# 3D Modelling with Esri CityEngine for the City of Tomorrow

# SMART CITY PROJECT MORGENSTADT

Prof. Dr. Jörg Schaller
Esri Deutschland Group GmbH

Konference GIS Esri v ČR
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# 3D Modelling with Esri CityEngine for the City of Tomorrow

Project Partners:

- City of Cologne, Germany
- Fraunhofer Institute IAO
- Esri Germany
- Prof. Schaller UmweltConsult (PSU)
- TUM – Chair of Strategy & Management of Landscape Development

# 3D Modelling with Esri CityEngine for the City of Tomorrow

Goal: 3D GIS analysis &presentation of development scenarios for the district of Mülheim South

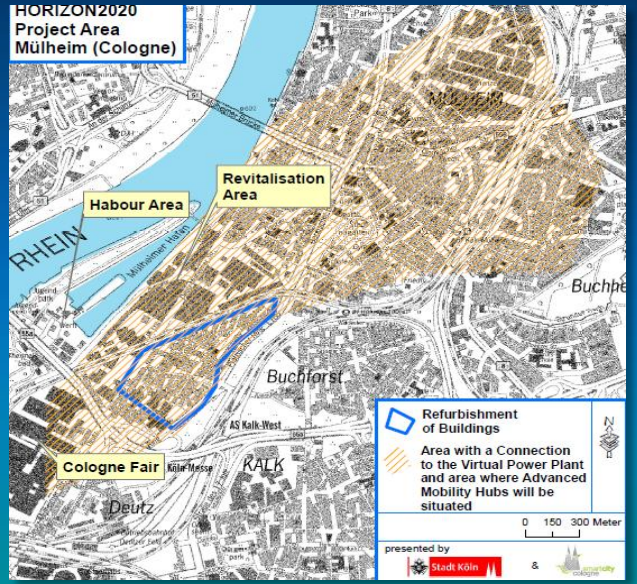
Objectives:

- Implementation of a holistic approach for sustainable urban development
- Modernization of the district, including residential and office buildings: How can sustainable and smart technologies (building, energy, mobility) be integrated into a particular social environment?
- Presentation of the current situation and modeling of future development scenarios

Web Applications for Smart City Cologne:

- Future use of the 3D city model for various tasks (e.g. city planning process, public participation energy and environmental modelling & optimization, flood modeling)

# Project Area




# Morgenstadt Module 1
## Green Industry Parks, Conversion Areas & New Districts

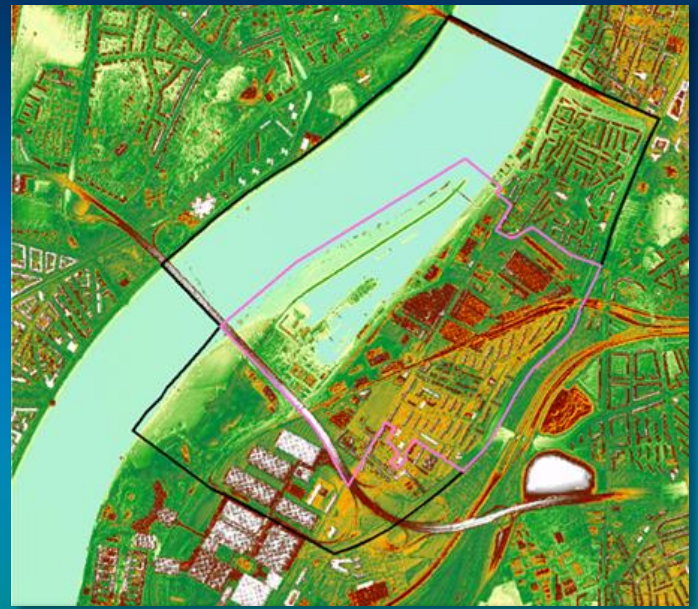
Definition of key modules, technologies, interfaces and technology-oriented processes that need to be implemented in order to create sustainable districts:

- Integral analysis of different sectors such as building, energy and mobility
- Hybrid-energy grids & smart grid technologies + heterogeneous energy demand
- Intelligent power/ heat generation, distribution and use + local / regional power supply
- Electric mobility, multimodal & shared mobility solutions
- Integrated resource- and material flow management systems
- Measures to improve the urban climate
- Smart City Integration (open data, intelligent data, IT-interfaces & online energy load management)
- Shared & sustainable logistics at district scale
- Joint optimization of green infrastructure

