

HELSINKI 3D+

A New Generation of City Models

City of Helsinki / 3D City Information Model

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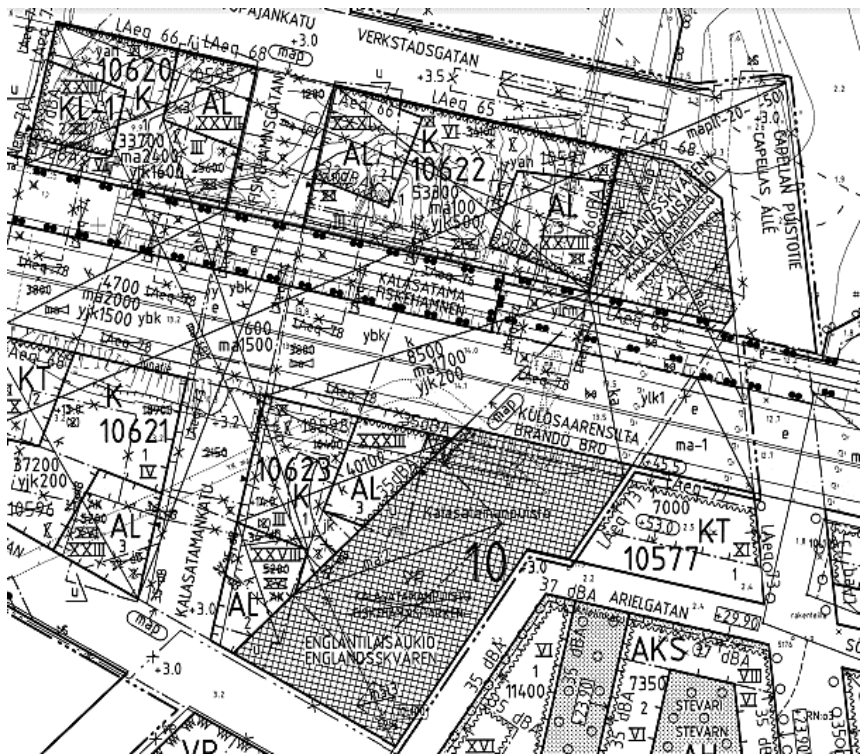
Project Manager/ Architect/MSc (Civ.Eng)
Jarmo Suomisto

Helsinki 3D+ Three year project 2015 – 2017 in City Executive Office / ICT-development



Why... 3D ?

City of Helsinki / 3D City Information Model



Because essential information is lost ...

City of Helsinki / 3D City Information Model



Helsingin kaupunki / 3D kaupunkitietomallihanke

HELSINKI 3D+

Goals

- **Up-to-date 3D platform** to city internal processes
- **Uniform city model** to various developing projects
- Part of **Smart Helsinki OS**
- Raise common **understanding and interaction** of new development
- Give analyzed de facto information to **support decision making**
- Tools to analyze and reach city's **environmental objectives**
- **Open 3D data** to citizenry, companies, developers, universities ...

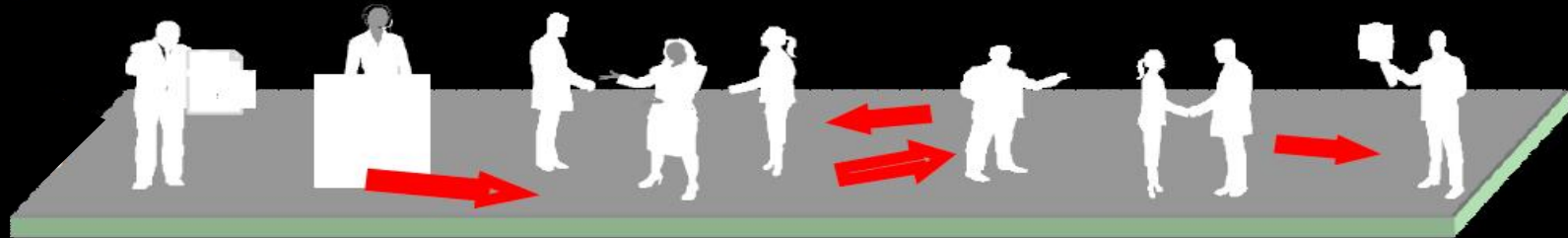


3D Information Modeling in EU Digital Agenda

Socio – Economical
Ecosystem



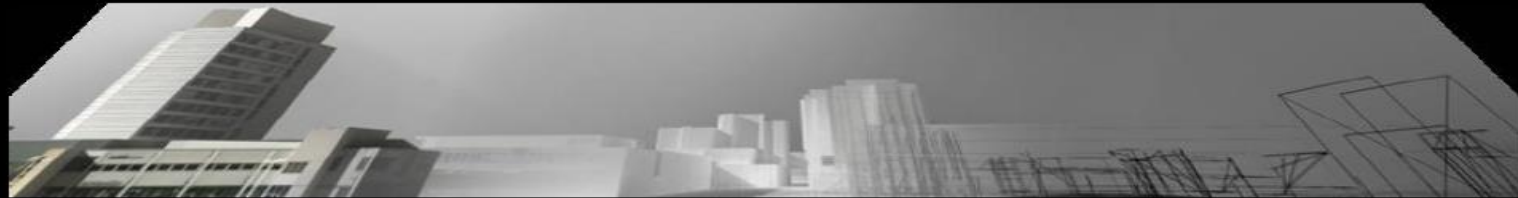
Open Innovation
Together



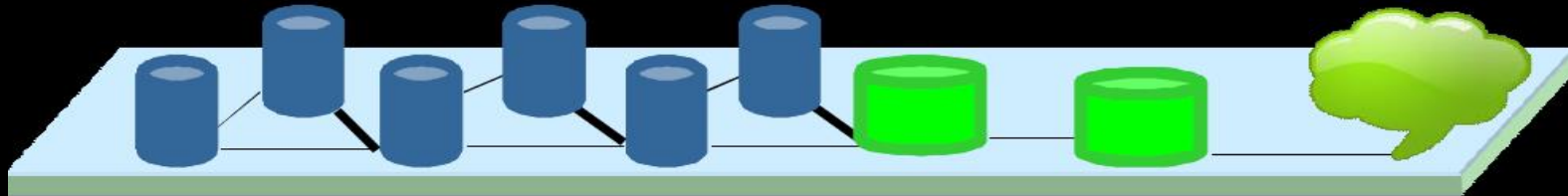
Processes
and Concepts



Virtual Worlds
and Modeling



Physical Environment
as Data Storage



“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)





3D data of Helsinki since **1985** ...

1999 3D-simulator

LOD 2 + new developments



3D-model + game engine [RealiMation]



Real-time simulator in exhibitions

City of Helsinki / 3D City Information Model

Master Plan 2002



2003 Pasila

3D model
Design alternatives
Real-time-simulator



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

New Challenges

- Visual WOW! is **not enough**
- Helsinki **SMART City** goals
- Broad **technological** development
- **CityGML-standard** and progress in European cities
- Need to have more **accurate data and analyzes**
- Need to **modernize** working methods
- **Open data** culture
- **Leap in the dark** with new technology
- First City within **Nordic** countries



A high-angle, wide shot of a city skyline, likely New York City, with a river and a bridge in the background. Two parachutists are in the air, each with a large, orange parachute. The parachutes are fully deployed and open. The sky is a pale blue with some light clouds. The overall scene is bright and clear.

