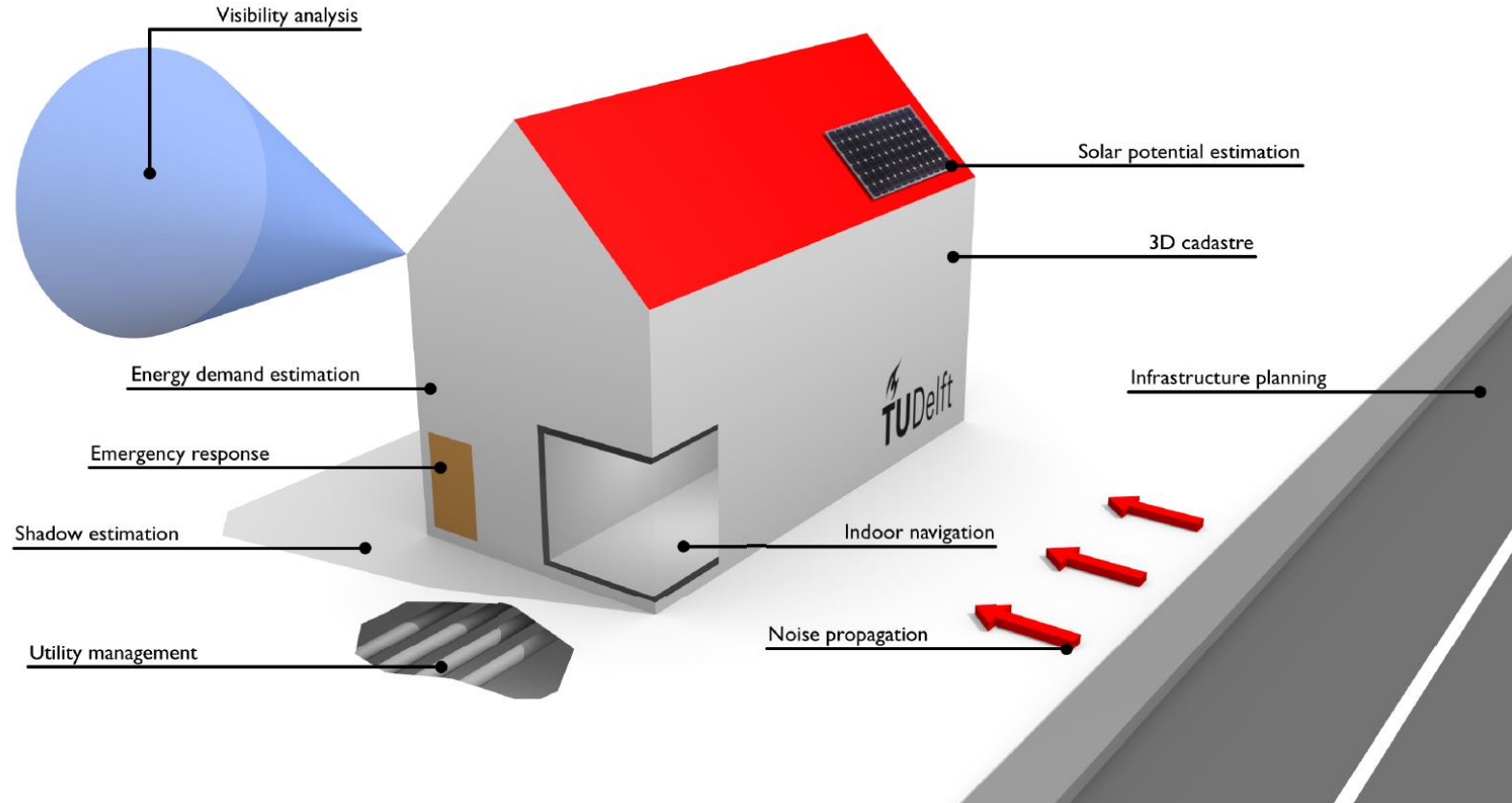
- 10 Quality Indicators of Urban space
- 11 CO2 / GHG / Energy Simulation
- 12 Urban development energy use simulation





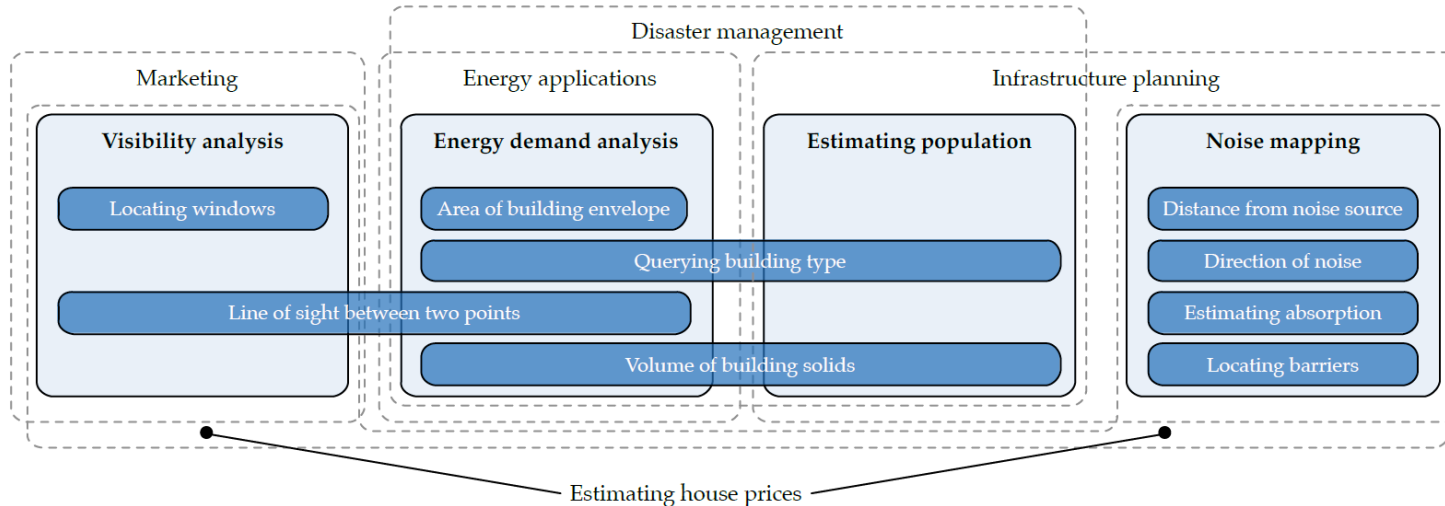
Use of 3D City Models ...