# Data Provided by the City of Cologne (Excerpt)

- Digital Terrain Model (DGM1)
- Digital Surface Model (DOM)
- Data of the official real estate cadastre information system (ALKIS)
- High resolution orthophotos / aerial photos / facade photos
- Energy report of the buildings in the project area (BEST tables / EnEV-certificate)
- Traffic data and models
- Master- and Development Plans
- Environmental data and models (noise, air pollution, water management etc.)
- Statistical data

# View of Cologne Mülheim South
# LIDAR Elevation Model & Building Models



# View of Cologne Mülheim South
# 3D Model Status Quo

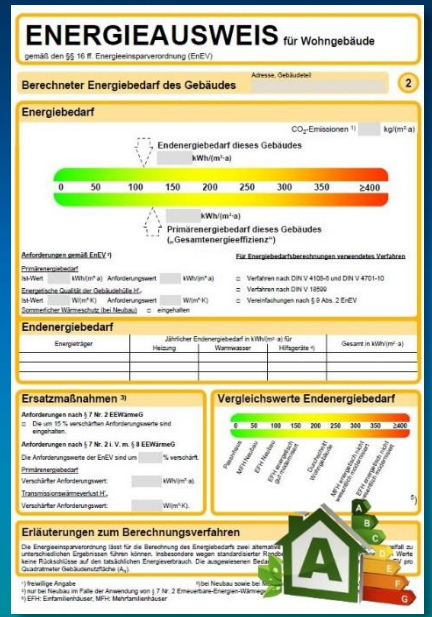

# Energy Data

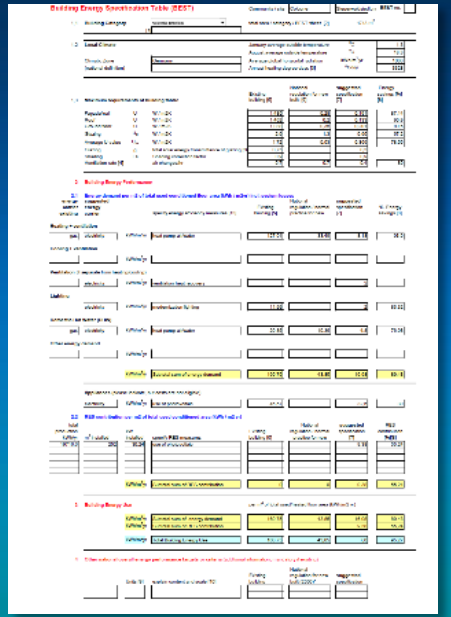
## BEST (Building Energy Specification Table)

for building in the Stegerwald Settlement

Includes:

- building category and specifications
- information about the local climate
- energy efficiency of the buildings
  - heating costs
  - lighting
  - hot water
- share of renewable energy sources (e.g. solar)



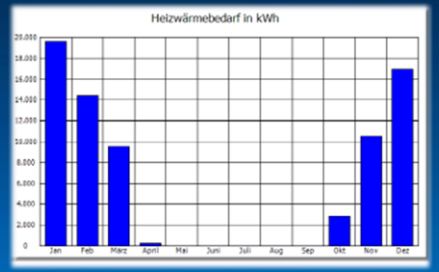



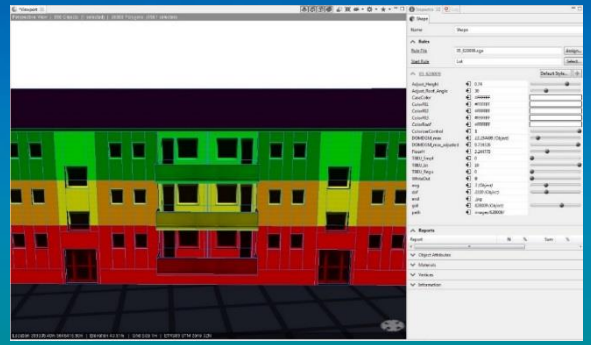
# Energy Data

EnEV (Energy Saving Regulation)

Includes:

