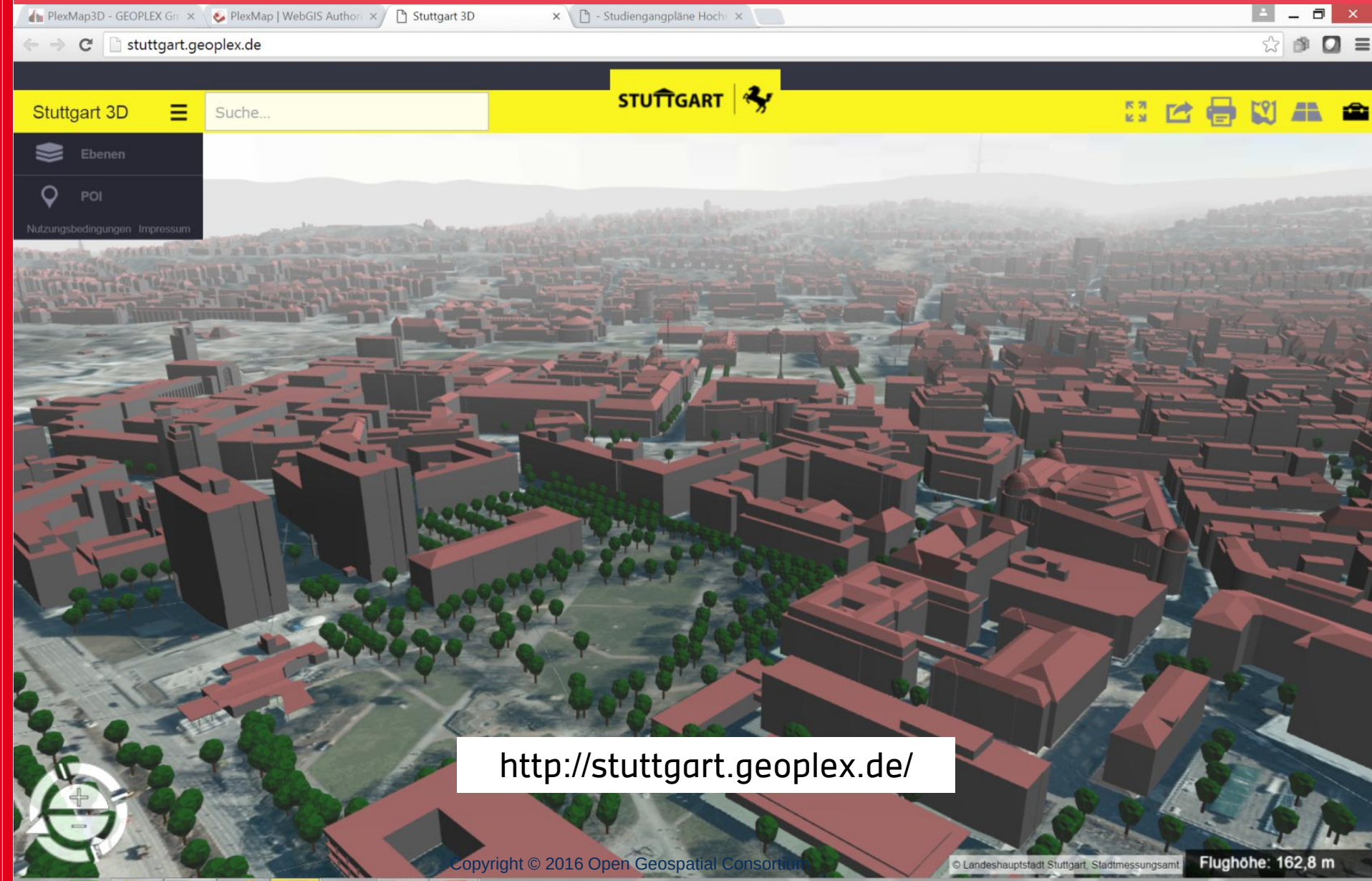
Towards an European Scale Platform for Urban Energy Simulation

Prof. Dr. Volker Coors

EULF Workshop on Methodologies for energy performance assessment based on location data, 12-14 September 2016, Ispra (IT)

Hochschule für Technik Stuttgart



The team

Focus on

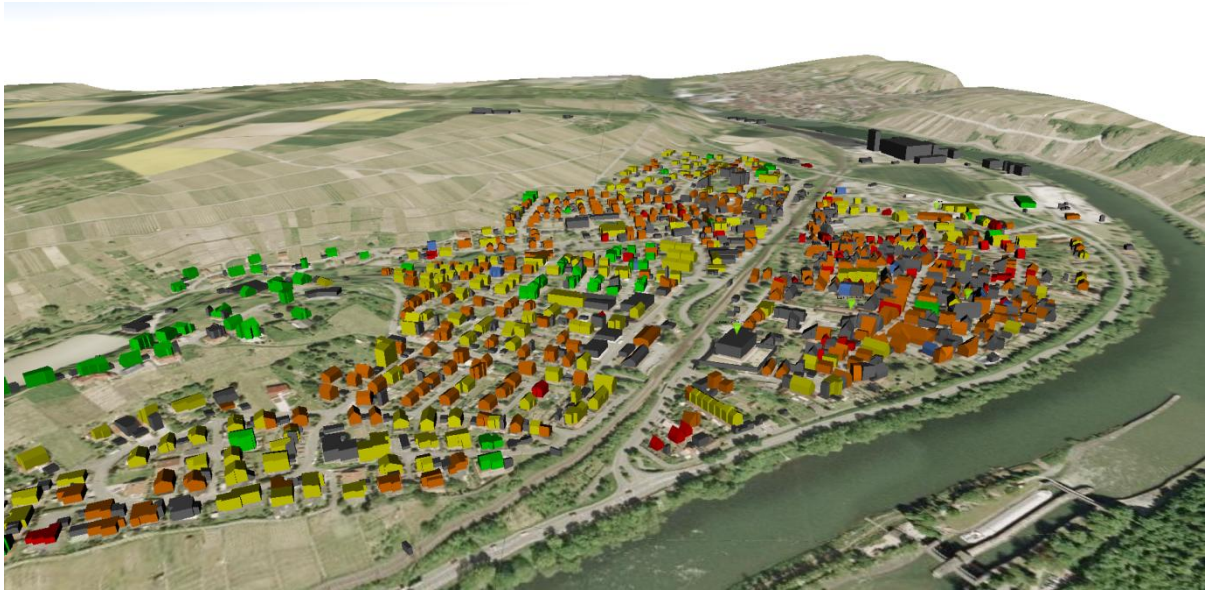
- 3D geospatial data infrastructure
- Urban simulation
- 3D visualization

Geoinformatics Contribution

- Simulation software on city level and beyond
- Provide suitable data sets for simulation and planning
- Make simulation and data accessable as easy as possible to professionals AND citizens by
  - Service-oriented IT infrastructure
  - Standards (OpenGeospatial consortium / INSPIRE)

Example: Energielabel Atlas NL

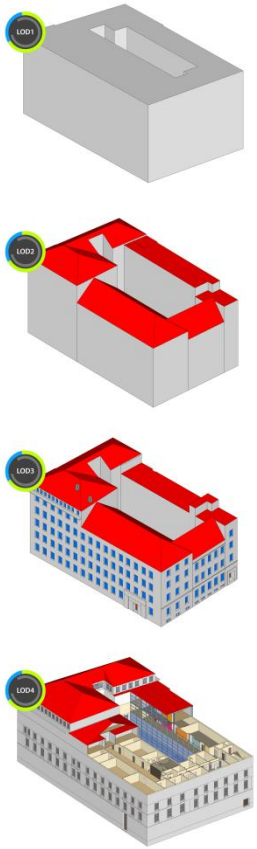
In 3D?!