at least 29 use cases that are a part of more than 100 applications

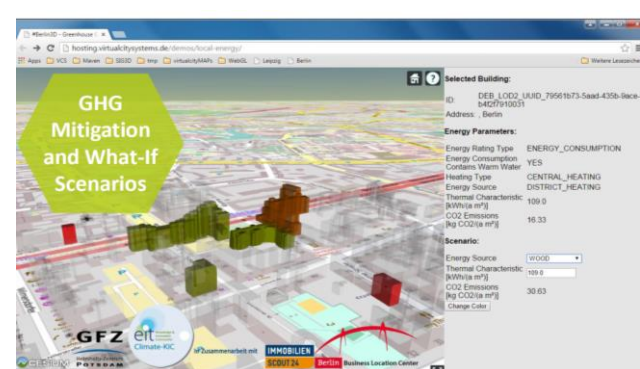
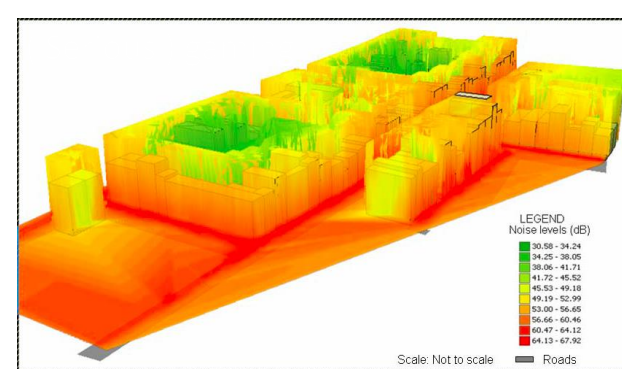
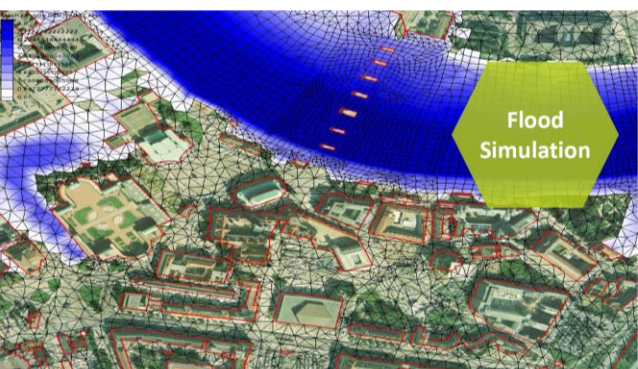
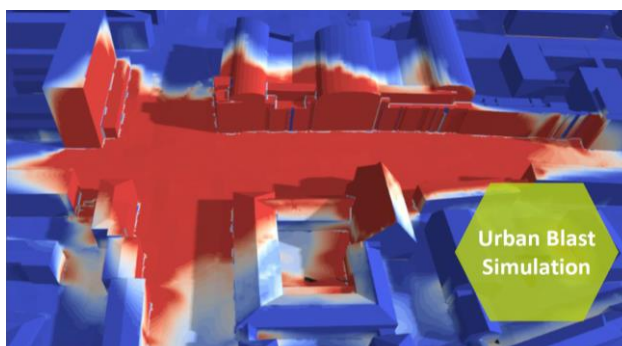
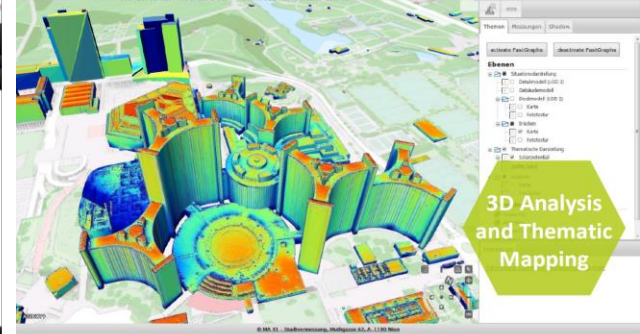
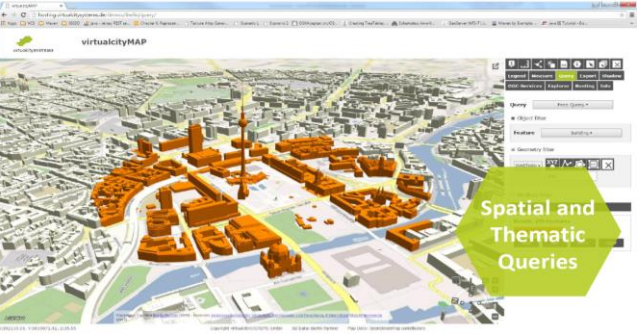


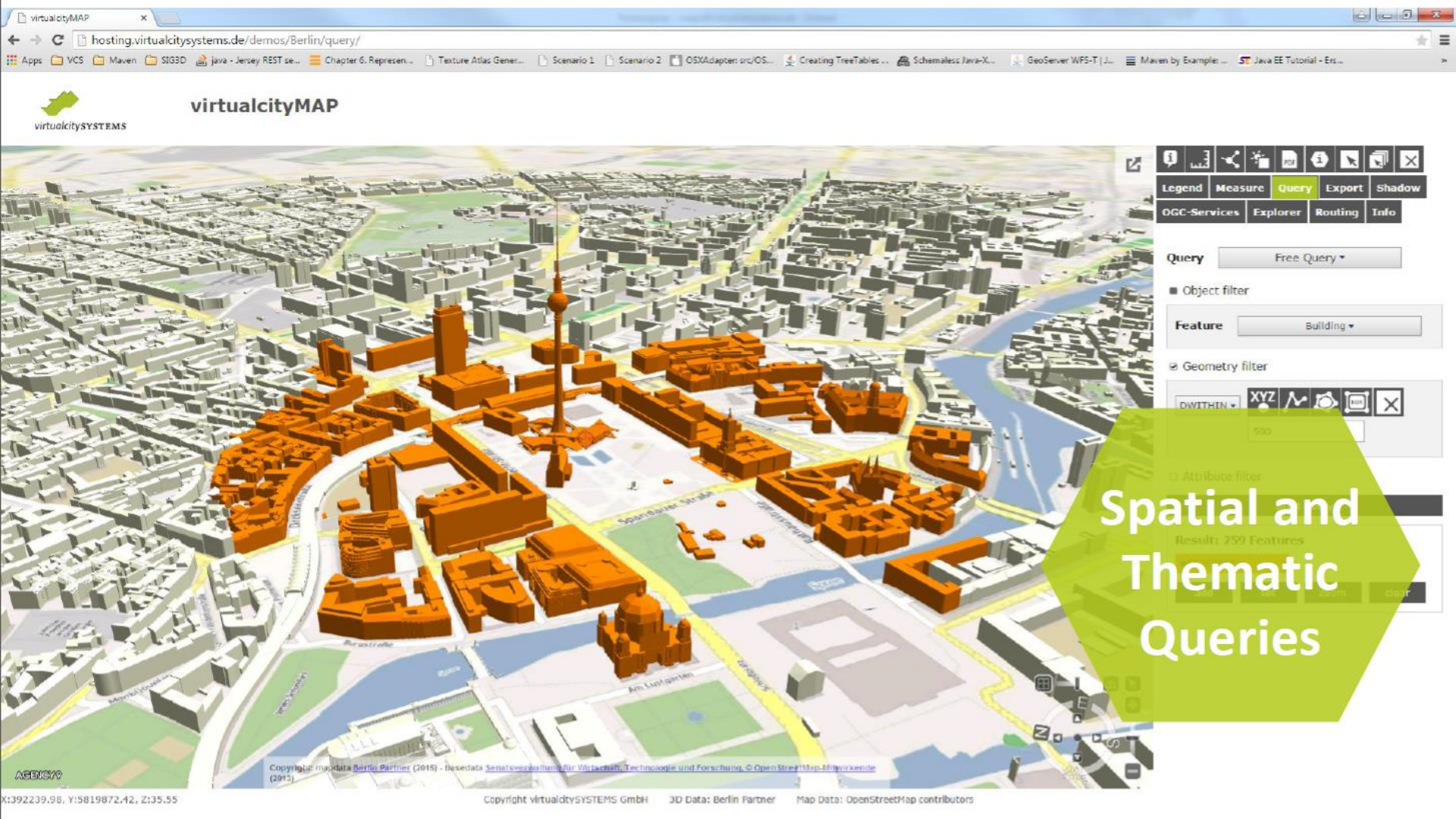
Use of 3D City Models ...

at least 29 use cases that are a part of more than 100 applications



The tangled relations between spatial operations (dark blue), use cases (light blue) and applications (outlined with a dashed stroke), and their overlap which prevents a straightforward listing and classification. This example is simplified, as the application domains normally have more corresponding use cases, and use cases usually consist of more than a few spatial operations.