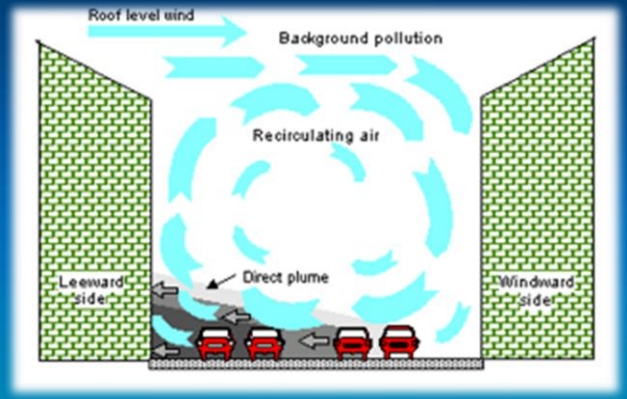
- Primary energy demand
- Final energy demand
- Transmission heat loss

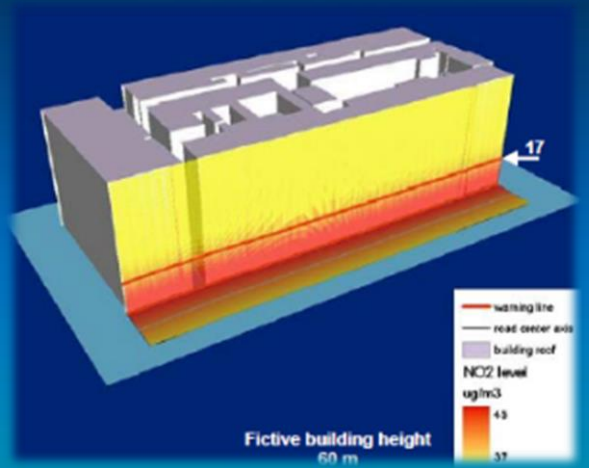


# Environmental Quality – Air Quality

- Urban traffic is the main cause
- Spatial modeling of the air pollution situation in urban canyons
- Considering the factors wind, traffic, local climate etc.




Pictures:
Wang, G., van den Bosch, F.H.M., Kuffer M., 2008: Modelling urban traffic air pollution dispersion. The International Archives of the Photogrammetry. Remote Sensing and Spatial Information Sciences, Vol. XXXVII, Part B8, 153-158

# Environmental Quality – Noise Pollution

- Noise sources:  roads, rail, airports, industries, ports
- Spatial modeling of the noise pollution
- What factors affect the noise pollution?

2D Model Output

3D Model Output

Pictures:
Topographisches Informationsmanagement Nordrhein-Westfalen, Umgebungslärm NRW 2012, Calculations CadnaA
http://www.tim-online.nrw.de/tim-online/initParams.do

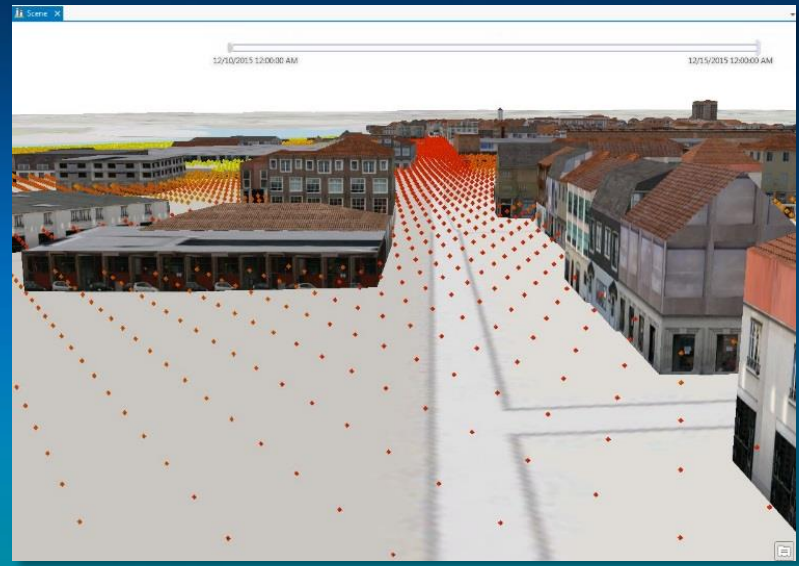
# Environmental Quality – Noise Pollution