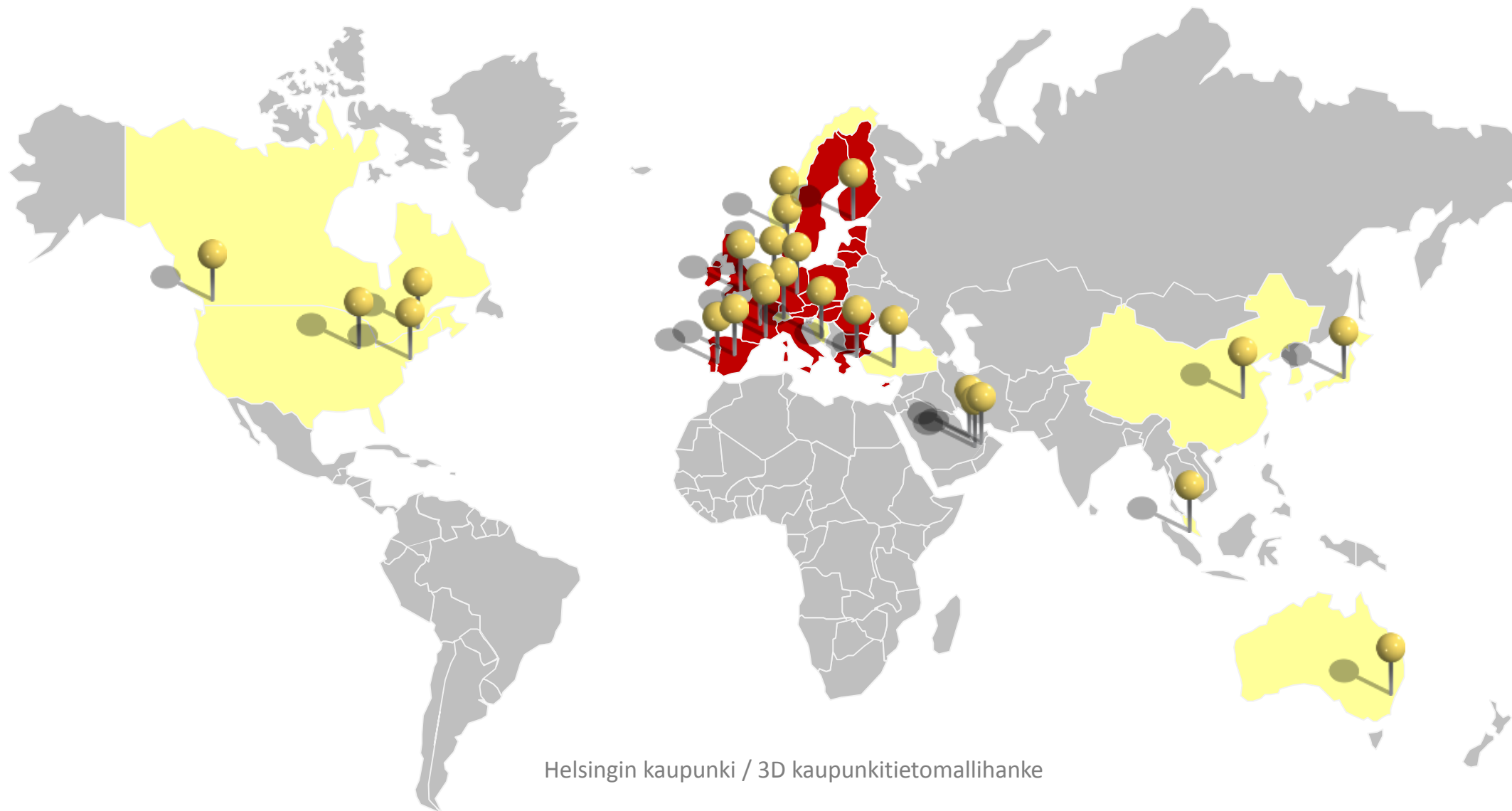
CityGML

IFC

InfraGML

Standards and parachutes work best when they are open !