virtualcityMAP



virtualcitySYSTEMS

Legend Measure Query Export Shadow

OGC-Services Explorer Routing Info

Query Free Query

Object filter

Feature Building

Geometry filter

DWITHIN XYZ

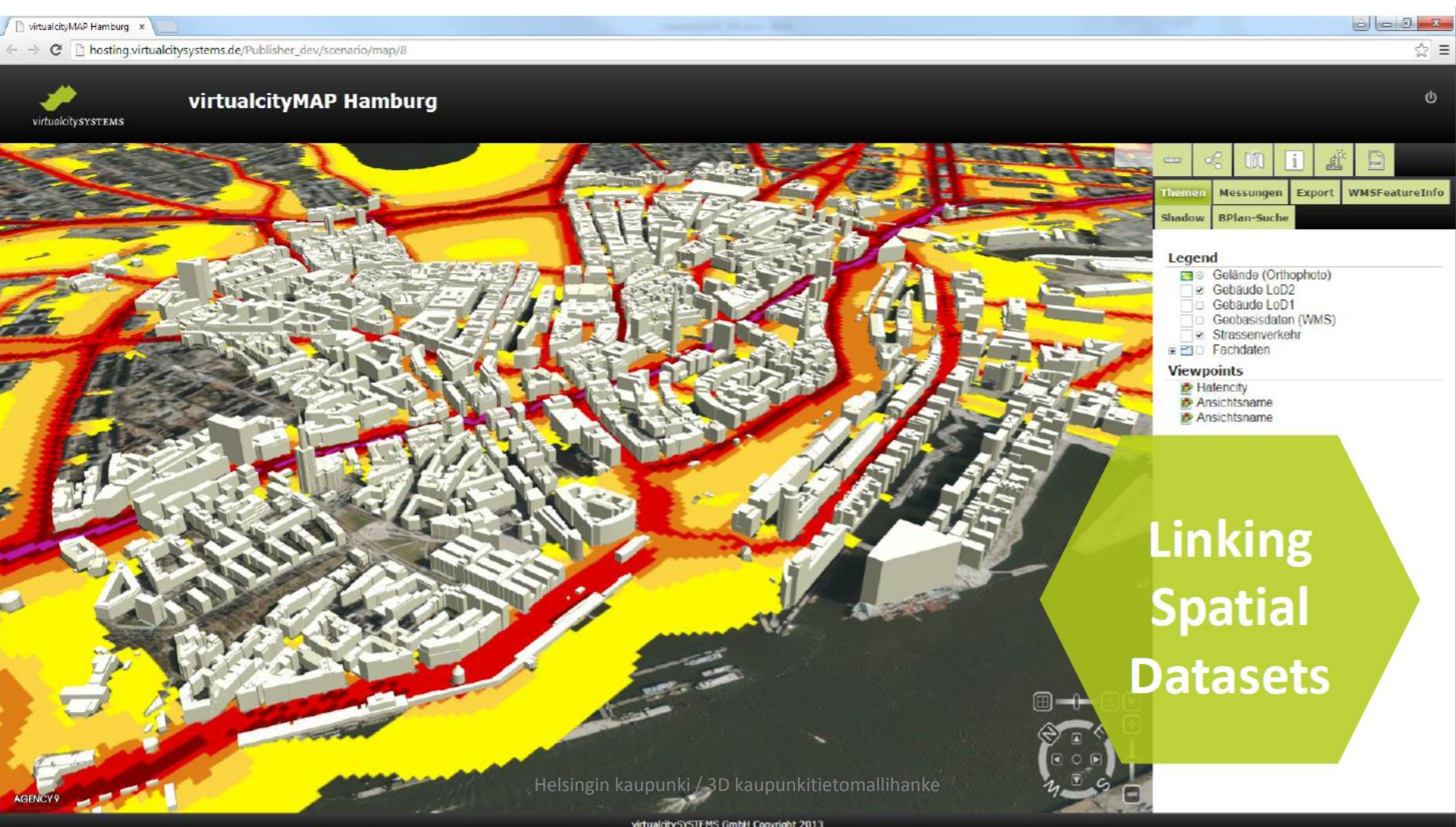
Attribute filter

Result: 259 Features

Spatial and
Thematic
Queries

Copyright: mandata Berlin Partner (2015) - Basedata: Senatverwaltung für Wirtschaft, Technologie und Forschung, © OpenStreetMap-Mitwirkende (2015)

Copyright virtualcitySYSTEMS GmbH 3D Data: Berlin Partner Map Data: OpenStreetMap contributors



virtualcityMAP Hamburg



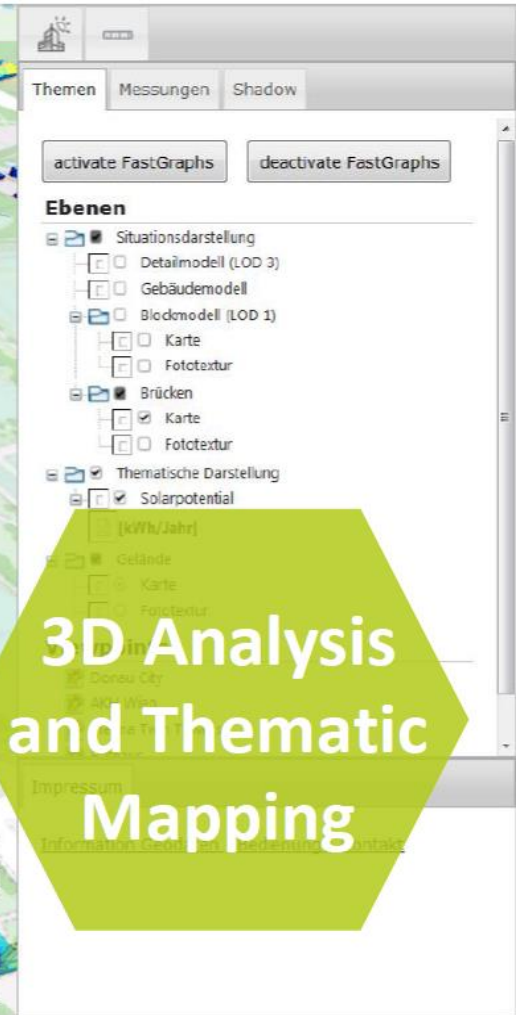
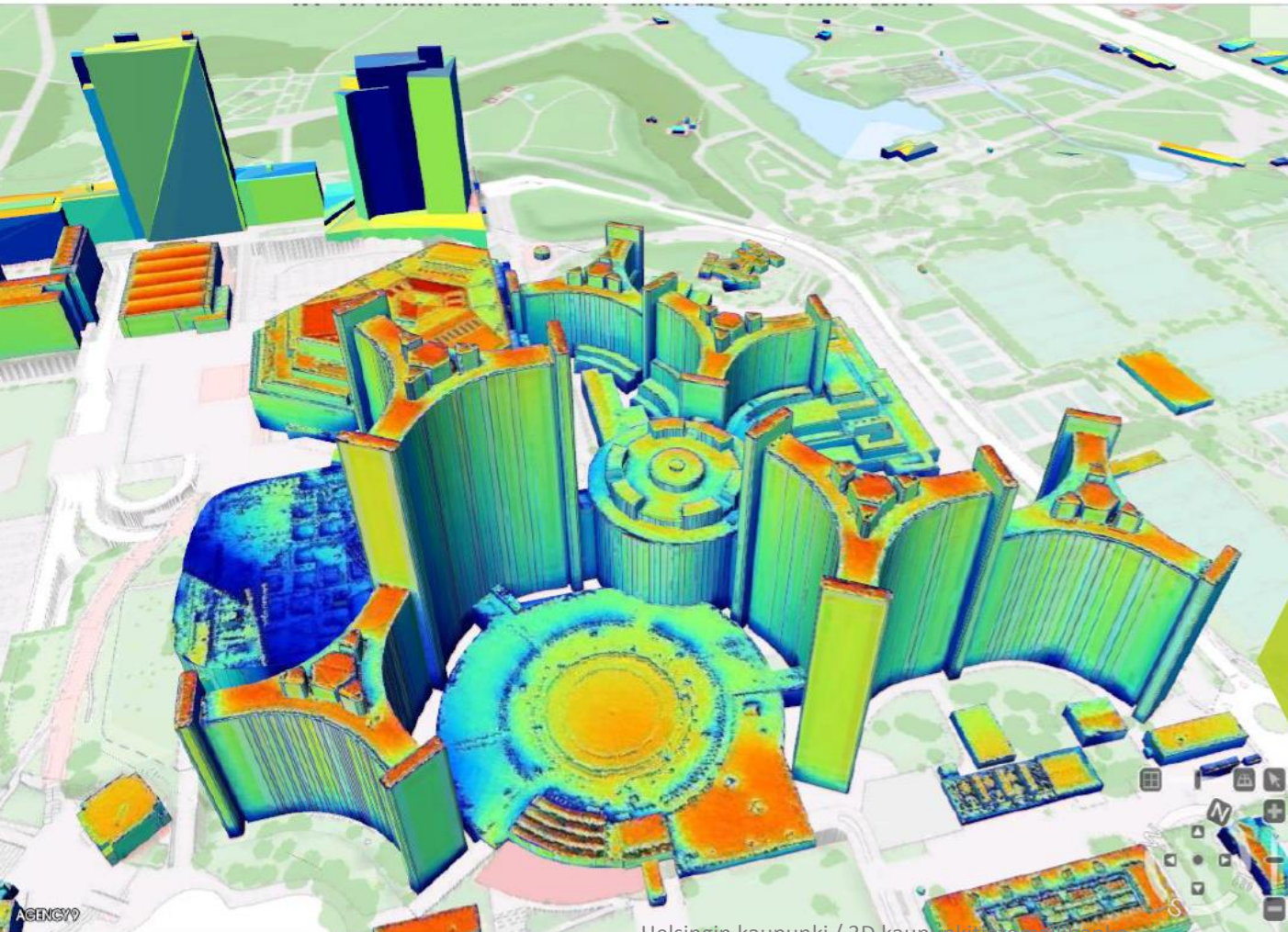
Themen Messungen Export WMSFeatureInfo