3D Noise Pollution Model Output

x, y, z

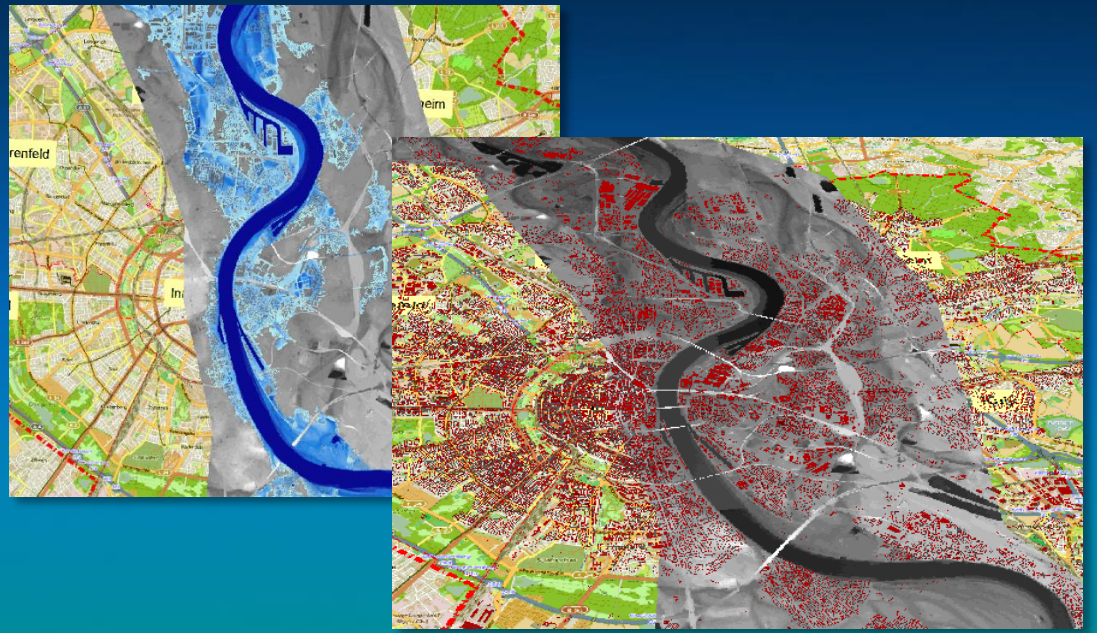
Point-Related

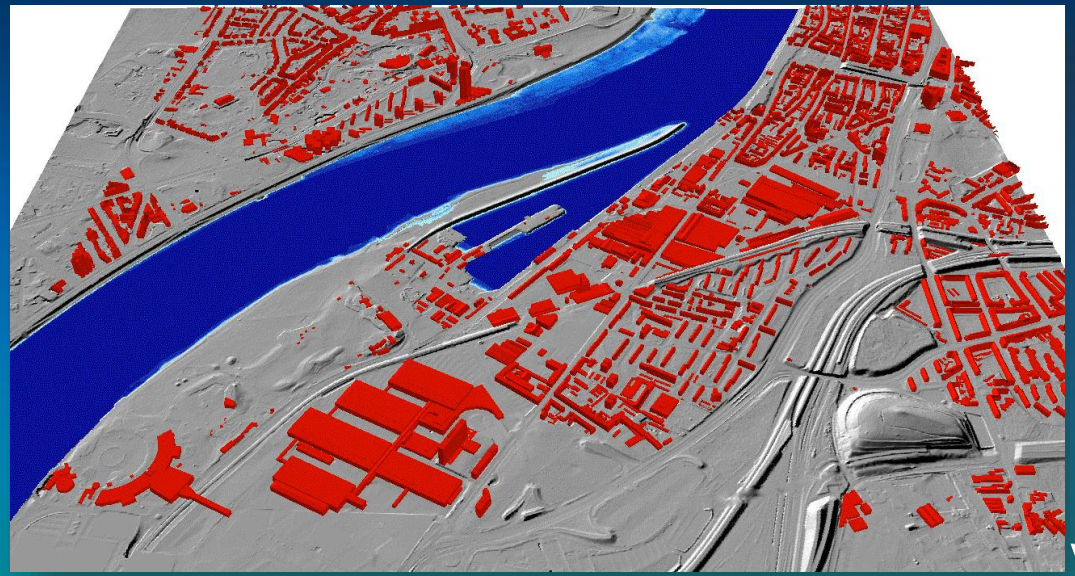
Noise dBA Values



Source: 3-D noise calculation model (City of Cologne)