CityGML World Map



Helsingin kaupunki / 3D kaupunkitietomallihanke

Citizenry / City officials / Companies / Innovators



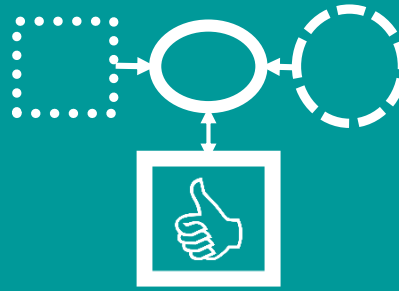
DATA UTILIZATION



3D Web services

Pilot portfolio

- Development
- Solutions
- Analytics



New work practises

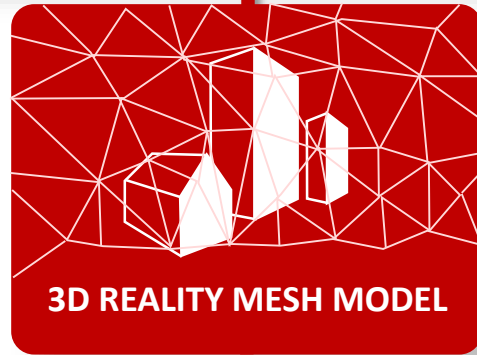
Open 3D data



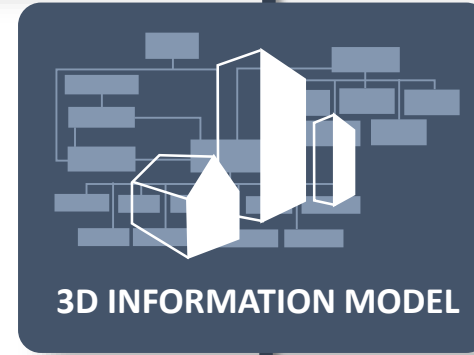
Service and product innovations



3D SPATIAL DATA INFRASTRUCTURE



3D REALITY MESH MODEL

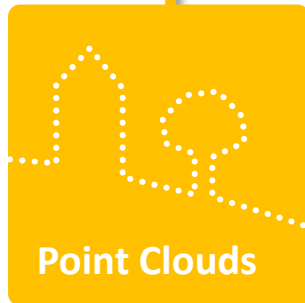


3D INFORMATION MODEL



DATA MAPPING LAYER / Import / Export / Update

GIS DATA



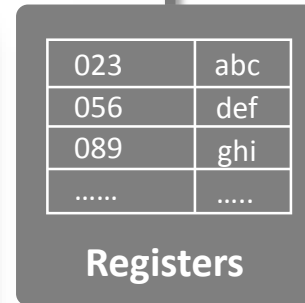
Point Clouds



Oblique Images

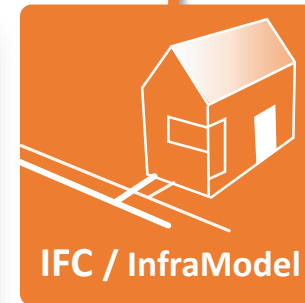


GIS DataBases



| | |
|-------|-------|
| 023 | abc |
| 056 | def |
| 089 | ghi |
| | |

Registers



IFC / InfraModel



New Geodata

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°

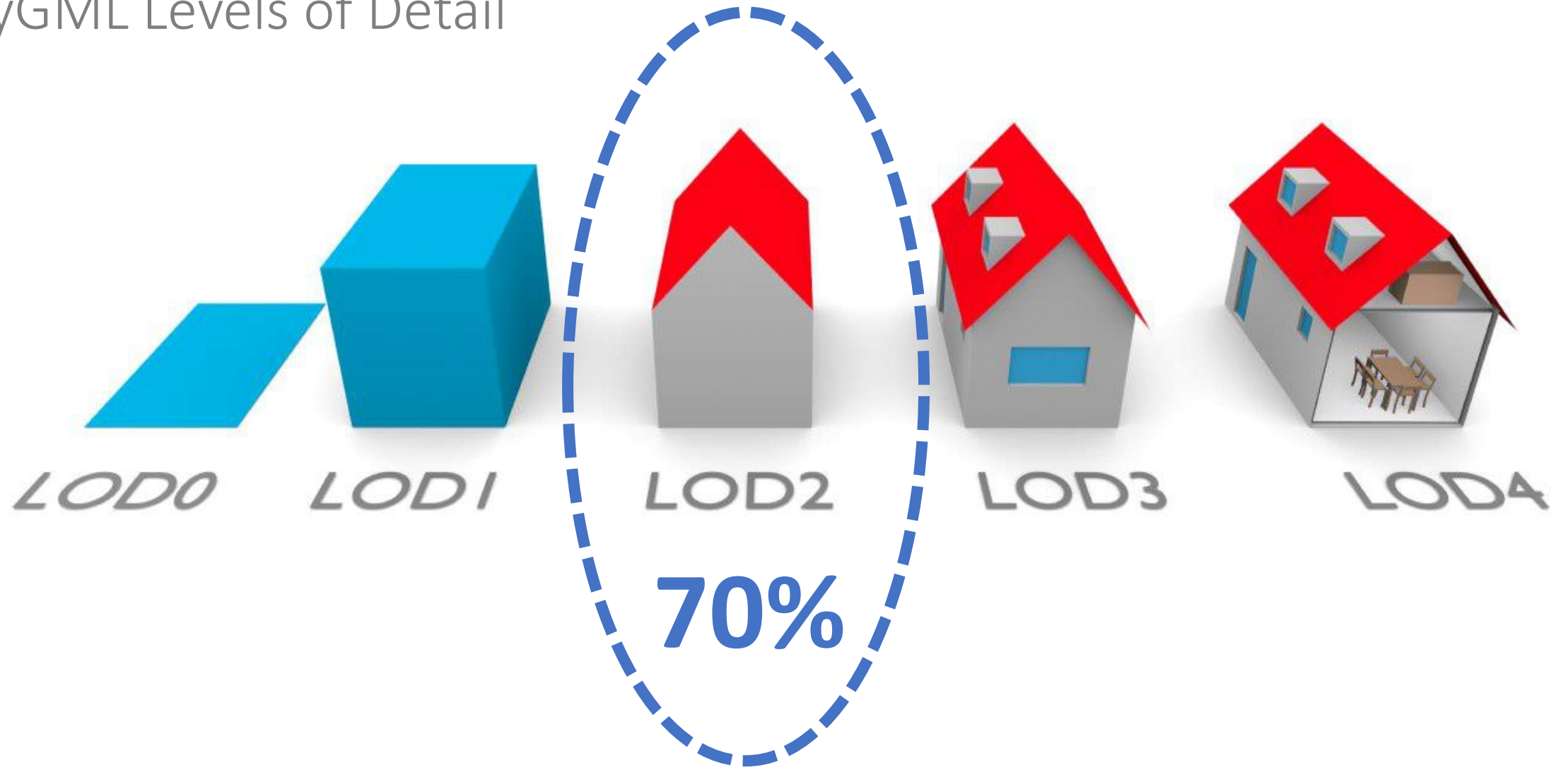
Kuvaus

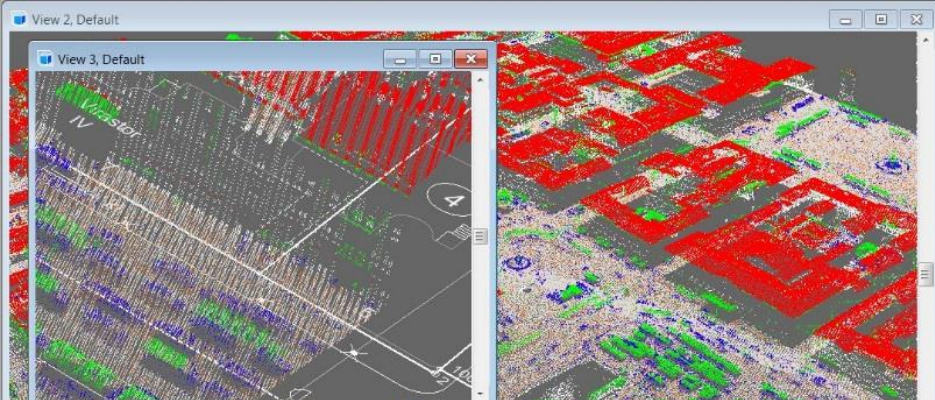
- Kaupunkimallin teksturointi, verkkomalli, viistokuvapalvelu
- Viiden kameran järjestelmä (Microsoft Osprey, mittakamera)
- Nadiiri (RGB, CIR) ja neljä viistokameraan
- Lentokorkeus 1370m
- Maastoresoluutio n. 10cm
- Sivupeitto 65%, pituuspeitto 80%

Rajoitukset

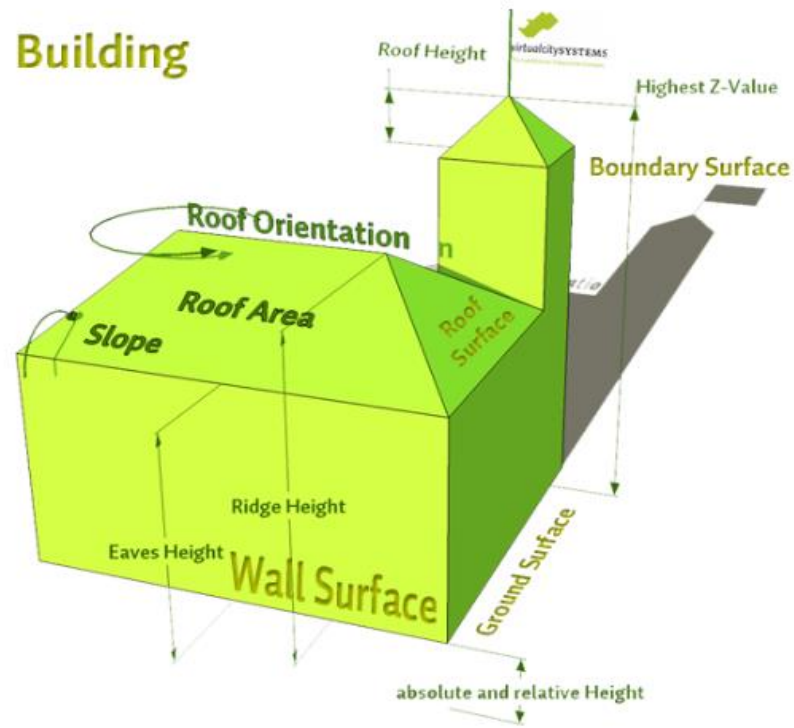
- Sää, lennonjohto, aluevalvontalaki, ...