Shadow BPlan-Suche

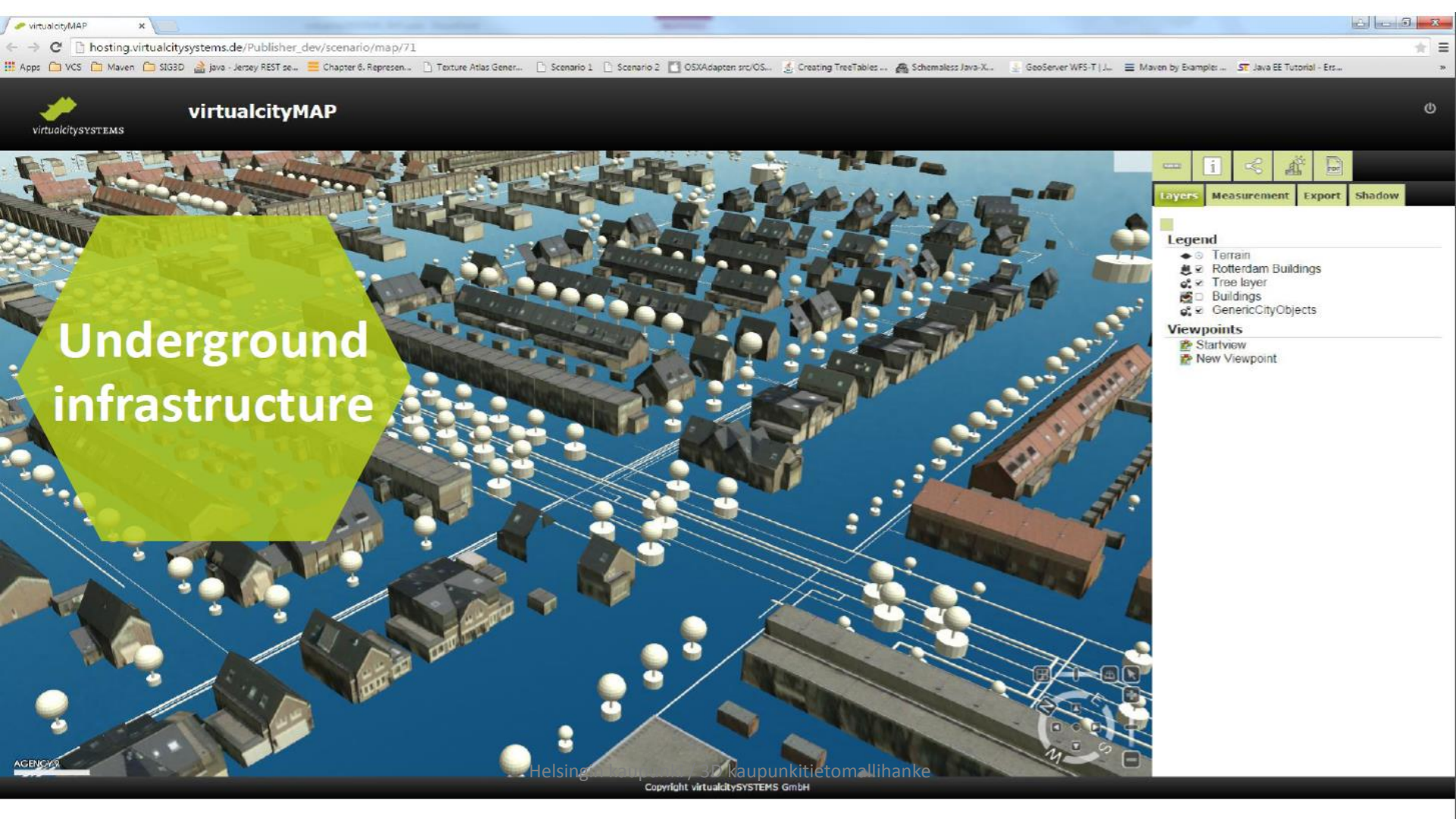
- Legend**
- ☒ Gelände (Orthophoto)
 - ☒ Gebäude LoD2
 - ☐ Gebäude LoD1
 - ☐ Geobasisdaten (WMS)
 - ☒ Strassenverkehr
 - ☐ Fachdaten
- Viewpoints**
- ☒ Hafency
 - ☒ Ansichtsname
 - ☒ Ansichtsname