# Flood Simulation (Tests)

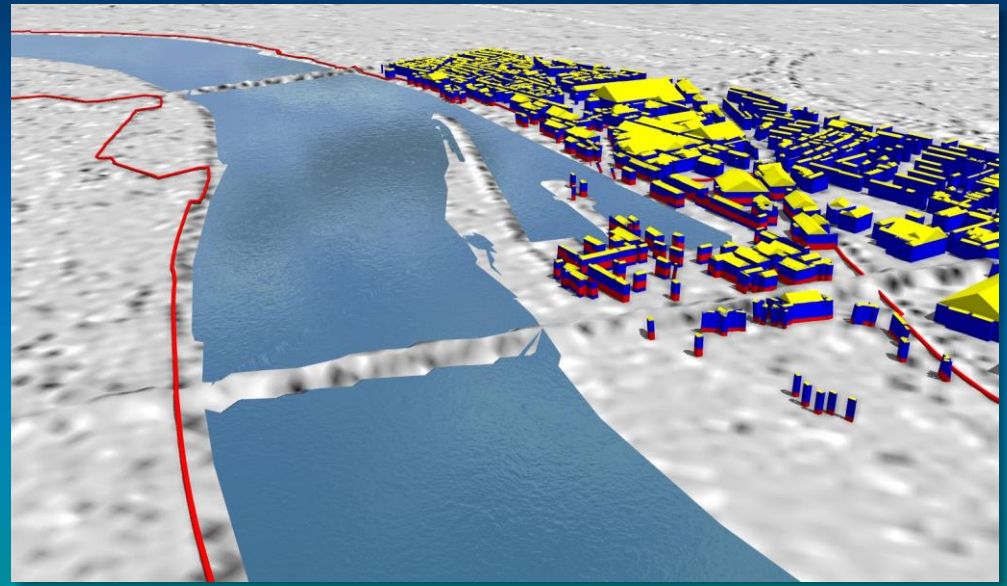




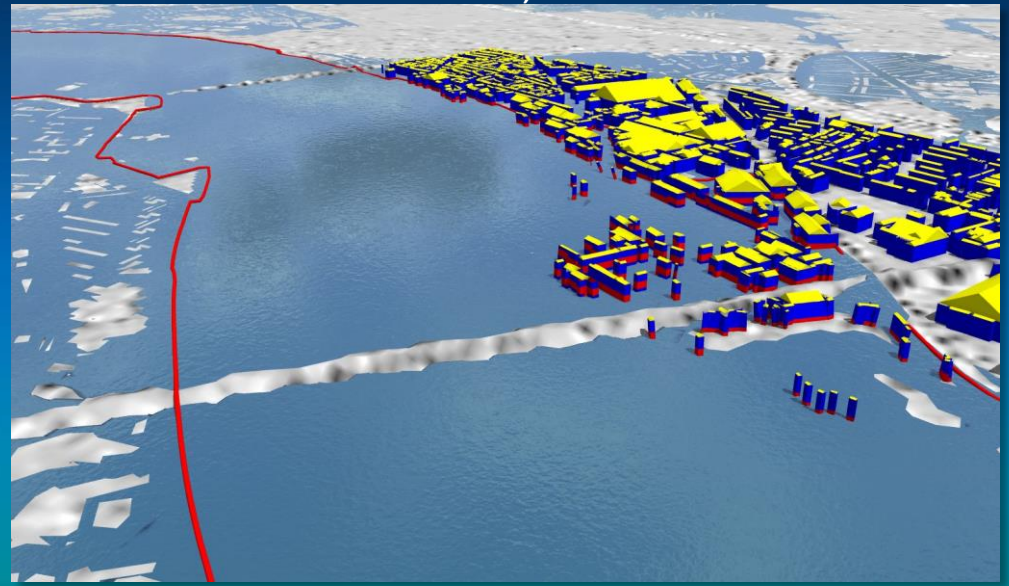
VIDEO

# Flood Simulation (Tests)

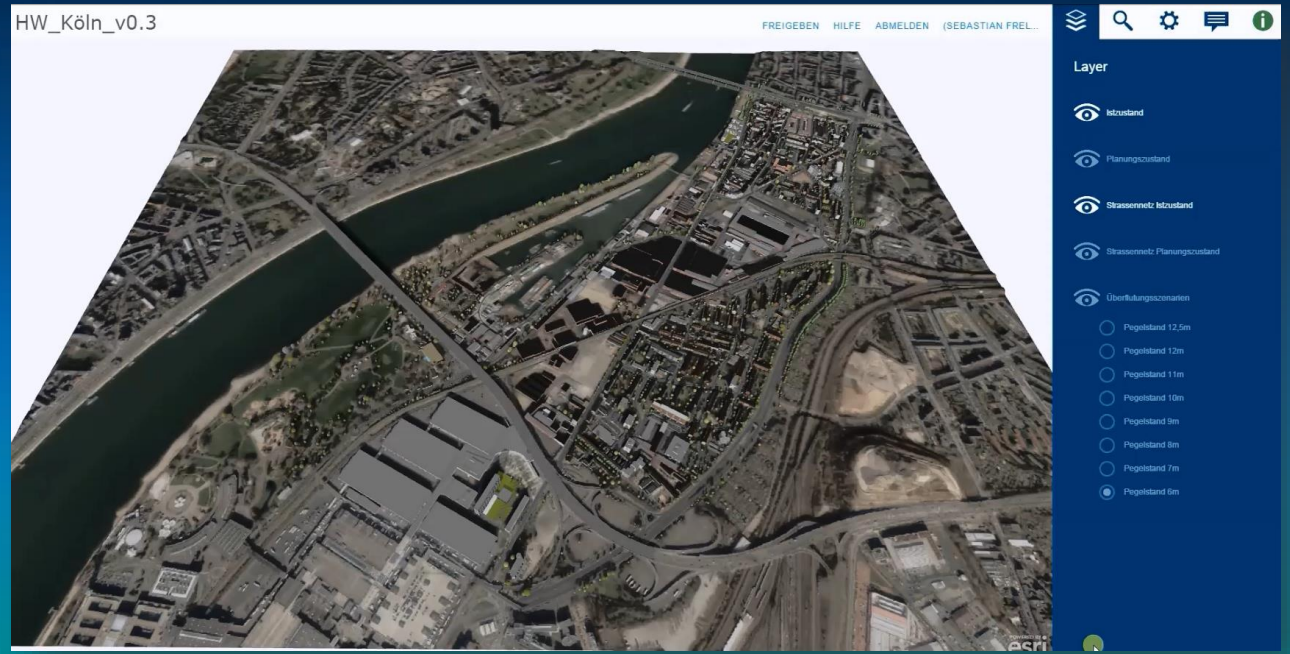
6 m