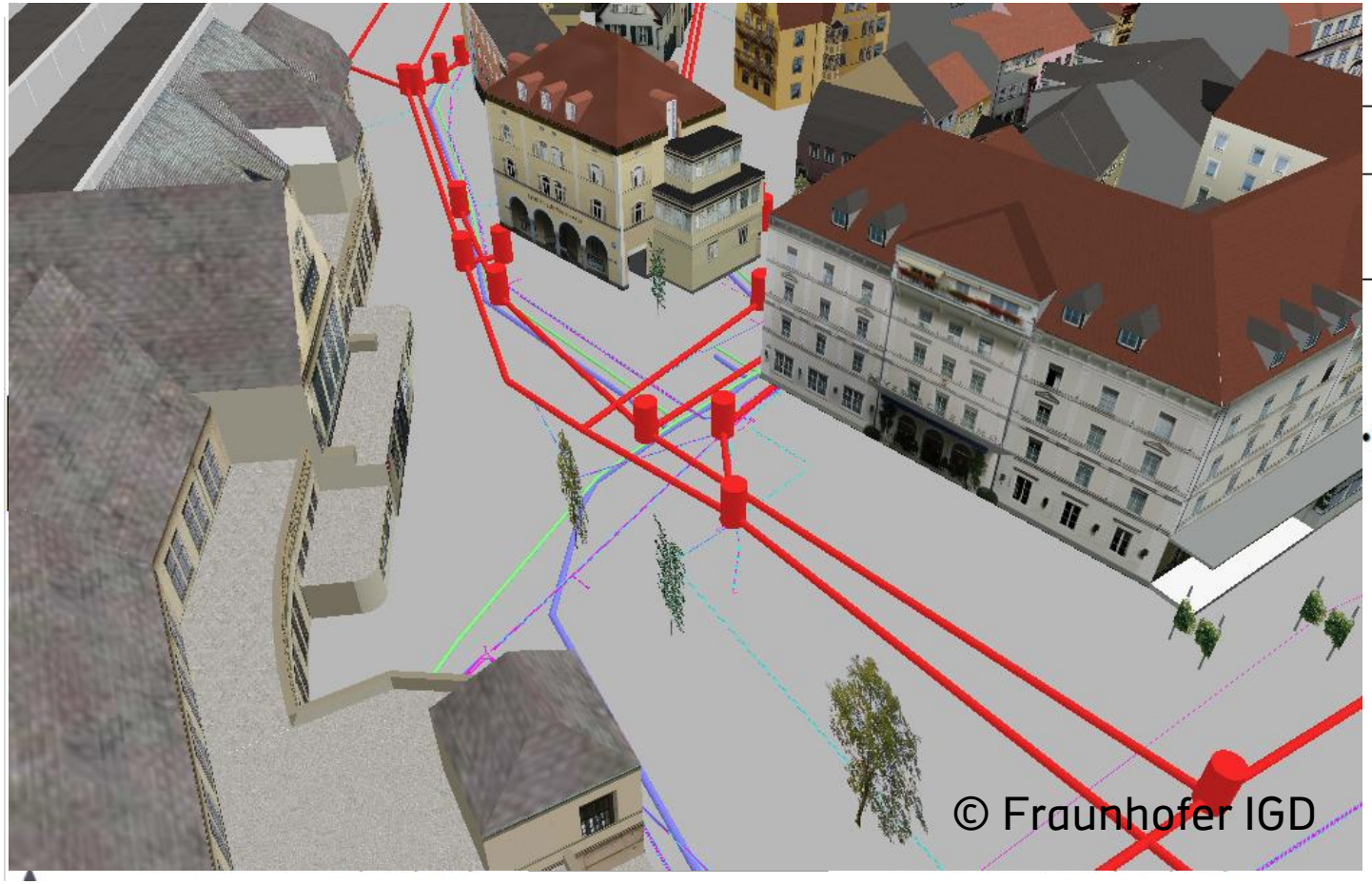


EU Joint Research Center
Energy and Location Workshop
November 2015

https://ec.europa.eu/jrc/en/publication/spatial-data-modelling-building-stock-energy-needs-proceedings-workshop-ispra-24-25-26-november-2015

CityGML





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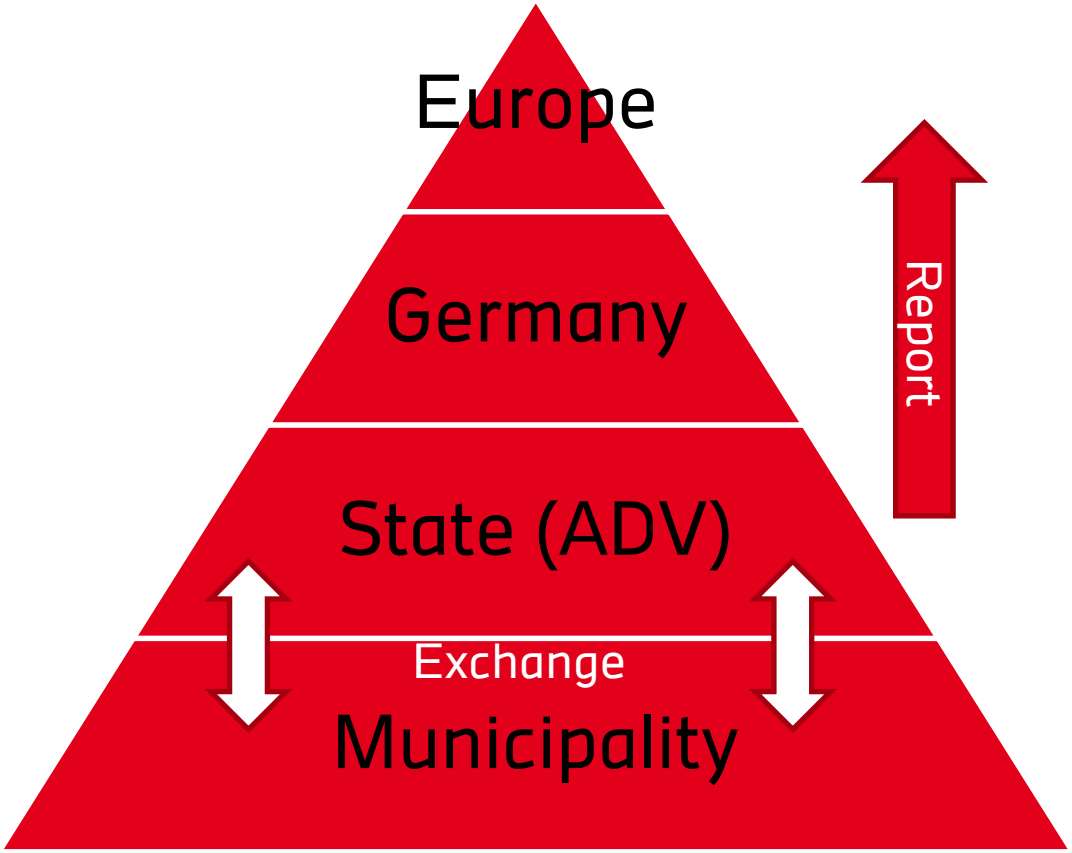
3D City Models



INSPIRE building model
(CityGML INSPIRE ADE)

CityGML ADV profile

CityGML ADV profile

CityGML
SIG3D Modelling Guide

Data availability

Germany:

- Almost all buildings available in LoD 1
- LoD 2 is work in progress, about 80% achieved
- Notopen data (besides Hamburg and Berlin)

Europe:

The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLI-B4, 2016
XXIII ISPRS Congress, 12–19 July 2016, Prague, Czech Republic

STATE-OF-THE-ART OF 3D NATIONAL MAPPING IN 2016

Jantien Stoter[a,b], Bruno Vallet[c], Thomas Lithen[d], Maria Pla[e], Piotr Wozniak[f], Tobias Kellenberger[g], Andre Streilein[g], Risto Ilves[h], Hugo Ledoux[b]