Linking
Spatial
Datasets

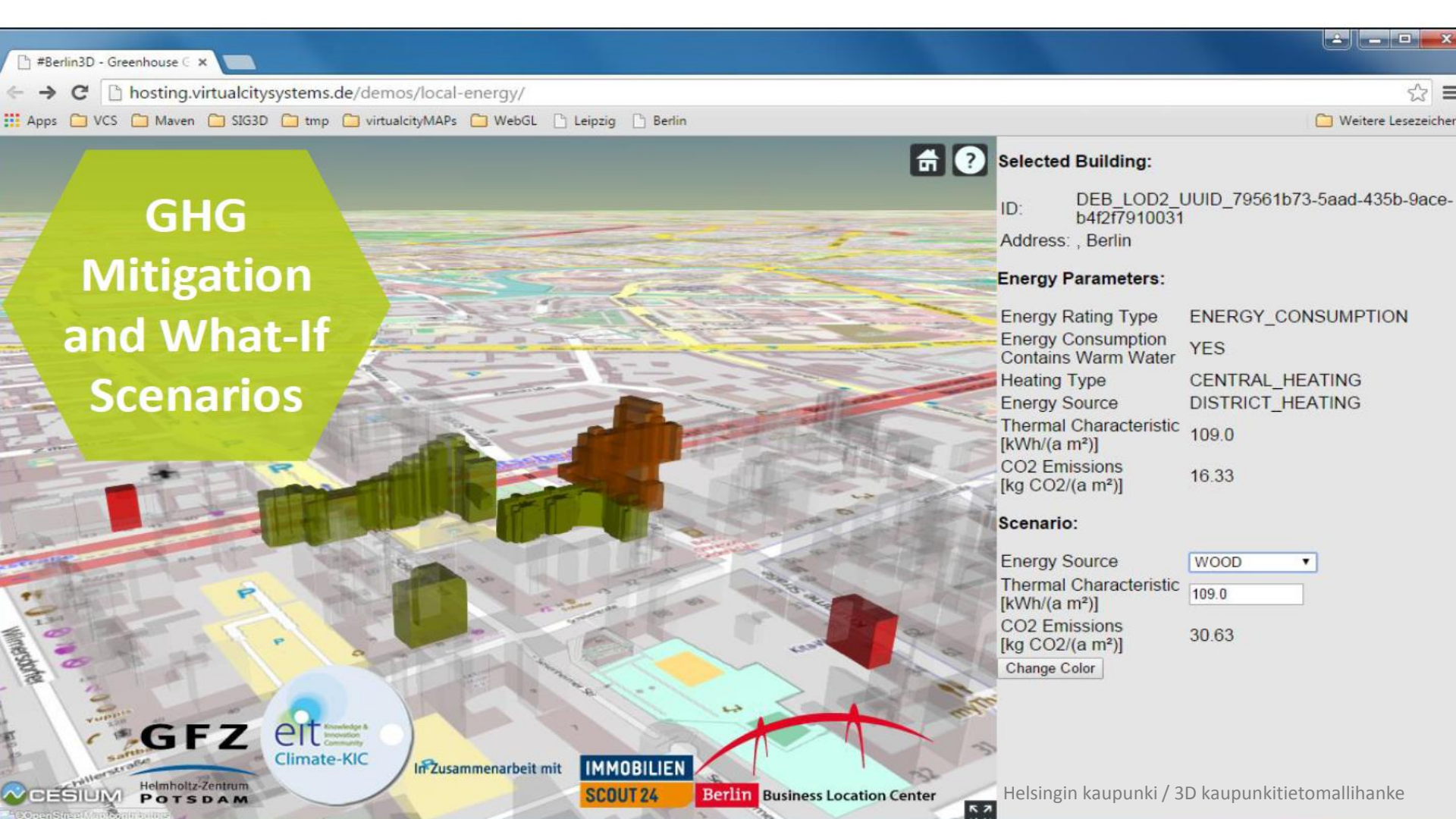
Helsingin kaupunki / 3D kaupunkitietomallihanke



3D Analysis and Thematic Mapping



Underground infrastructure



GHG Mitigation and What-If Scenarios



Selected Building:

ID: DEB_LOD2_UUID_79561b73-5aad-435b-9ace-b4f2f7910031
Address: , Berlin

Energy Parameters:

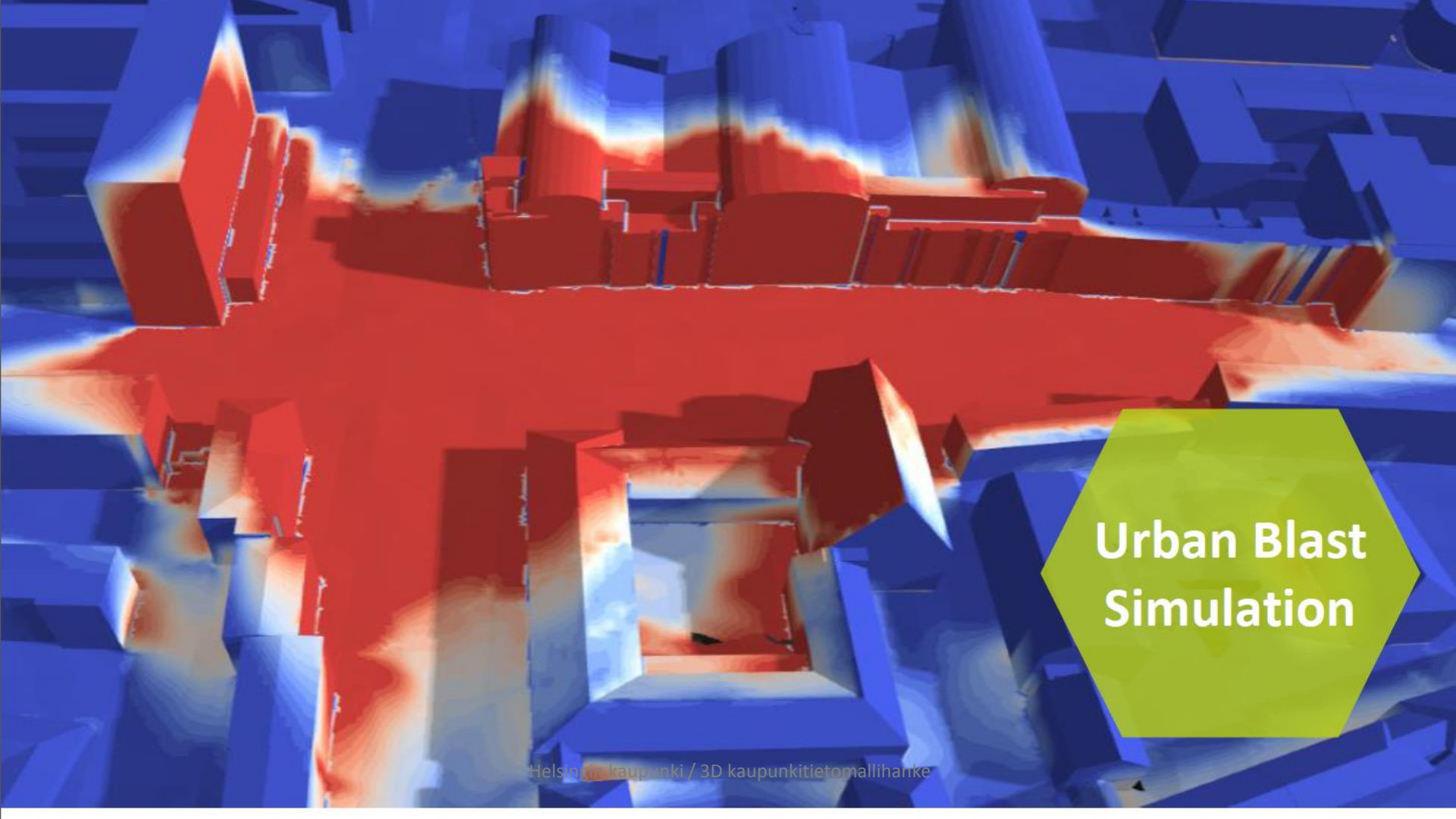
Energy Rating Type	ENERGY_CONSUMPTION
Energy Consumption	YES
Contains Warm Water	
Heating Type	CENTRAL_HEATING
Energy Source	DISTRICT_HEATING
Thermal Characteristic [kWh/(a m²)]	109.0
CO2 Emissions [kg CO2/(a m²)]	16.33

Scenario:

Energy Source

Thermal Characteristic [kWh/(a m²)]

CO2 Emissions [kg CO2/(a m²)]

A 3D visualization of an urban blast simulation. The scene shows a city street with buildings on either side. A large, bright orange and red plume of smoke and fire is visible in the center of the street, indicating the point of impact. The buildings are rendered in a simplified, blocky style. The overall color palette is dominated by the orange and red of the explosion, with blue and grey tones for the buildings and sky.