CityGML Levels of Detail

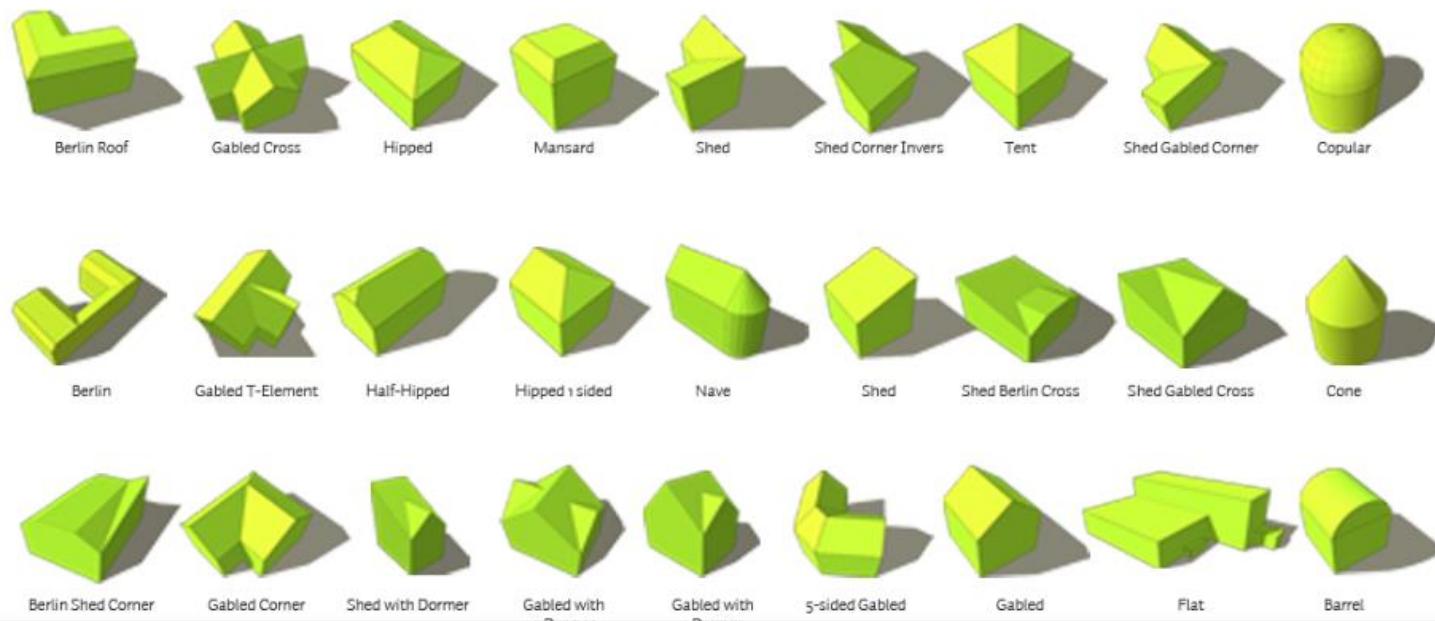




Building

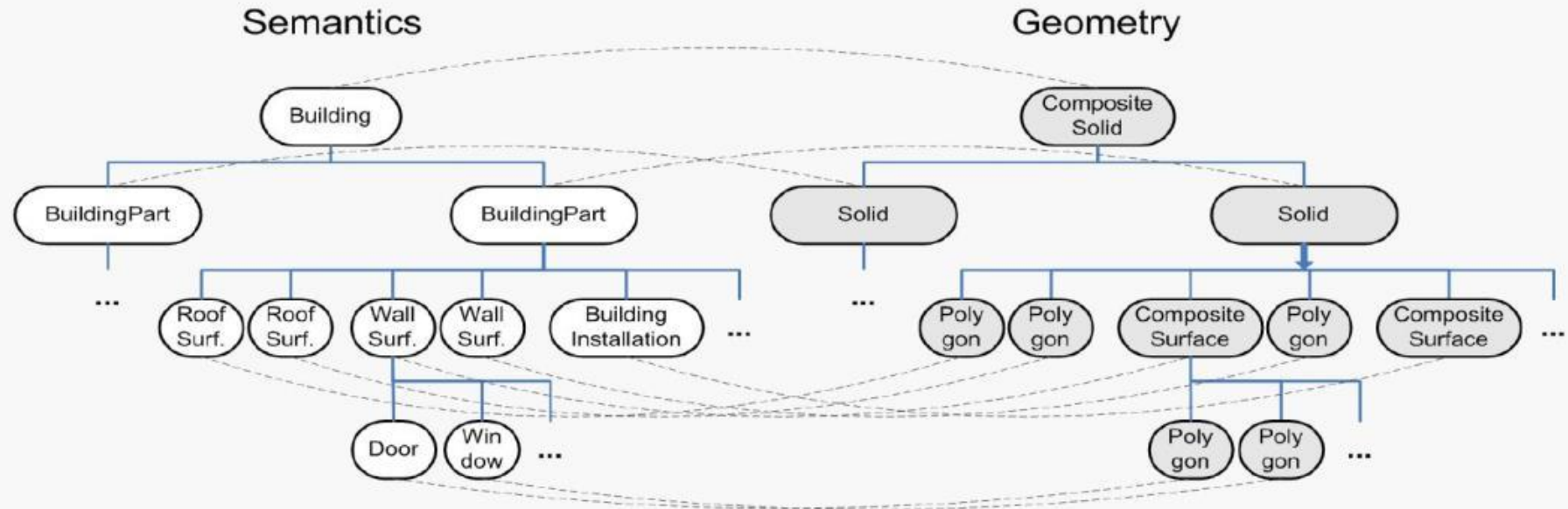
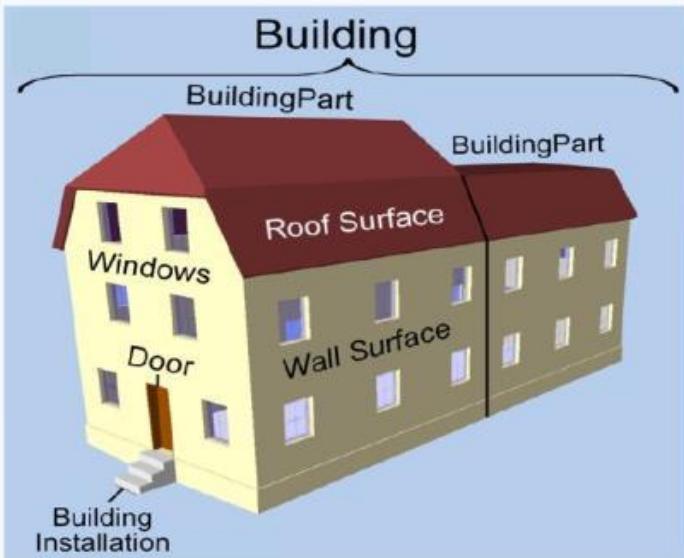