[a]Kadaster, Apeldoorn, Jantien.stoter@kadaster.nl
[b]3D Geoinformation, Delft University of Technology, Delft, The Netherlands, {H.Ledoux|J.e.stoter}@tudelft.nl
[c]IGN, France, bruno.vallet@ign.fr
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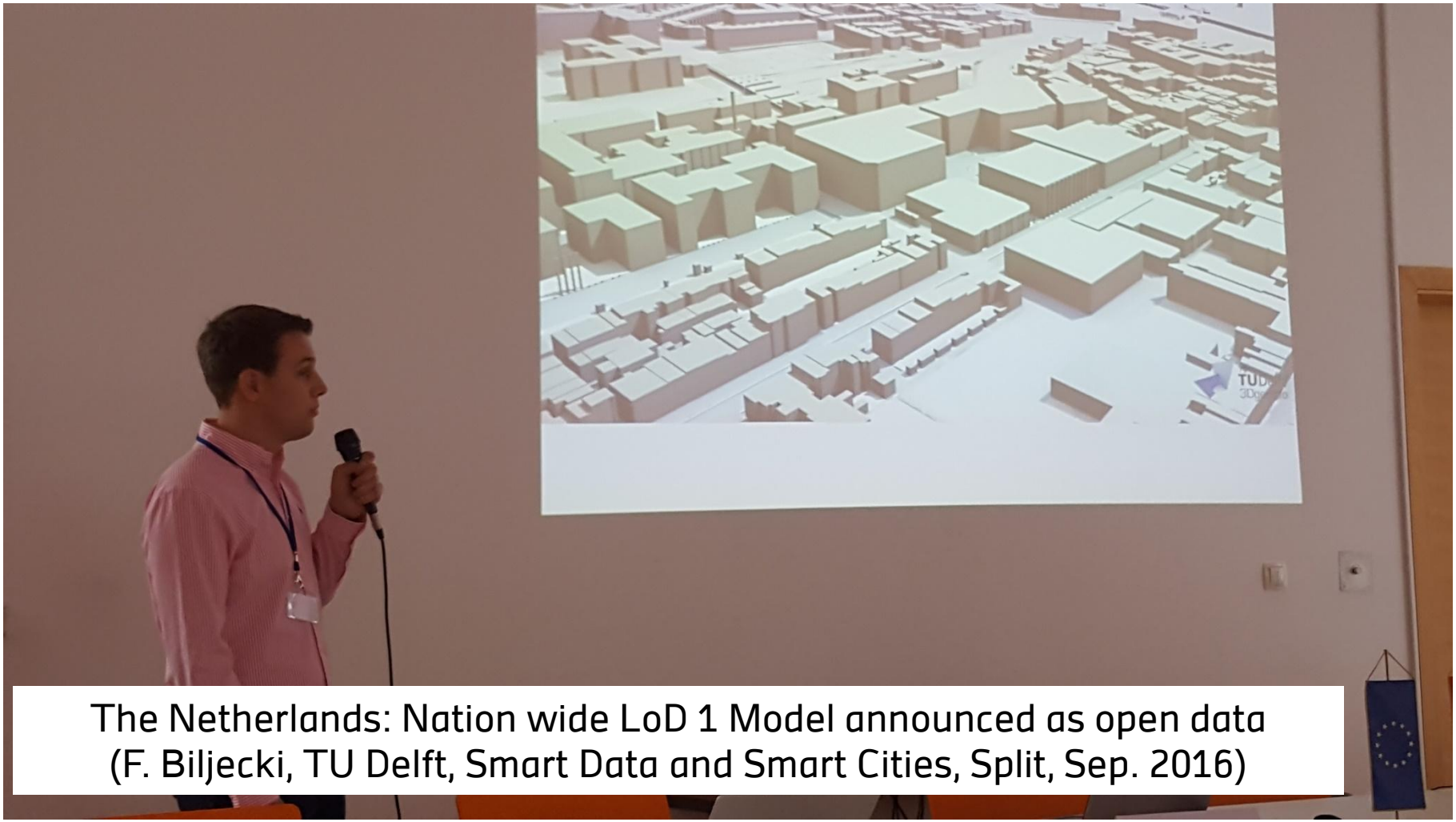
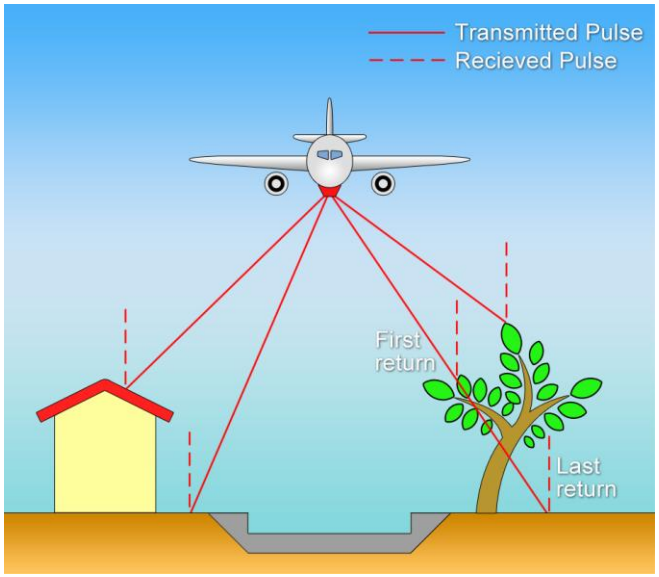
[e]ICGC, Catalonia, maria.pla@icgc.cat
[f]Gugik, Poland, piotr.wozniak@gugik.gov.pl
[g] swisstopo, Tobias.Kellenberger@swisstopo.ch, Andre.Streilein@swisstopo.ch
[h]NLS, Finland, risto.ilves@maanmittauslaitos.fi