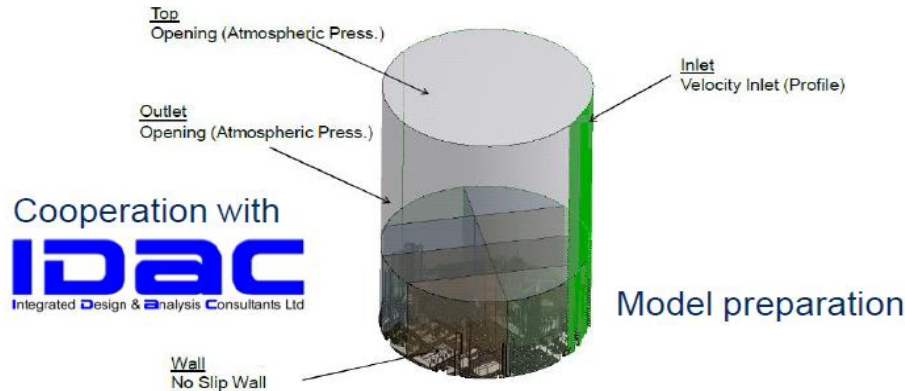
Urban Blast Simulation

Helsingin kaupunki / 3D kaupunkitietomallihanke

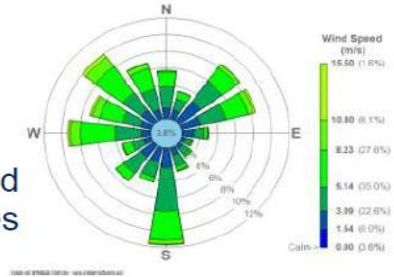
Turbulent Urban Air Flow

- Project

High-Rise wind loading
and pedestrian air flow comfort

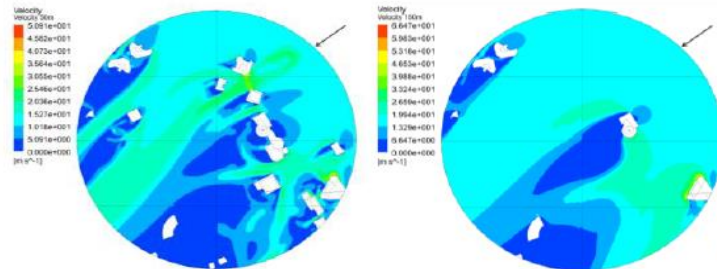


Measured
wind profiles

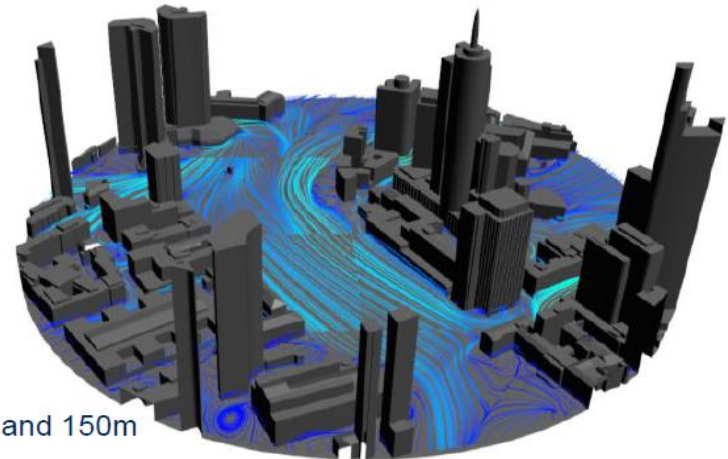


Solutions

- Pedestrian comfort at ground level in urban space
- Transient wind loading on building surfaces and at detailed Points



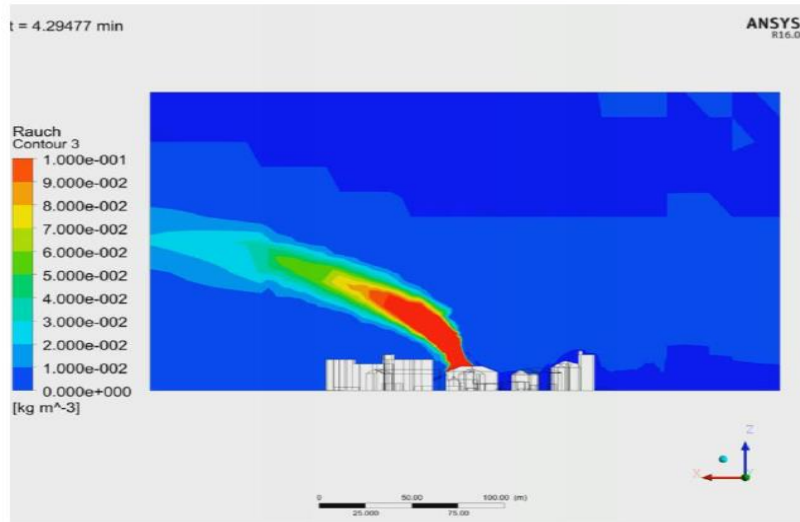
Velocity contours
at a height of 50m and 150m



Urban Air Quality & Climate

- Project

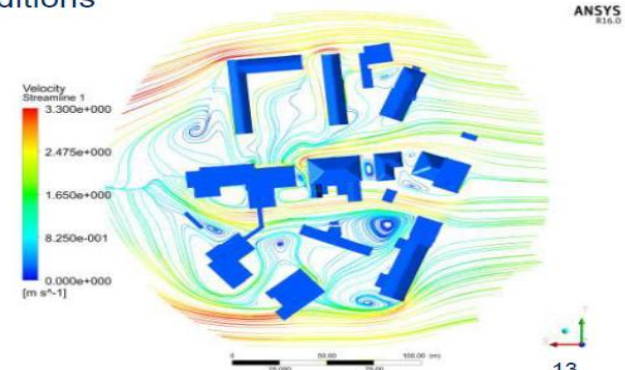
Transient urban smoke development under turbulent steady-state air flow conditions



Realistic fire scenario



Steady-state air flow conditions



Solutions

- Urban air quality & pollution
- Urban climate

Urban Crowd Movement & Evacuation

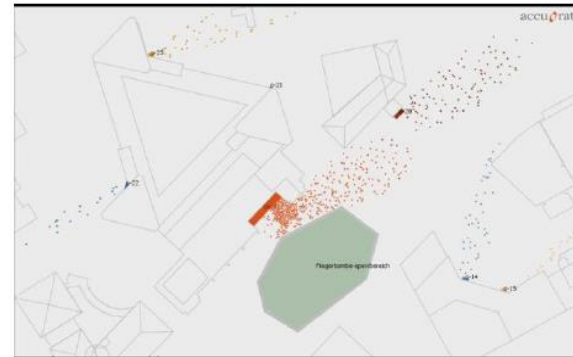
- Project Crowd simulation in urban environments for evacuation and major events
- Type Demonstrator

Cooperation with
accu^orate
Institute for
crowd simulation



Solutions

→ Transient urban crowd movement



Model definition

- Urban evacuation scenario with 2.000 people
- based on semantic city model data of building usage
- Transient simulation result
- Result: Evacuation takes less than 6 min

Wirtschaftsatlas Berlin

www.businesslocationcenter.de/wab/maps/main/

Datenschutz | Haftungsausschluss | Benutzerhinweise | Impressum

Berlin Business Location Center

Suche

Straße Nr.