- CityGML semantic
- SHP & CityGML attributes



Creation of LoD 1 and LoD 2 building models

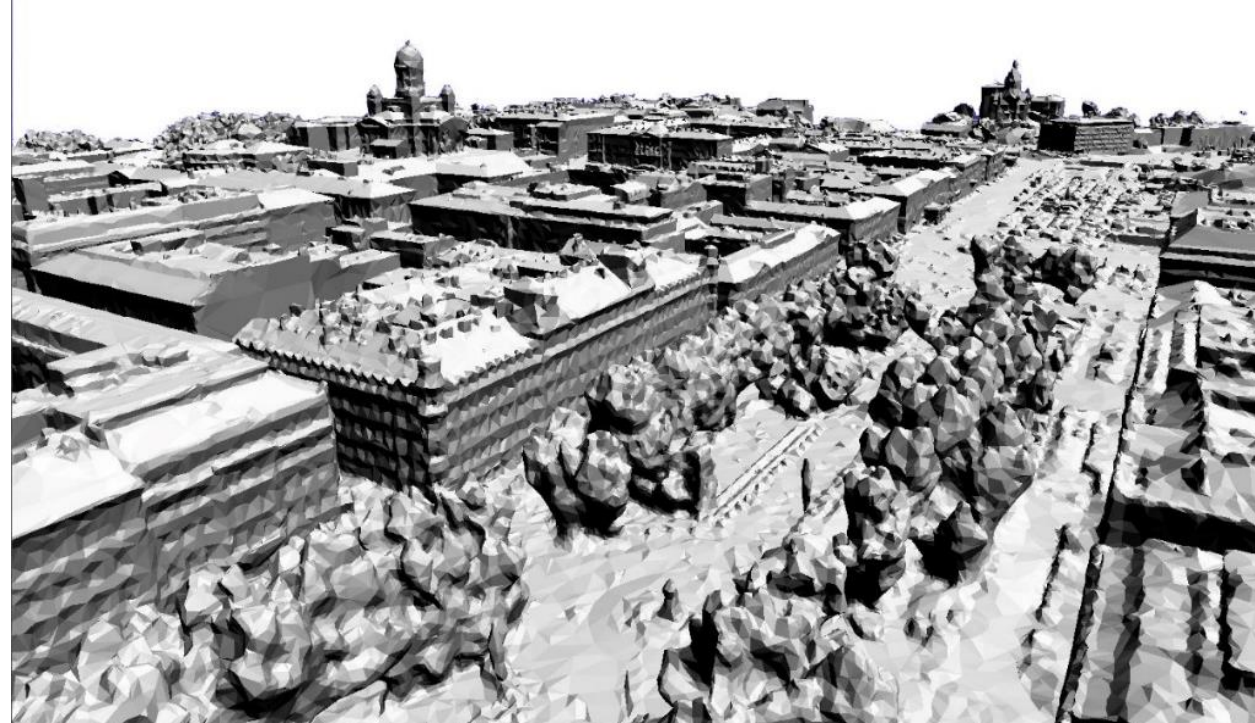
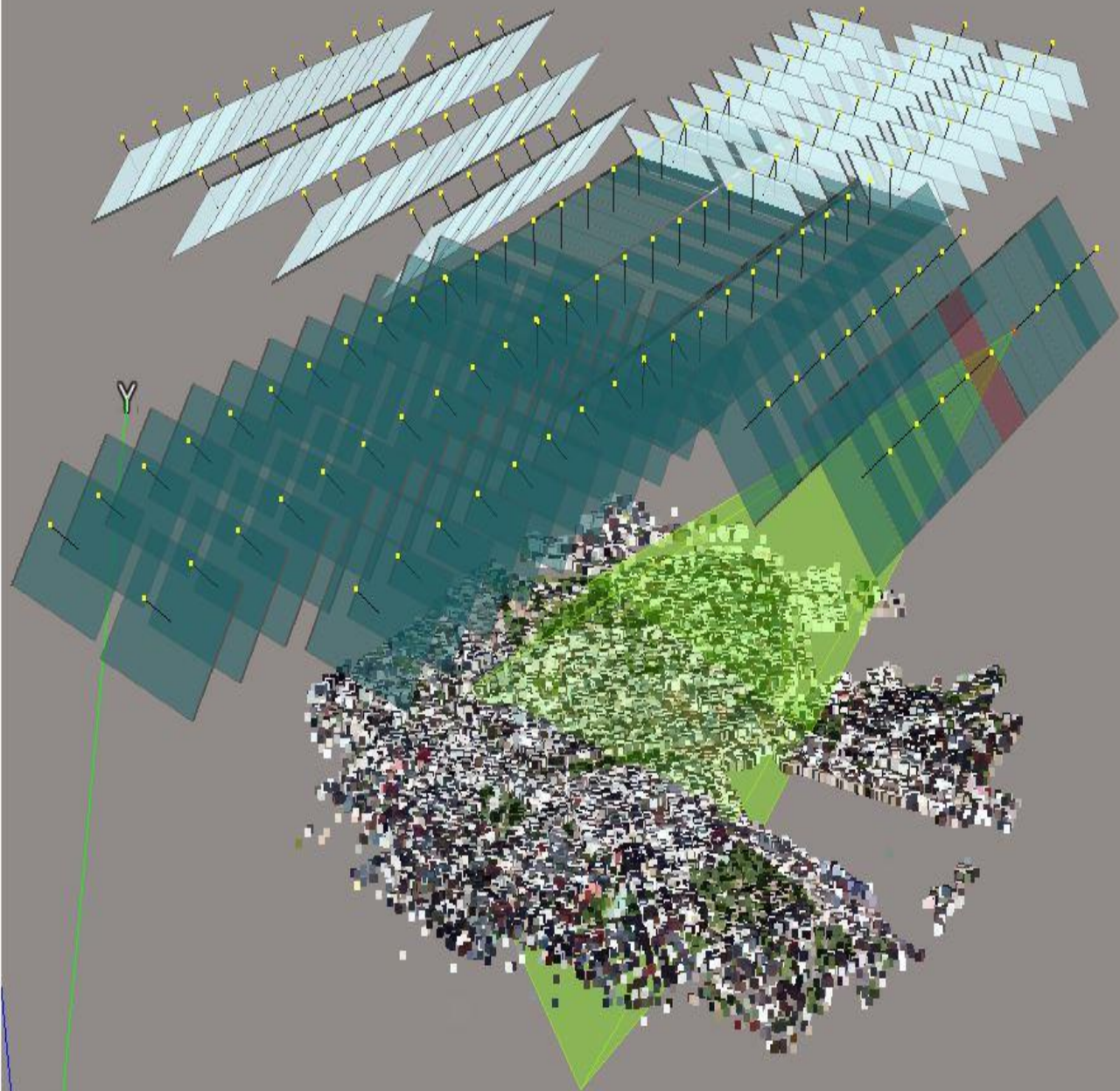
Semantics + Geometry