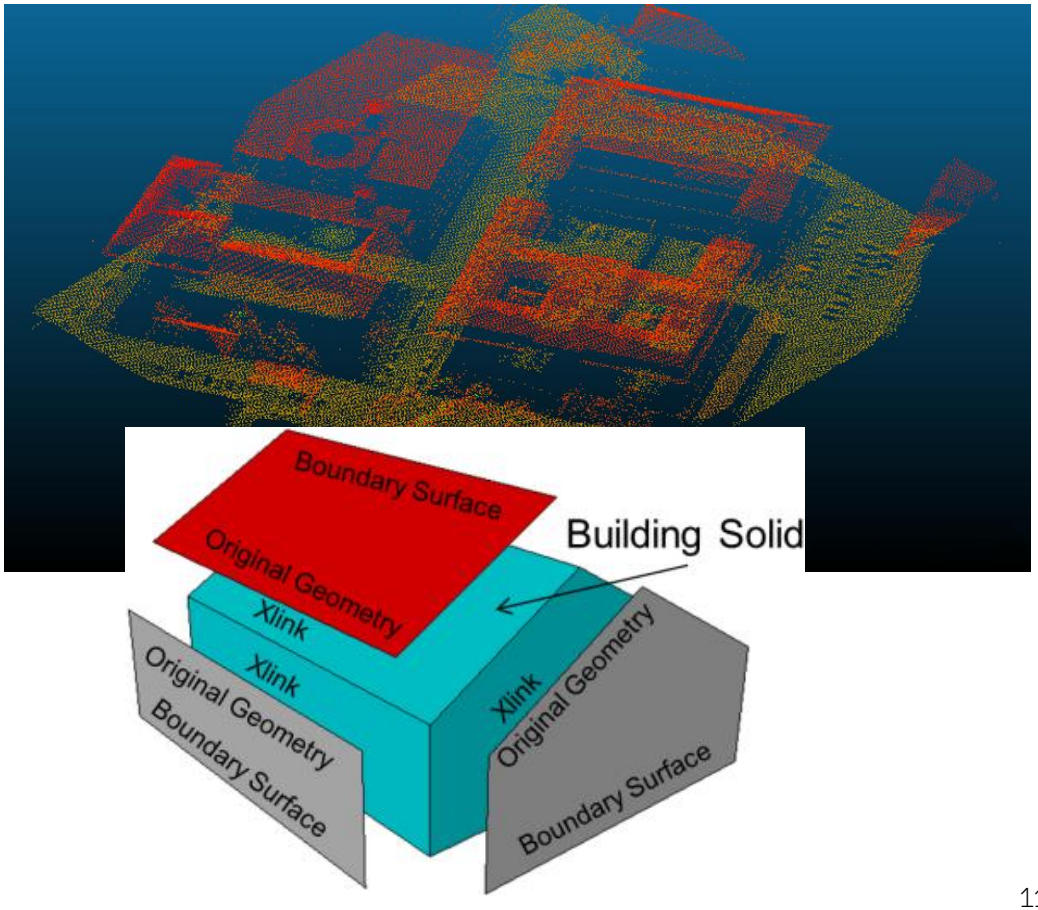
Data availability

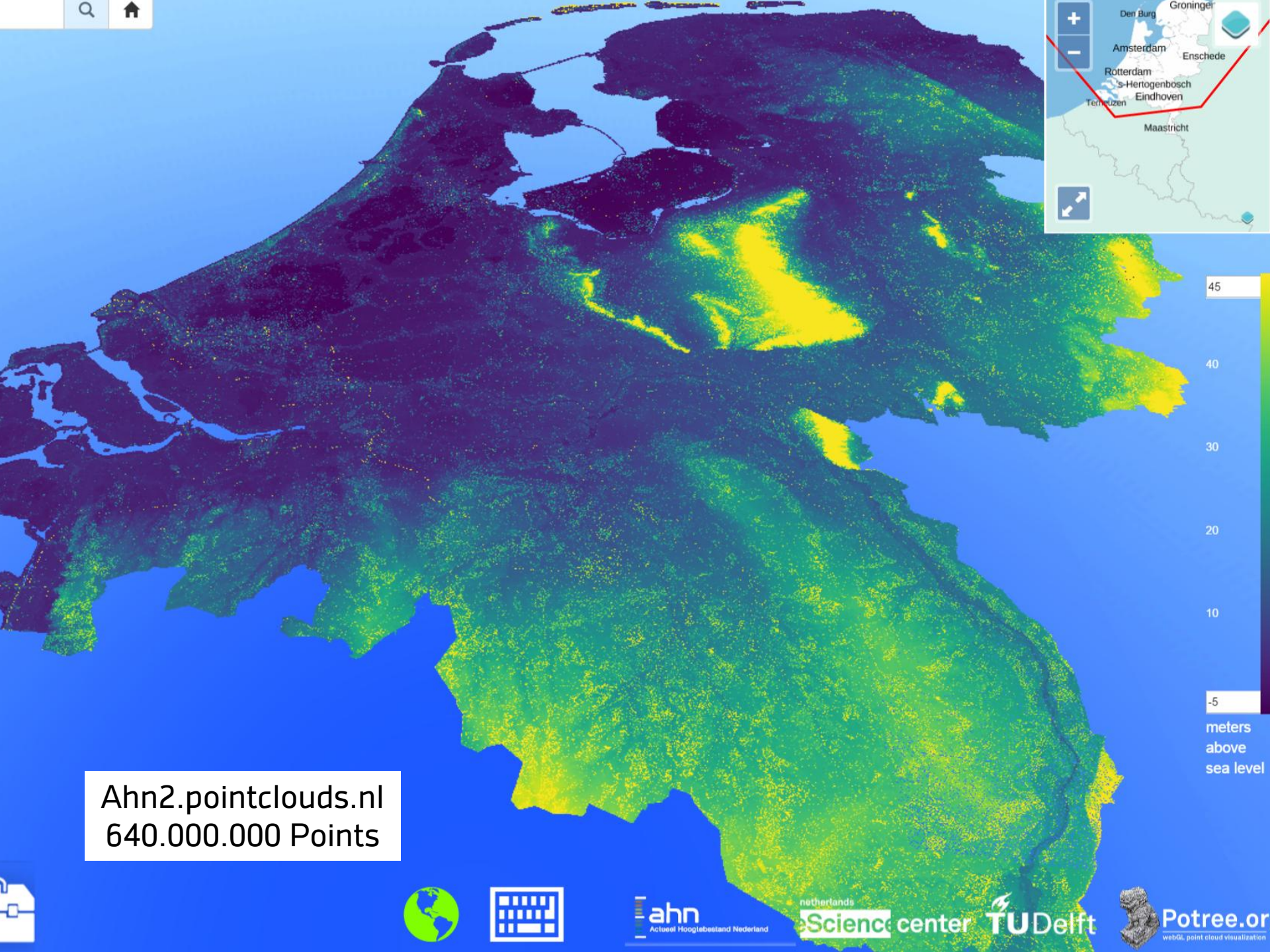


The Netherlands: Nation wide LoD 1 Model announced as open data
(F. Biljecki, TU Delft, Smart Data and Smart Cities, Split, Sep. 2016)

3D Building Model






Den Burg
Groningen
Amsterdam
Enschede
Rotterdam
's-Hertogenbosch
Eindhoven
Terneuzen
Maastricht
45
40
30
20
10
-5
meters
above
sea level
Ahn2.pointclouds.nl
640.000.000 Points
ahn
Actueel Hoogtebestand Nederland
netherlands
eScience center
TU Delft
Potree.org
webGL point cloud visualization

3D building model

Hochschule für Technik Stuttgart

Urban Simulation

SimStadt

3D City model

Building Attributes

3D-Geodatenserver

Quality check tool

CityDoctor

Irradionce & shadow

Building Libraries

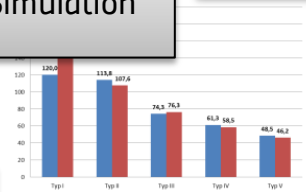
 # Building Physics
 # Building usage
 # Refurbishment scenarii