12,5 m



# Flood Simulation (City Engine)




VIDEO

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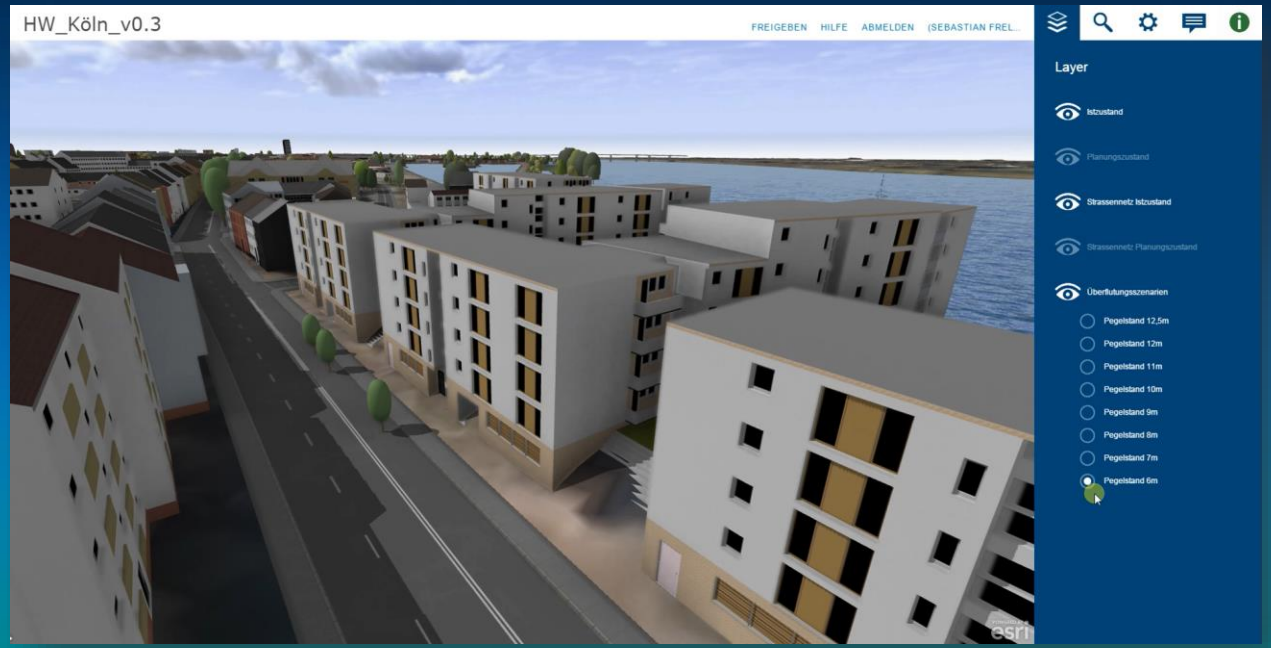
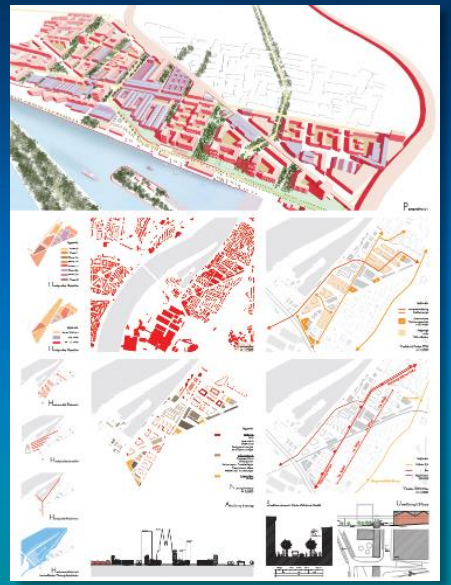