Mesh-model

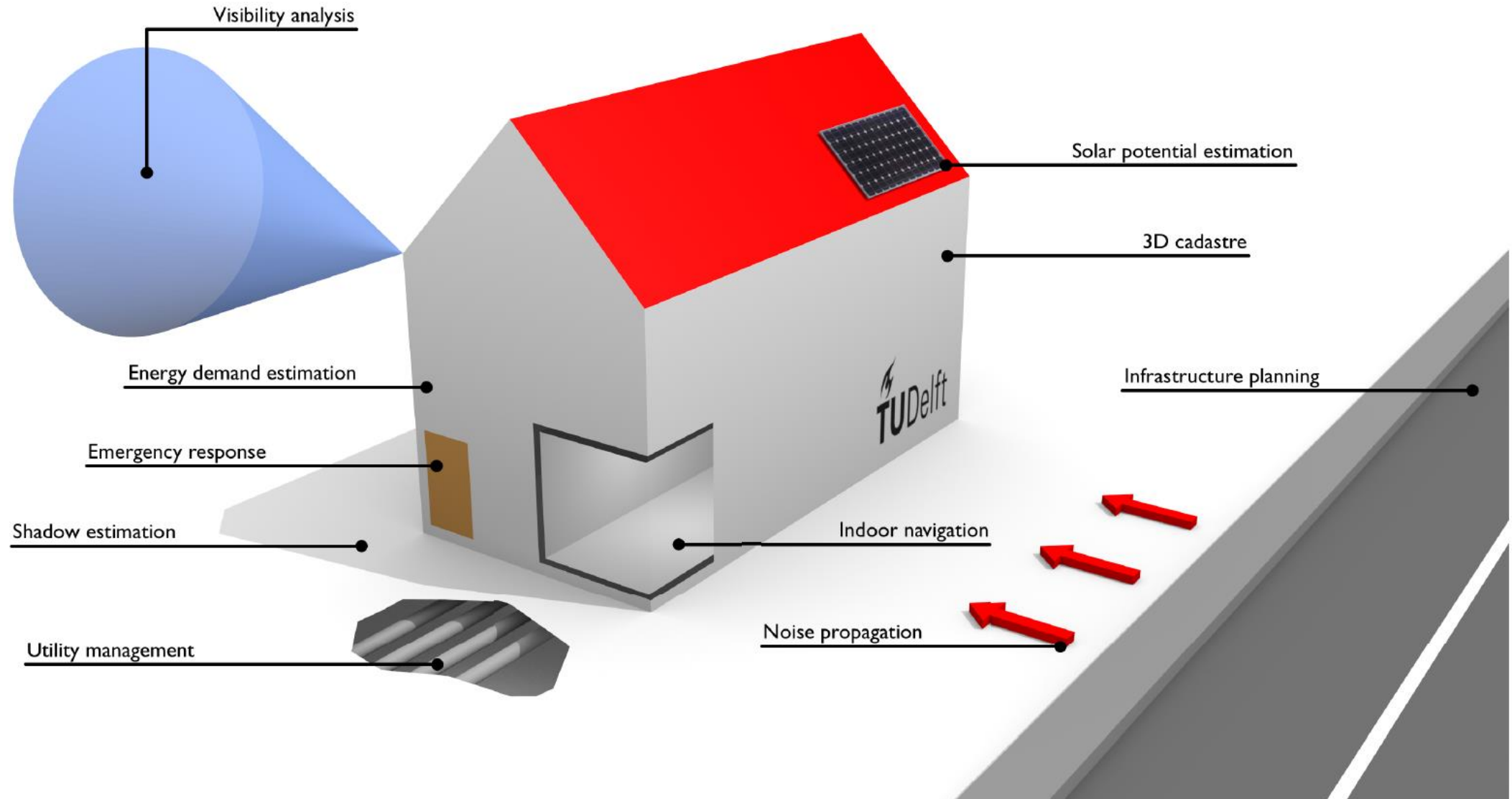


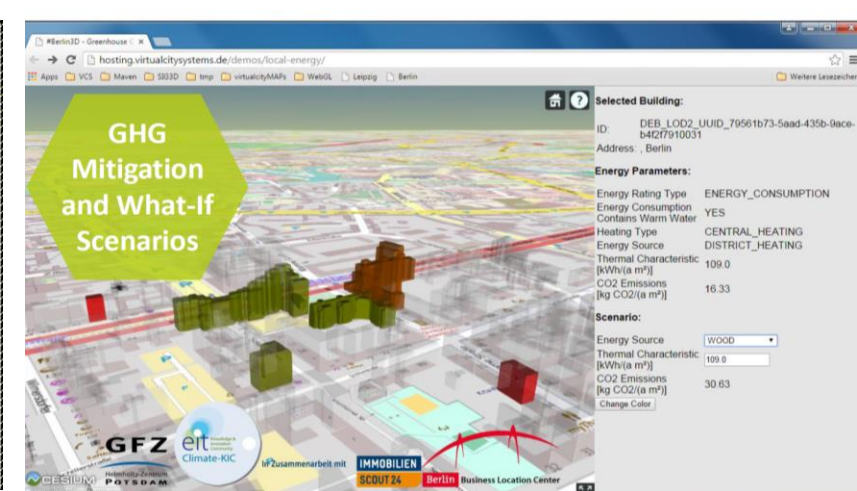
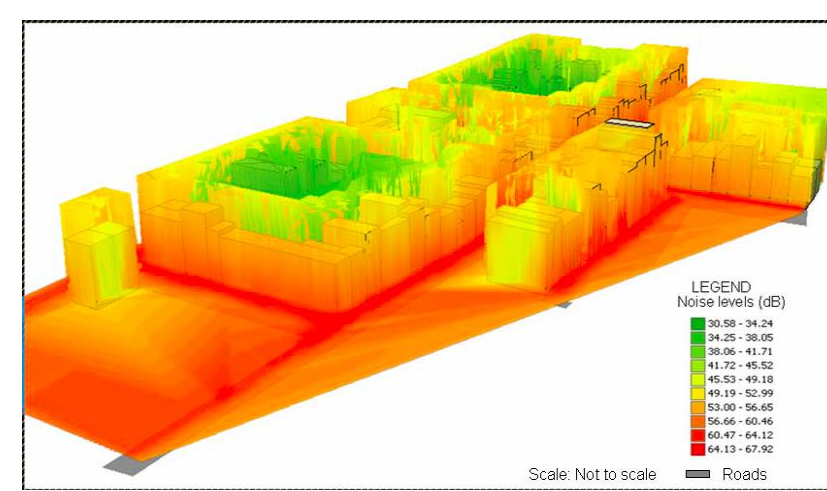
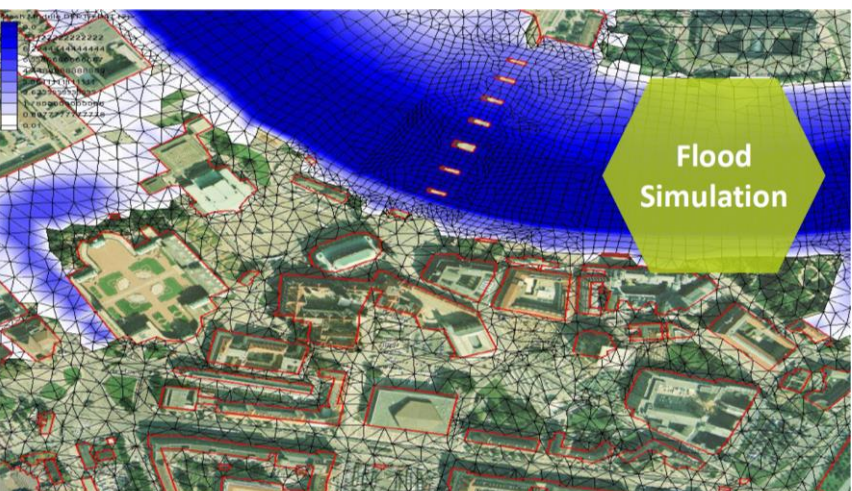
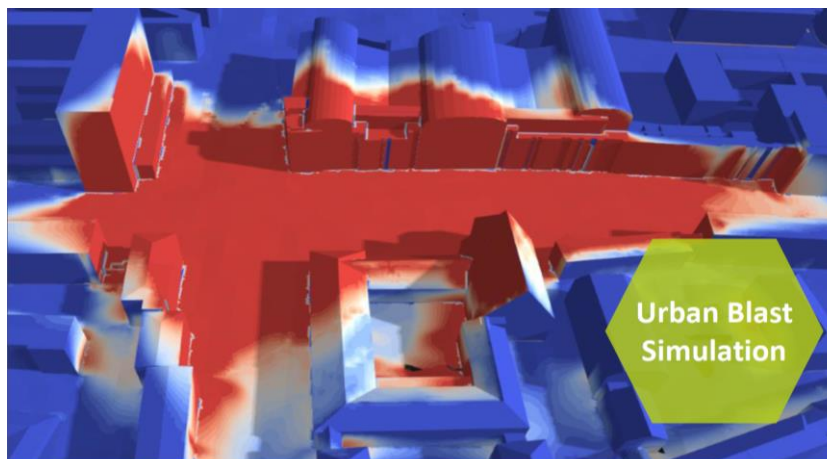
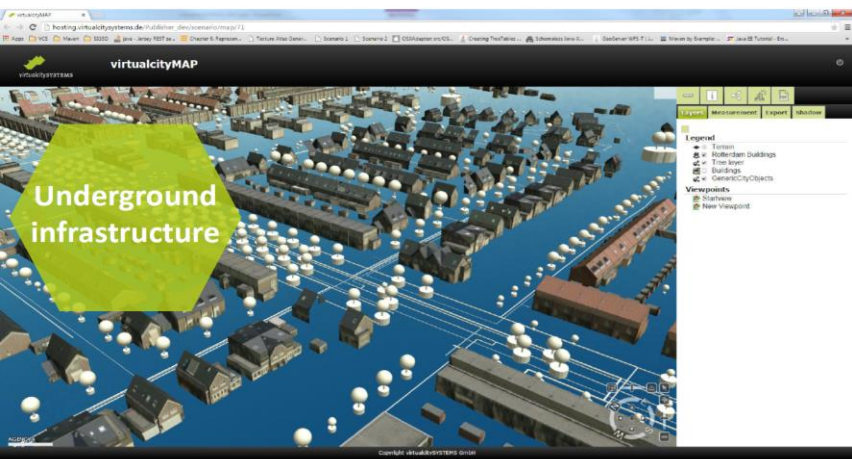
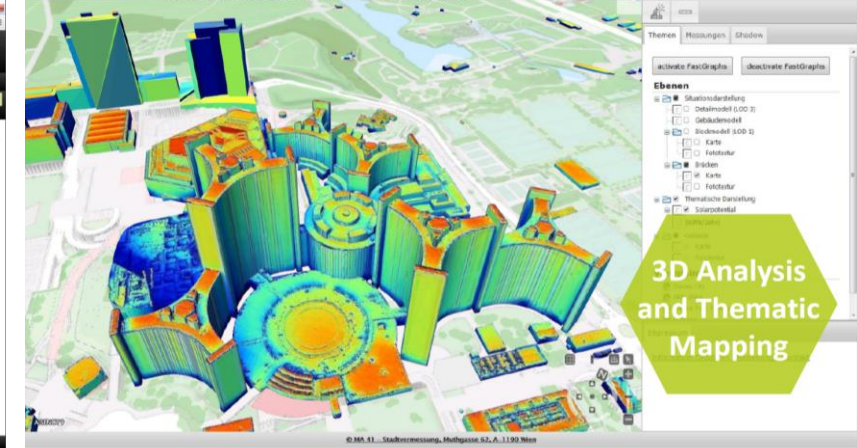
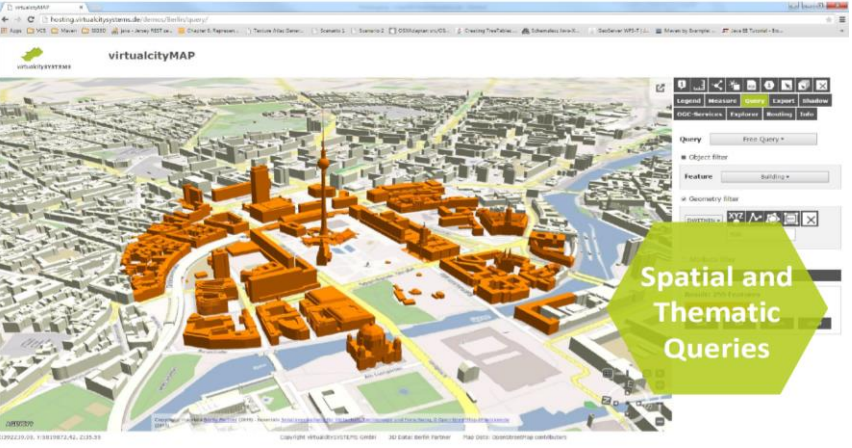


... what about the benefits ?