SimStadt

Analysis

Simulation

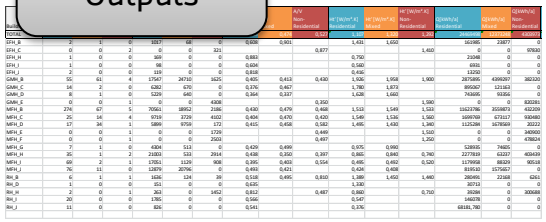
Simulation Model



2D Map

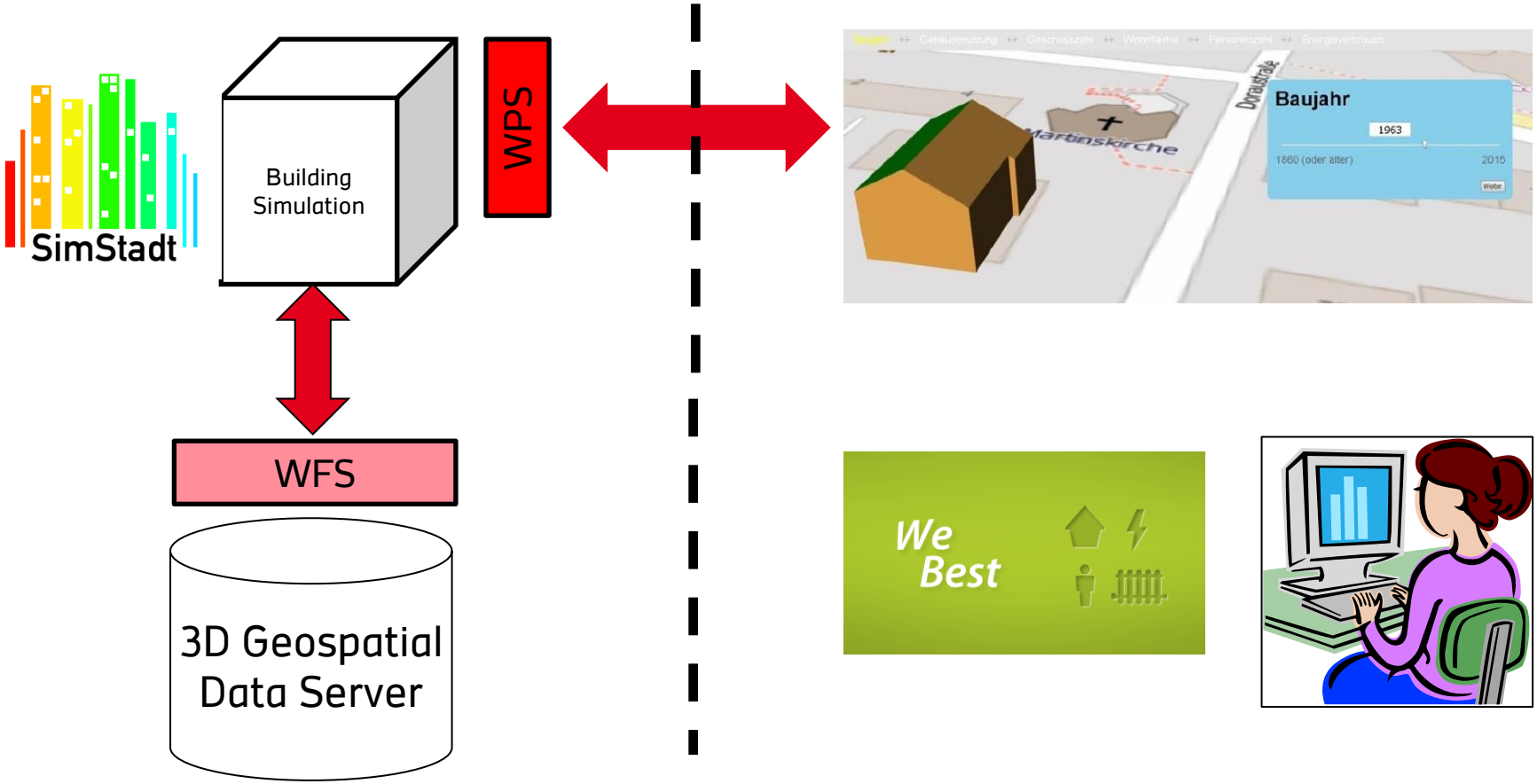
3D Viewer

Export Outputs

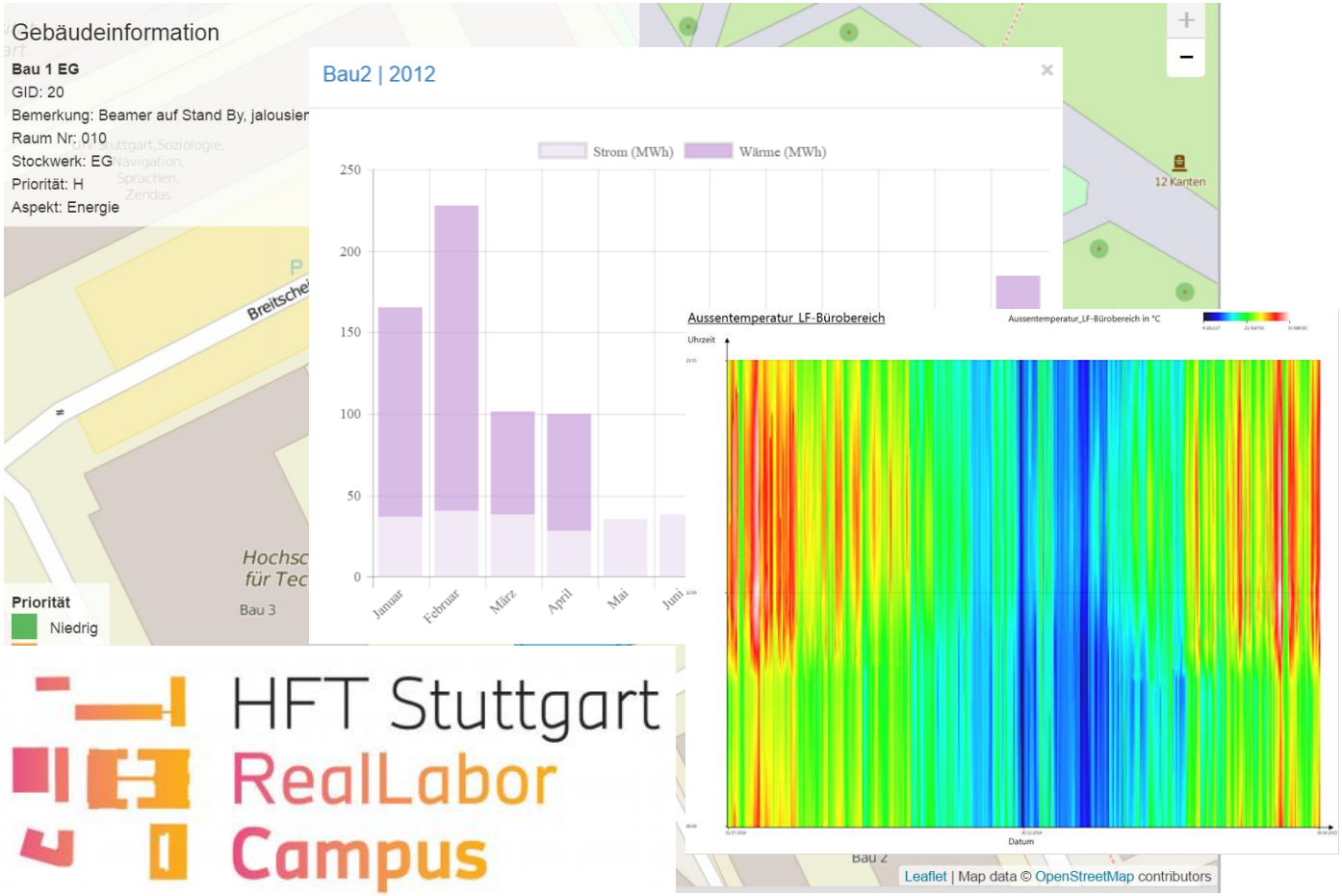


SimStadt: Heat Demand

Simulation as a Service for citizens



Sensor Observation Service (SOS)