Straßensuche

Themen

Basiskarten

- ☐ Luftbild
- ☐ Karte von Berlin 1:5000 (K5)
- ☐ 3D-Gebäude
- ☐ Bäume
- ☐ ÖPNV

Cluster / Branchen

- ☐ Gesundheitswirtschaft
- ☐ IKT, Medien, Kreativwirtschaft
- ☐ Verkehr, Mobilität, Logistik
- ☐ Energietechnik
- ☐ Optik
- ☐ Dienstleistungswirtschaft

Standortinformationen

- ☐ Gewerbeimmobilien
- ☐ Wissenschaft und Forschung
- ☐ Technologiezentren
- ☐ Top 200 Berliner Arbeitgeber
- ☐ Medizinische Versorgung
- ☐ Soziale Infrastruktur
- ☐ Behörden und Institutionen
- ☐ Schulen und Ausbildung
- ☐ Familien und Kinder
- ☐ Freizeit und Kultur
- ☐ Hotels und Gastronomie
- ☐ Berlin-Partner

Thematische Karten

- ☐ Planungsinformationen
- ☐ Denkmale

Messfunktion

Objektinformationen Photovoltaik: Marlene-Dietrich-Platz 2 (Mitte)

sehr gut geeignet

Mögliche CO ₂ Einsparung in t pro Jahr:	32,37
Möglicher Stromertrag in MWh pro Jahr:	51,88
Installierbare Modulfläche in m ² :	396,52
Mögliches Investitionsvolumen in €:	84.750
Erzielbare Leistung in kW:	56,5

Source: <http://www.businesslocationcenter.de/wab/maps/main/>

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Realisiert durch virtualcitySYSTEMS GmbH

Im Auftrag der Senatsverwaltung für Wirtschaft, Technologie und Forschung
Der Wirtschaftsatlas von Berlin wird aus dem Europäischen Fond für Regionale Entwicklung (EFRE) gefördert.

EFRE

EUROPEAN UNION
Europäischer Fonds für
regionale Entwicklung
Investing in the future



Energy Atlas Berlin



Energy Atlas Anwendungsbereiche Veröffentlichungen Partner Kontakt Impressum English

Search



Über den Energy Atlas



Erfahren Sie mehr über die Hintergründe und Problemstellung des Energy Atlas.