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

Applications of 3D City Models ...





KAUPUNKIMALLIEN KÄYTTÖTAVAT

HYÖTYKÄYTTÖ

SOVELLUS



SUURI VAIKUTUS

NOPEA HYÖTY 3 kk

- Analyysit
- Simulaatit
- Esittelymateriaali
- Tapahtuma[markkinointi]
- Projektimalli
- Datat visualisointi
-

TOIMINTATAVAN MUUTOS 12 kk

- Energia-atlas
- Vuorovaikutusalusta
- Tietomallien yhteiskäyttö
- Projektihallinta
- Hankehallinta
- Avoin data

HELPPO

VAIKEA

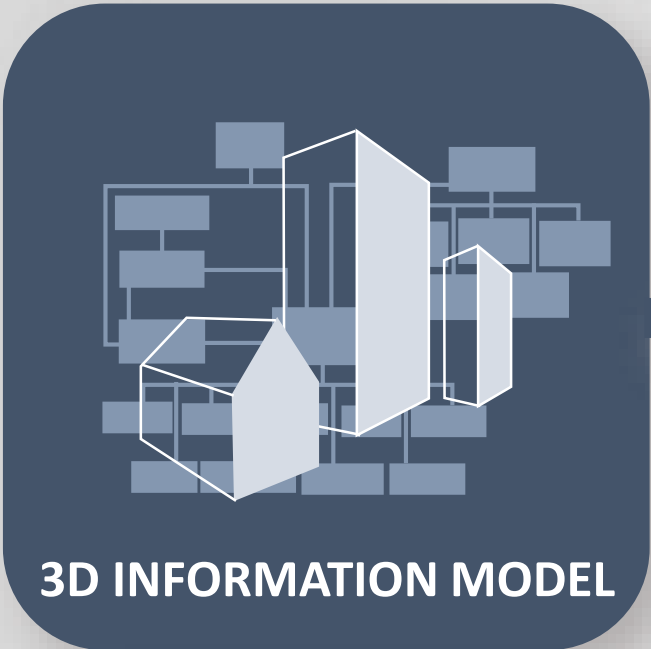
KOKEILUT 1 kk

- Esityslaitteet
- Teknologia
- Puuhastelu

NYHRÄYSTÄ ∞

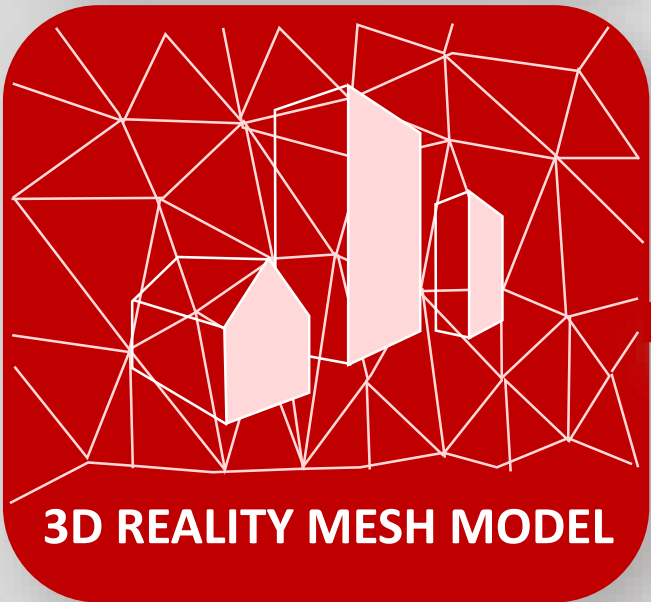
- Väärät valinnat
- Umpikuja...

PIENI VAIKUTUS



3D INFORMATION MODEL

| | |
|-------|-------|
| 023 | abc |
| 056 | def |
| 089 | ghi |
| | |



3D REALITY MESH MODEL

HELSINKI 3D+ UTILIZATION PILOTS PORTFOLIO

3D INFRASTRUCTURE

- 1 **Open Data** On-line Service / December 1. 2016
- 2 Model **maintenance** processes
- 3 Intranet Oblique Foto & LAS **service**

PROCESS DEVELOPMENT

- 4 CityGML/InfraModel/IFC **Collaboration**
- 5 3D Virtual **Parks** / Tree derivation from LAS data
- 6 **Underwater** Citymodel / Kruunusillat Bridge

SMART SOLUTIONS

- 7 Citizen **Interaction** Platform / Serious Gaming
- 8 **Underground** Service Tunnel Marketing / Serious Gaming
- 9 Urban development **energy use** simulation

URBAN ANALYTICS

- 10 Quality Indicators of **Urban space** / Aalto University
- 11 CO2 / GHG / **Emission analyses** / Low Carbon City Lab
- 12 **Solar Potential** Analyses / TUM



MAANALAINEN KAUPUNKIMALLI

Aleksin huoltotunneli



Helsingin kaupunki

RAKENNUSTEN ENERGIAN- KULUTUS

Havainnollistaminen
kaupunkimallilla

Available Attributes

Ratio CO2: 37.0 kg/m²/a
Classe CO2: D
Ratio Energy: 187.0 kWh/m²/a
Classe Energy: D
Ratio Water: 124.0 l/m²/a
Classe Water: B
RATU: 2304
Hours Week: 2600



Helsingin kaupunki

AURINKO- ENERGIA

Helsingin kaikilta
rakennuspinnnoilta



Helsingin kaupunki

An aerial 3D digital model of a city, likely Helsinki, showing various buildings, green spaces, and water bodies. A compass rose is visible in the upper left, and coordinate data (X: 2108474.3, Y: 69, Z: 528.86) is displayed near the top center. The title text is overlaid in large white letters.

TIETOMALLIEN YHTEISKÄYTTÖ RAKENTAMISESSA



Helsingin kaupunki

OGELIKONE

uusia polkuja
kaupunkisuunnittelu-
keskusteluun



Helsingin kaupunki



<http://www.businesslocationcenter.de/en/berlin-economic-atlas/download-portal/berlin3d-hackathon>



#Berlin3D - Hacking Berlin's City Model

- Six weeks event
- CityGML based open data [geometry] download portal
- Seven groups presented their projects to a wider international audience



Project 1: 3yourmind



Professional 3D printing of individual buildings from the city model

3D printing allows building models to be produced in different materials essentially right at your fingertips. Therefore, in addition to plastic and ceramics, even metals such as steel and silver are available. By combining the data created by #3D-Berlin with the 3D printing comparison platform 3D-button.com, it is possible to forward individual buildings or whole city districts to 3D printer operators. Thus, users can easily have any area of Berlin printed out without having to own a 3D printer. It works by simply selecting the chosen area in the city map and then pressing the button for 3D printing. The possible printing materials and prices are displayed immediately. By comparing various 3D printer operators, the user can optimize the experience by comparing price, delivery time or quality. The print is then sent to them in a few days, safely packed.

Contact Information

Justus Loge


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3D-button online at: 3d-button.com 

3YOURMIND online at: 3yd.de 



Project 2: Flatmatch, Robert Buchholz



Virtual Apartment Tours in 3D

In Germany alone, millions of people look for a new apartment each year. Real estate platforms on the Internet allow seekers to find dozens of potentially suitable apartments in the shortest possible time. However, they are not a great help when actually trying to select the most suitable property from the pre-selected apartments. The final selection process still needs to be done by means of exhausting and time-consuming visits to the property, something that's not even possible when looking for an apartment from another location.

FlatMatch allows you to view the flat virtually in your web's browser. FlatMatch generates a virtual three-dimensional view of the apartment and its surroundings based on a color-coded floor plan and open geodata. Directly in the web browser, the visitor can then move freely throughout the virtual apartment and visit it in this way.