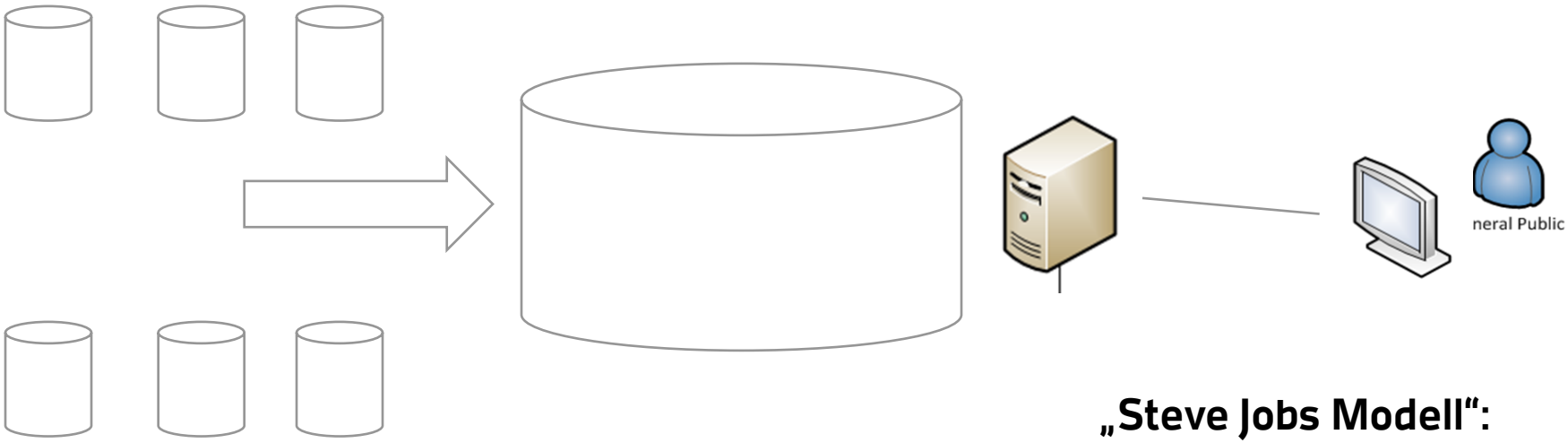
HFT Stuttgart
RealLabor
Campus

http://www.hft-stuttgart.de/Forschung/Reallabor/

Web-based Visualization

Data Mangement: Sirene Server

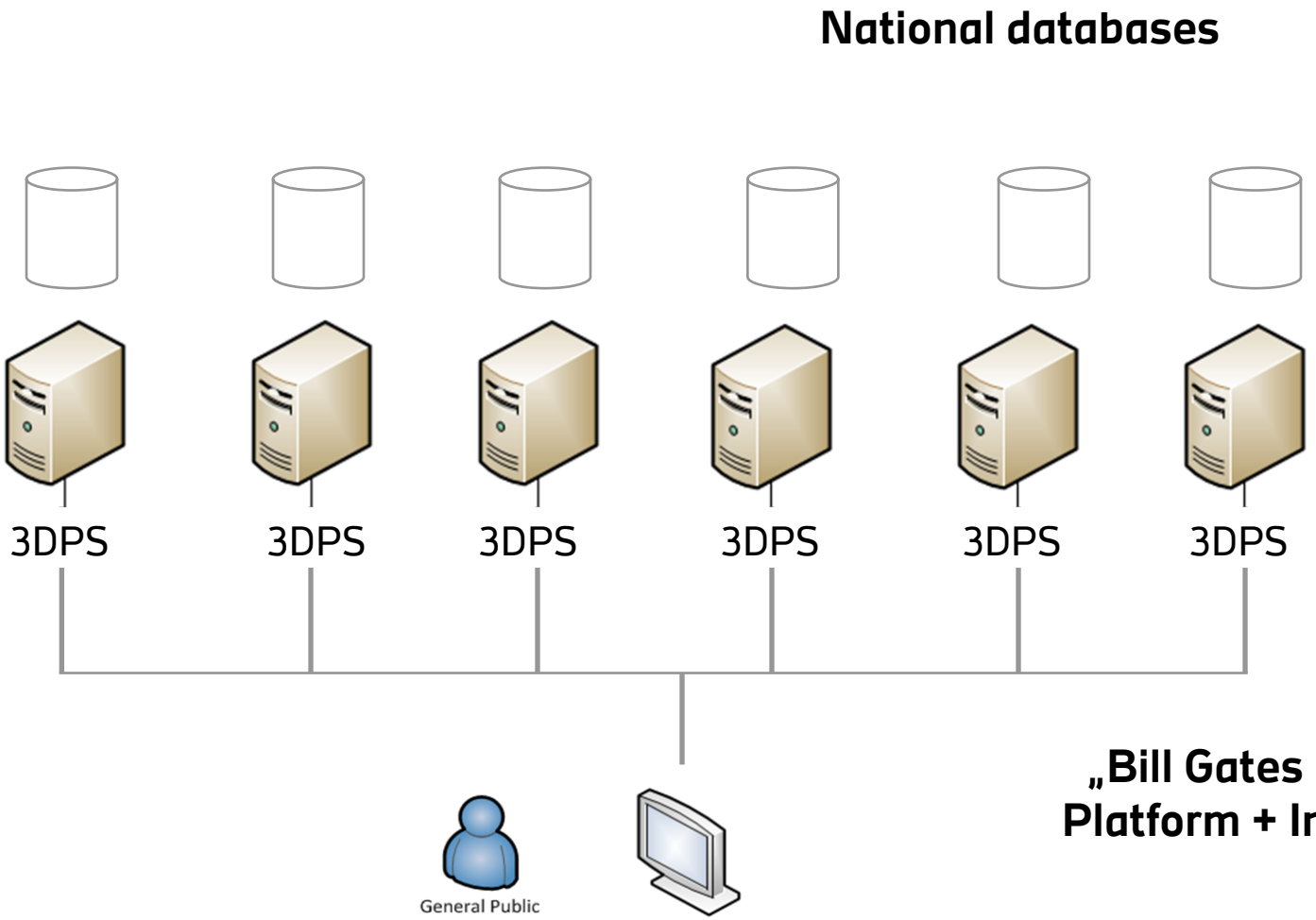
Centralized 3D database on european level



„Steve Jobs Modell“:

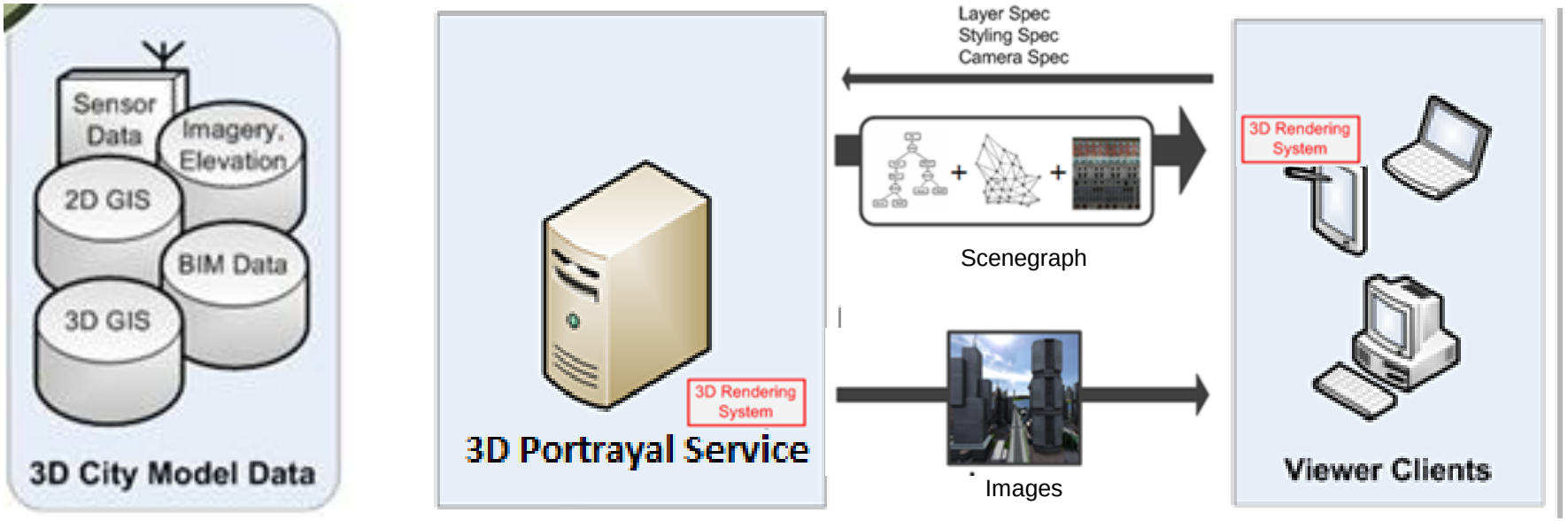
Sirenenserver nach J. Lanier: Wem gehört die Zukunft?