Anwendungsbereiche



Die verschiedenen Anwendungsbereiche des Energy Atlas finden Sie hier

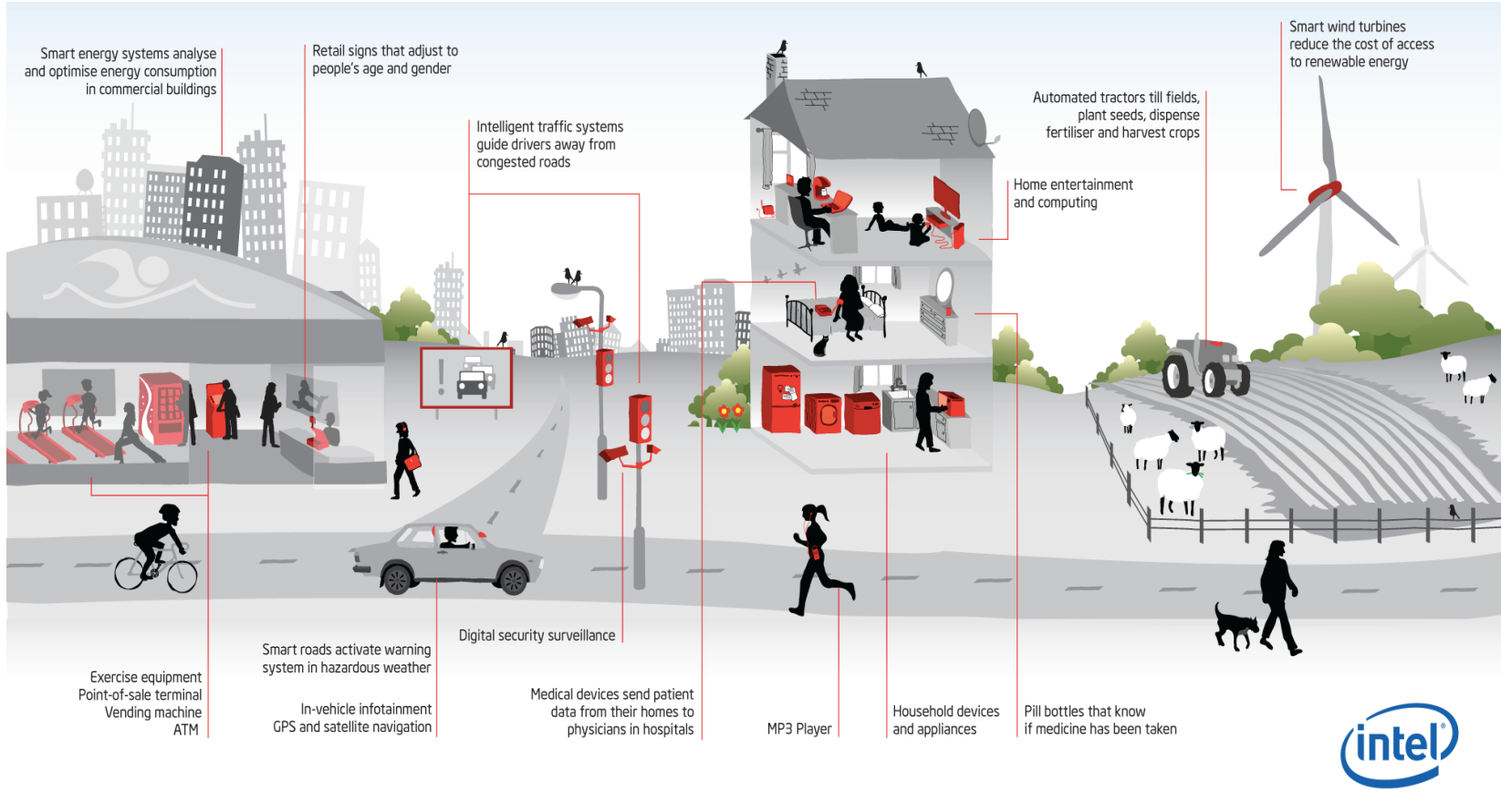
Innovationszentrum Energie



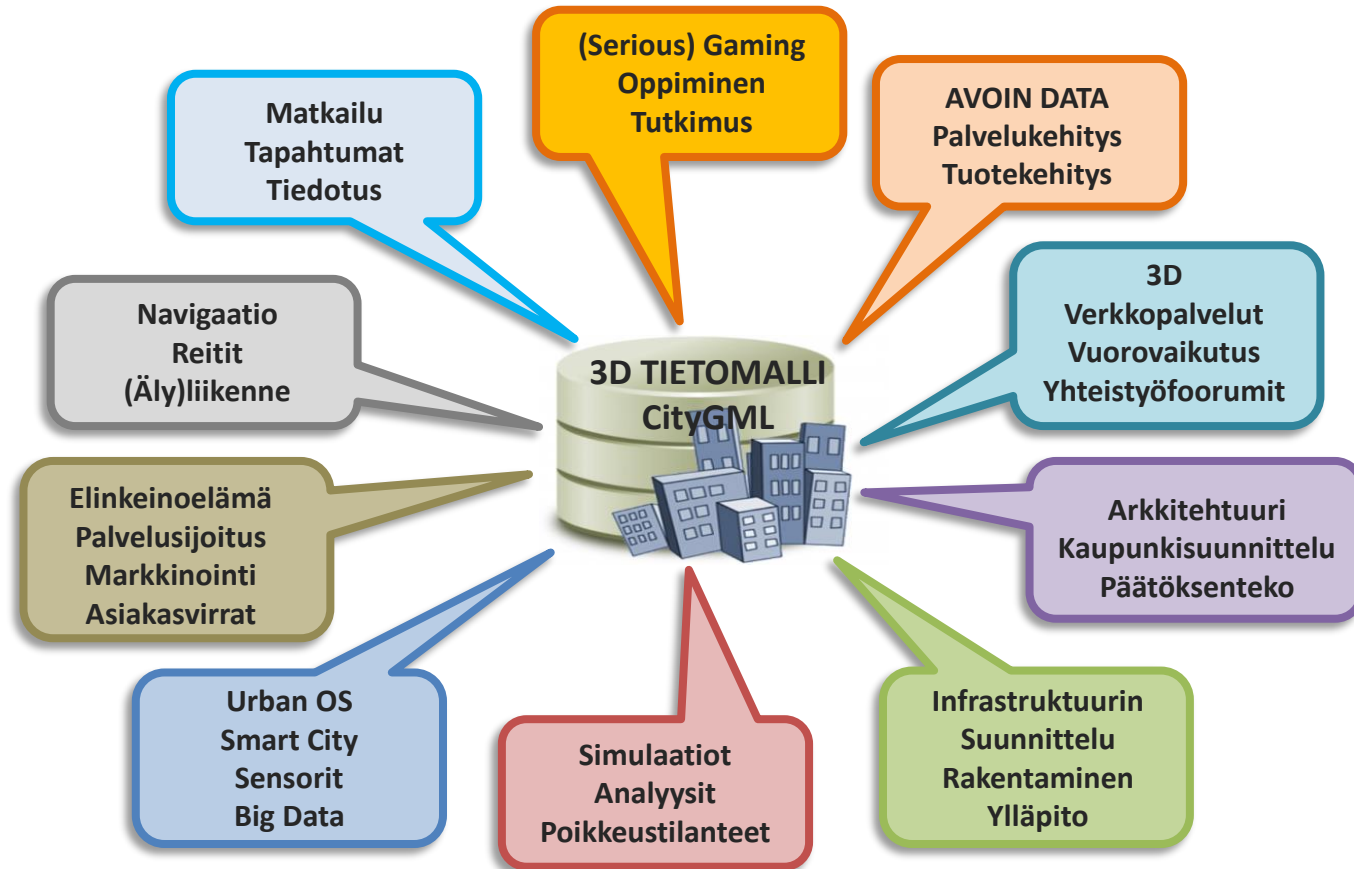
Hier kommen Sie zur Homepage des Innovationszentrums Energie der TU Berlin.

Data integration: power of 3D!

Smart cities: "The city knows what is happening where"



3D-tietomalli yhteistyön ja tiedonjaon alustana



... entä 3D läpimurto?

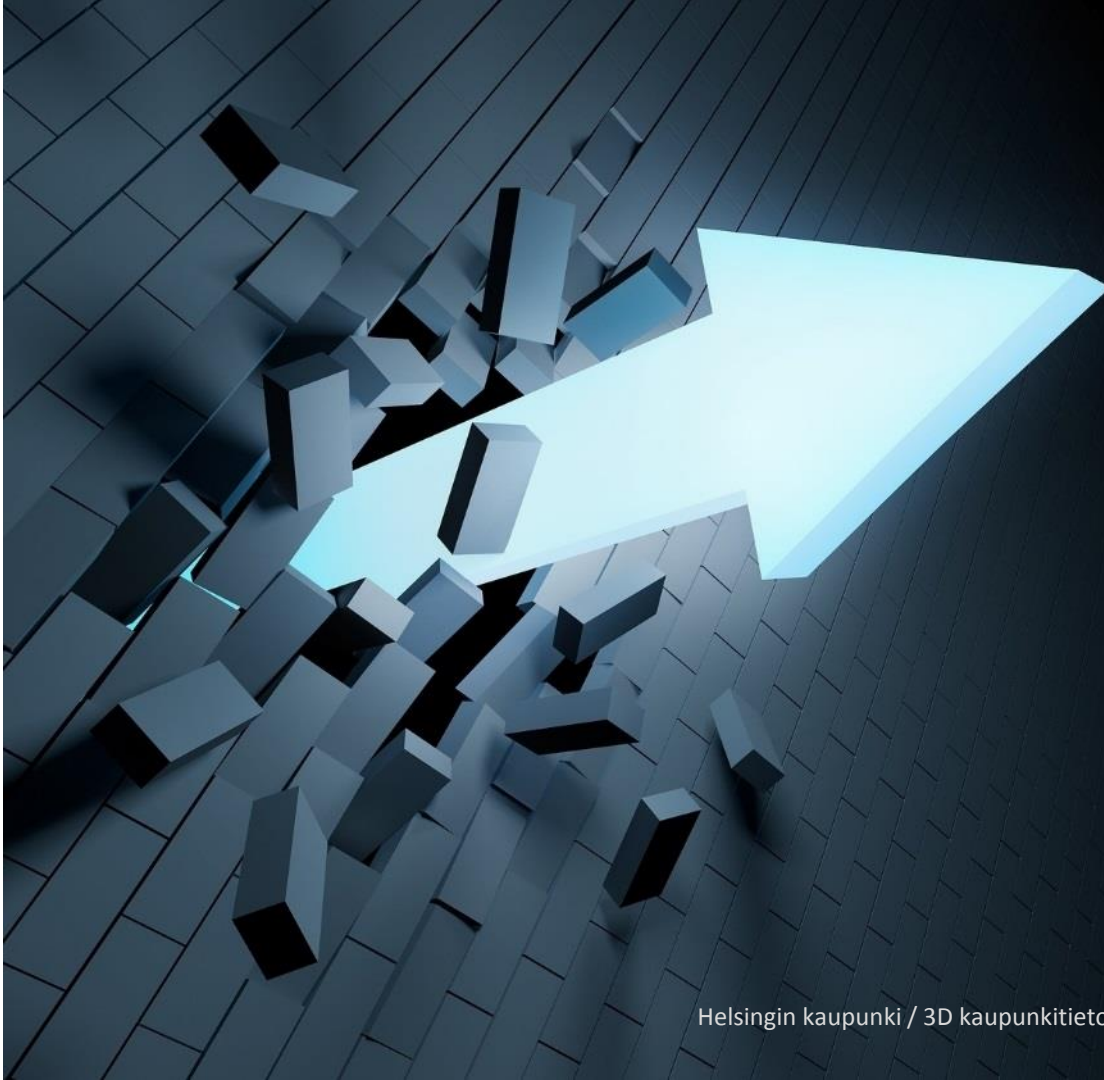
"Technology is the answer ... but what was the question ?" Cedric Price 1966

Helsingin kaupunki / 3D kaupunkitietomallihanke

Kestävä 3D-tietoinfrastruktuuuri edellyttää:

- 3D dataa, enemmän kuin WOW!
- Standardisointia
- Validointia
- Kansainvälistä yhteistyötä
- **3D DATAN INTEGRAATIO ON TARKEIN !**
 - GIS / INFRA / BIM
 - Pinnalla ja pinnan alla
 - Yli toimialarajojen





- 3D lainsäädäntö
- 3D standardit
- 3D perusdata
- 3D datan saatavuus ja jakelu
- 3D ja turvallisuus
- 3D hankinta
- 3D kaupunkisuunnittelu
- 3D ympäristö
- 3D energia
- 3D rakennukset ja rakenteet
- 3D ja infrasuorite
- 3D pelit
- 3D maaperä
- 3D arkeologia
- 3D tutkimus ja koulutus

Kiitos mielenkiinnosta !

3D kaupunkitietomallihanke



HELSINKI 3D+