Thanks to the release of the "3D City Model of Berlin", FlatMatch no longer has to rely on purely abstract building data from the OpenStreetMap project to simulate the apartment landscape in Berlin, but can display a building in its real form and its real appearance.


FlatMatch makes it possible to evaluate and compare apartments on your computer in a much safer way. Thus, FlatMatch reduces the time spent searching for a new apartment, and allows you to accurately find somewhere to live that is truly what you're looking for.

Contact Information

Dr. Robert Buchholz

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Prototype: flatmat.ch 



Project 3: Brainbox



Urban planning through visualizing and simulating planning processes

The BrainBox is a 10-meter high interactive installation and a unique place where visitors can learn about innovative projects from the “Smart City Berlin 2030” and develop urban visions of the future together in a playful way.

Where is the Berlin of tomorrow created? What exciting projects are there? And how do they contribute to sustainable urban development? The BrainBox is a new kind of public space in which access to information and planning of intelligent systems in our cities (Smart Cities) becomes a democratized process.

The BrainBox has a 360-degree projection system and an interactive table where complex issues are communicated and negotiated in a simple and understandable way with the help of playing cards. Additional information corresponding to each card appears on the screens: detailed overviews, multimedia content, connections to other maps, and precise locations within the urban space by means of a 2D view and the 3D city model.

The BrainBox is however not only a showcase for the Smart City research from the TU Berlin, but for all of Berlin, and has come to include more than 300 innovative projects, relevant persons, local requirements and framework conditions from all over the city as part of its digital catalog (Urban Gallery).

The BrainBox is a transdisciplinary research project at CHORA city & energy for urban design and sustainable urban planning in the city and is led by Professor Raoul Bunschoten. It is a place where urban planners and architects conduct research together with technologists, interactive artists and social scientists.

Contact Information

Jonas Schorr

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Project 4: GfZ Potsdam



Visualization of greenhouse gas emissions in public buildings

In the climate-KIC Initiative Low Carbon City Lab (LoCaL), the GFZ, South Pole Carbon Group (Zurich, Switzerland), the National Physical Laboratory (London, UK) and the Laboratoire des Sciences du Climat et de l'Environnement (Gif-sur-Yvette Cedex, France) have set the goal of using innovative methods to capture the greenhouse gas emissions in urban areas, preparing the data for decision-makers and making the savings effects from the introduced measures easy to check.

70% of the total anthropogenic GHG emissions generated today occur in cities. Calculations from the UN show that around 75% of global humanity will live in cities in the year 2050. The future growth rate is 1.8 percent per year, which is almost twice the global average growth rate. Thus, the future development of generated anthropogenic greenhouse gas emissions is linked to the development of urban space. The GFZ, together with its industrial partner virtualcitySYSTEMS, developed geoinformatics tools for spatial planning and data acquisition, a prerequisite for giving cities a better way to control and check their emissions.

As part of the #Berlin3D Hackathon, the GFZ integrated energy data from real estate platforms (ImmobilienScout24) into the 3D city model for Berlin. From this data (energy demand / consumption and energy sources), specific CO2 emissions are calculated using emission factors. Then, the calculated emissions can be visualized using the 3D city model.

Contact Information

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Martin Wattenbach


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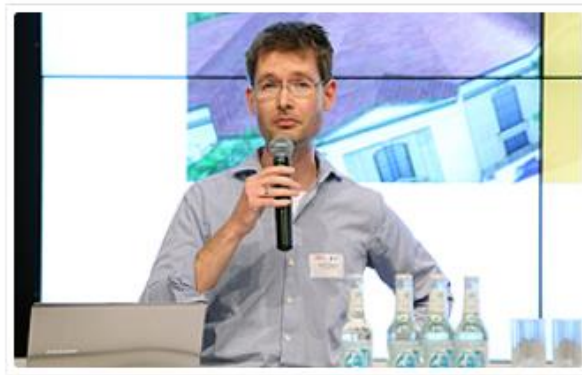
Stefan Lüdtkke

✉ sluedkte@gfz-potsdam.de

Ben Kuster

✉ bkuster@gfz-potsdam.de

www.climate-kic.org/programmes/low-carbon-city-lab 



Project 5: 3D Content Logistics



3D Smart Map with information on the Berlin economy

The aim of the project is to create and offer a web-based 3D map from the open data of the 3D city model for Berlin, combining it with other geodata, and using it in the field of urban analytics.

The 3D map based on SmartMap technology displays all the buildings in Berlin, including the real facade images – using a bird's-eye view from all four directions. The map can be easily integrated into your own web pages and is easily combined with other geodata (such as location information or real estate offerings) and analytics features.

The SmartMap is extremely robust and even very easy to use by non-experts. A special feature is that the image quality and the necessary transmission capacity are not dependent on the model's complexity. Therefore, the Berlin 3D city model can also be used efficiently on the Web and on mobile devices!

Contact Information

3D Content Logistics

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14482 Potsdam

Benjamin Hagedorn (Managing Director)

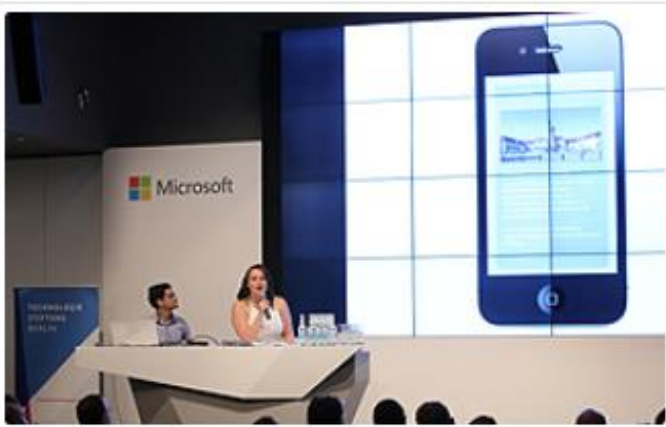
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<http://3dcontentlogistics.com/smartmap3dberlin>





Project 6: Amgad Agoub /Olga Bondarenko



CultiMapp

CultiMapp is an easy new way to explore Berlin. Open the app as you come across a building of interest and learn its story. See what cultural heritage jewels lie in your way as you go. Rotate and zoom into the building with the app's 3D viewer. Step into the past with the help of historical photographs blended into the 3D model and discover the meaning behind the architectural details. Whether you are a first-time visitor, or a seasoned Berliner, CultiMapp merges a rich cultural history with the simplicity of the mobile app.

Get the know as you go!

About

Amgad Agoub is a Master student for Geoinformation Sciences at the TU Berlin. Originally from Syria, Amjad resides in Berlin and is passionate about merging culture with cartography in new and exciting ways.

Olga Bondarenko is a Ukrainian-Cypriot writer and photographer who moved to Berlin and has yet to look back. An avid and active hacker and backer of all things culture, technology and geography.





Project 7: SchlarmannVisuals



Virtual city tour using a 3D headset

Forestage makes 3D models from all standard programs come to life by allowing you to walk through and experience them by means of virtual reality headsets. Compared to the conventional display formats, a more realistic impression is possible for projects that have only existed digitally until now.

In a few steps, construction plans can be visualized, technical equipment and machinery considered, tours through architectural draft designs can be taken or urban development measures from municipalities and administrations can be more accurately estimated. Above all, simple and intuitive use is the focus.

The software also offers features such as precise settings on the weather and the sun's position, or a multi-user function with which 3D environments can be used virtually by multiple people simultaneously, regardless of location.

Contact Information

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schlarmannvisuals.de/forestage 



3D+

Data validated and maintained
Models standardized
Infrastructure to deliver
Integrated to processes
Pilots for new workflows
Know how
Open data
Creativity



An aerial, high-angle view of a 3D city model of Helsinki, Finland. The buildings are rendered in a golden-yellow color, and the surrounding water is a deep blue. The city is densely packed with buildings, and the water is interspersed throughout the urban landscape. The text "HELSINKI 3D+" is overlaid in the center of the image.

HELSINKI 3D+

City of Helsinki / 3D City Information Model