Distributed Databases



3D Pilotprojekt Heckfeld

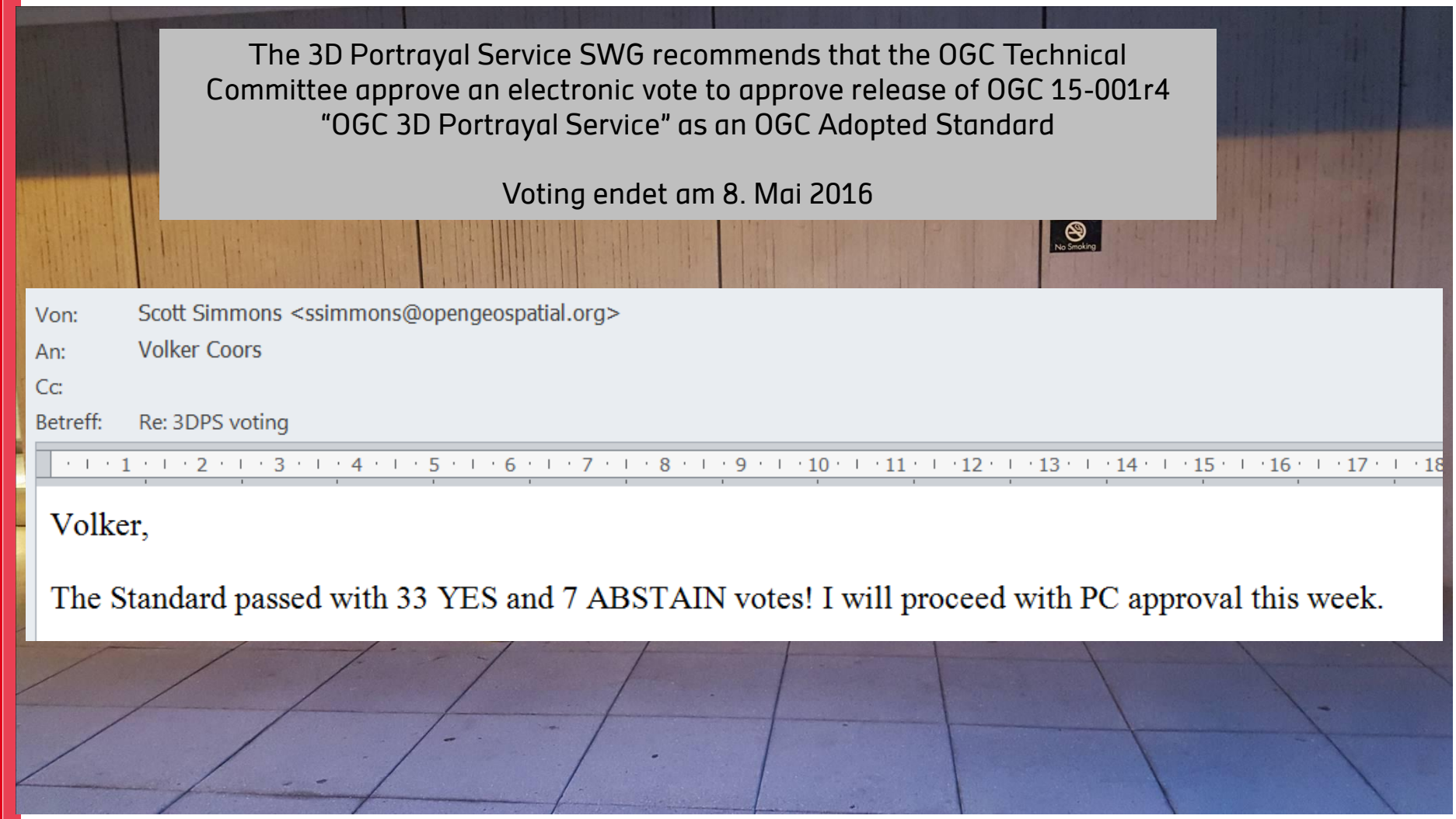
3D Portrayal Service



Standard Working Group gegründet 2013 (OGC TC Meeting ESRI, Redlands)
Chair: Volker Coors, Fraunhofer IGD / HFT Stuttgart
Co-Chair: Thorsten Reitz, ESRI
Editors: Benjamin Hagedorn, HPI & Simon Thum / Ralf Gutbell, Fraunhofer IGD

The 3D Portrayal Service SWG recommends that the OGC Technical Committee approve an electronic vote to approve release of OGC 15-001r4 "OGC 3D Portrayal Service" as an OGC Adopted Standard

Voting endet am 8. Mai 2016



Von: Scott Simmons <ssimmons@opengeospatial.org>
An: Volker Coors
Cc:
Betreff: Re: 3DPS voting

Volker,

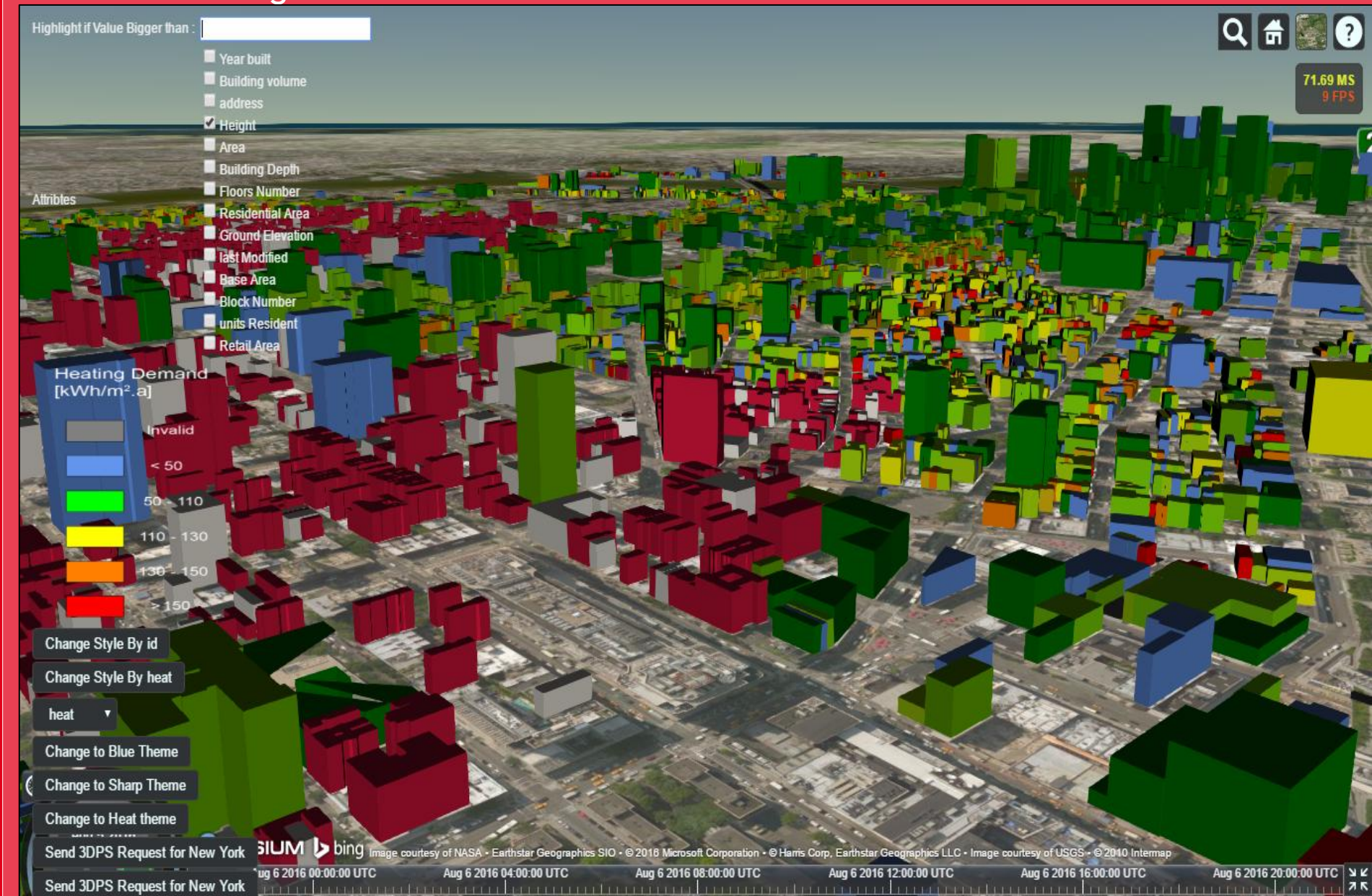
The Standard passed with 33 YES and 7 ABSTAIN votes! I will proceed with PC approval this week.

Hochschule für Technik Stuttgart

HFT Forschung

Hochschule für Technik Stuttgart

HFT Forschung



Related projects

Serviceorientierte Architektur für Smart Cities

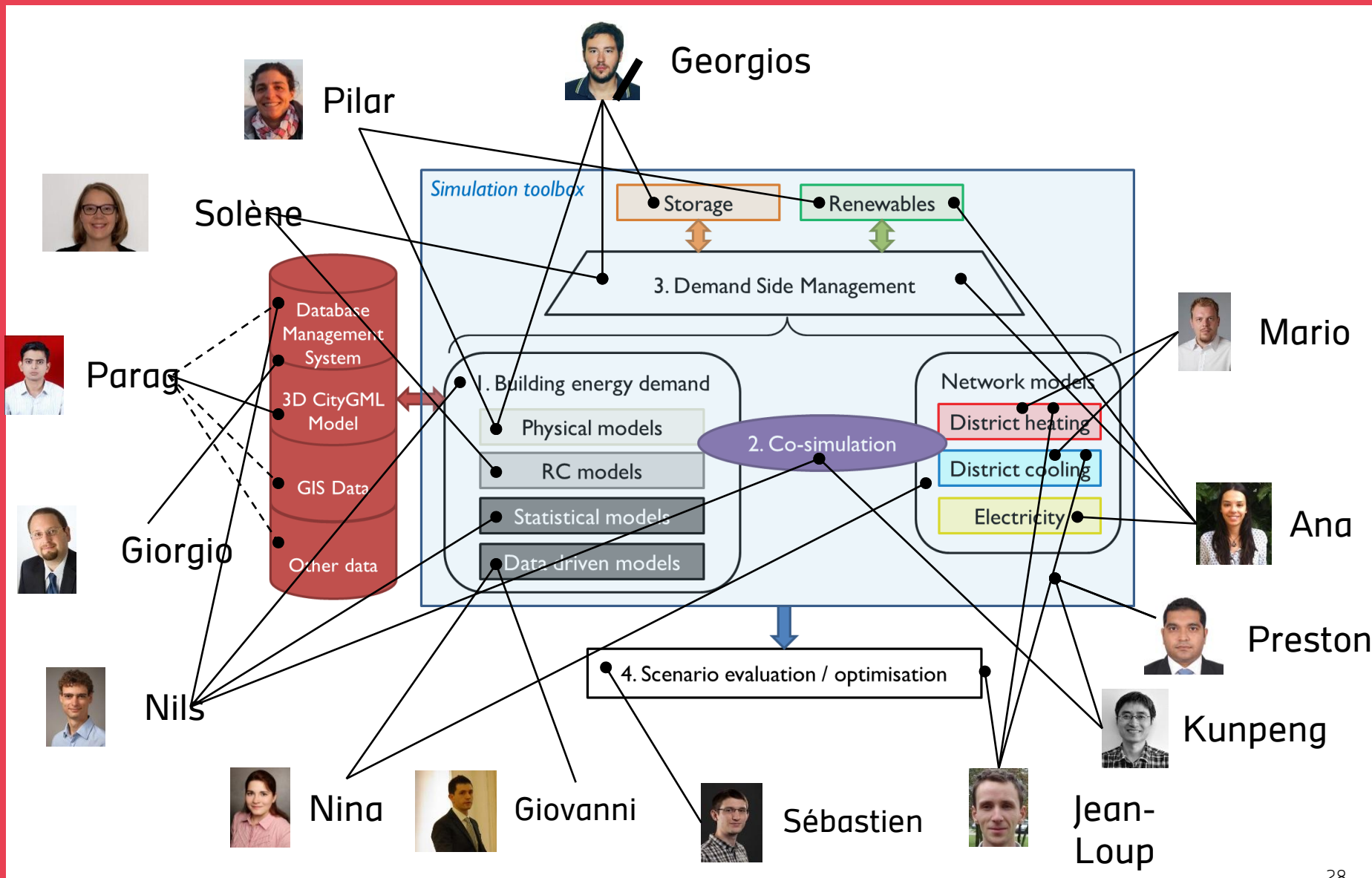
Co-funded by the Intelligent Energy Europe Programme of the European Union

CINERGY

http://www.ci-nergy.eu/

Ministerin Theresia Bauer eröffnet Zentrum Angewandte Forschung Urbane Energiesysteme und Ressourceneffizienz (Ensource)

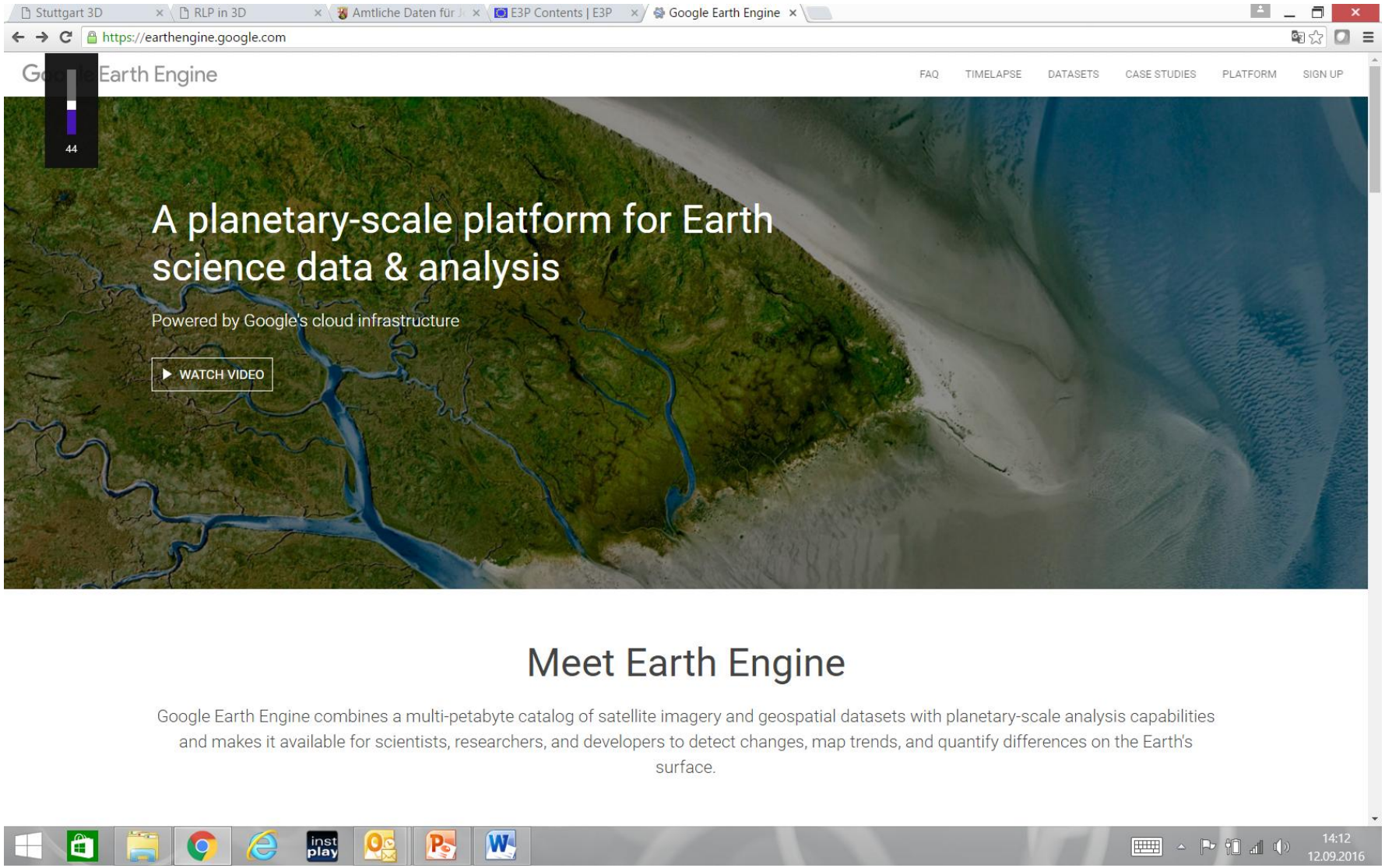
ENsource


Georgios
Pilar
Solène
Simulation toolbox
Storage
Renewables
3. Demand Side Management
Database Management System
3D CityGML Model
GIS Data
Other data
1. Building energy demand
Physical models
RC models
Statistical models
Data driven models
2. Co-simulation
Network models
District heating
District cooling
Electricity
4. Scenario evaluation / optimisation
Parag
Giorgio
Nils
Nina
Giovanni
Sébastien
Jean-Loup
Kunpeng
Preston
Ana
Mario

i_Cities (BMBF)

2017-2020 (4 years), 5 Million Euro funding

Proposal


Stuttgart 3D
RLP in 3D
Amtliche Daten für
E3P Contents | E3P
Google Earth Engine
https://earthengine.google.com
Earth Engine
FAQ
TIMELAPSE
DATASETS
CASE STUDIES
PLATFORM
SIGN UP
A planetary-scale platform for Earth science data & analysis
Powered by Google's cloud infrastructure
WATCH VIDEO
Meet Earth Engine
Google Earth Engine combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities and makes it available for scientists, researchers, and developers to detect changes, map trends, and quantify differences on the Earth's surface.
14:12
12.09.2016

Overall aim

- Distributed 3D building database for Europe
- Services for bulding energy performance analysis / simulation accessable via web-browser
- Upload of demain specific attribute data sets to refine database

- Challanges:
  - Minimum data requirement: LoD 1 building model, year of construction and building usage
  - The more data the better the simulation (refurbishment etc)
  - Data privacy, conditions of data usage
  - Performance

Iterative Development

1. Heating demand simulation based on INSPIRE building LOD1 data set (Ludwigsburg / LGL BW data set); tools: Georocket, SimStadt, Cesium for web based 3D visualization using 3D Portrayal Service

2. Add a second similar use case for another european city (Vienna?)

3. Develop guideline and interface for other cities to participate; either by setting up an own server or upload data set

4. Scale to national / state level (BW, The Netherlands, …)

Kontakt

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http://www.coors-online.de

Steinbeis-Transferzentrum
Technische Beratung an der
Hochschule für Technik Stuttgart

Our Contribution