VIDEO

# Development Scenario Cologne Mülheim South



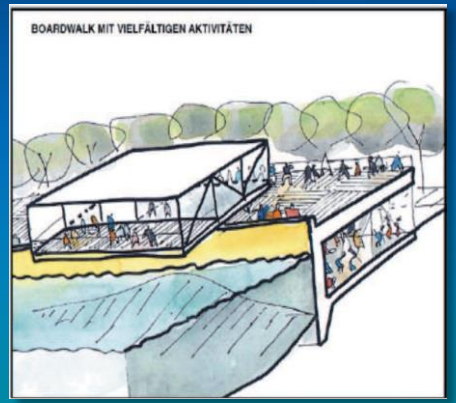
Werkstattverfahren Mülheimer Süden / Plans: BOLLES + Wilson, ksg architekten und stadtplaner, KLA kiparlandschaftsarchitekten

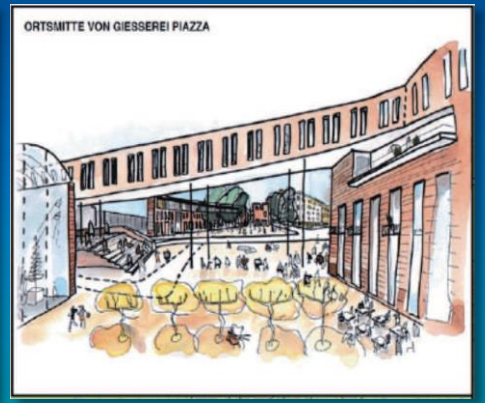
# Development Scenario Cologne Mülheim South


Werkstattverfahren Mülheimer Süden / Plans: BOLLES + Wilson, ksg architekten und stadtplaner, KLA kiparlandschaftsarchitekten

# Development Scenario Cologne Mülheim South

## Details BOLLES + Wilson

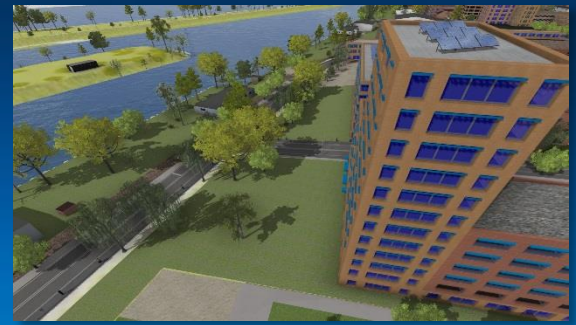



## Details ksg

Werkstattverfahren Mülheimer Süden / Plans: BOLLES + Wilson, ksg architekten und stadtplaner, KLA kiparlandschaftsarchitekten

# Development Scenario Mülheim South
# City Engine 3D Model



# Development Scenario Mülheim South
# City Engine 3D Model

VIDEO:
Overview

# Development Scenario Mülheim South
# City Engine 3D Model

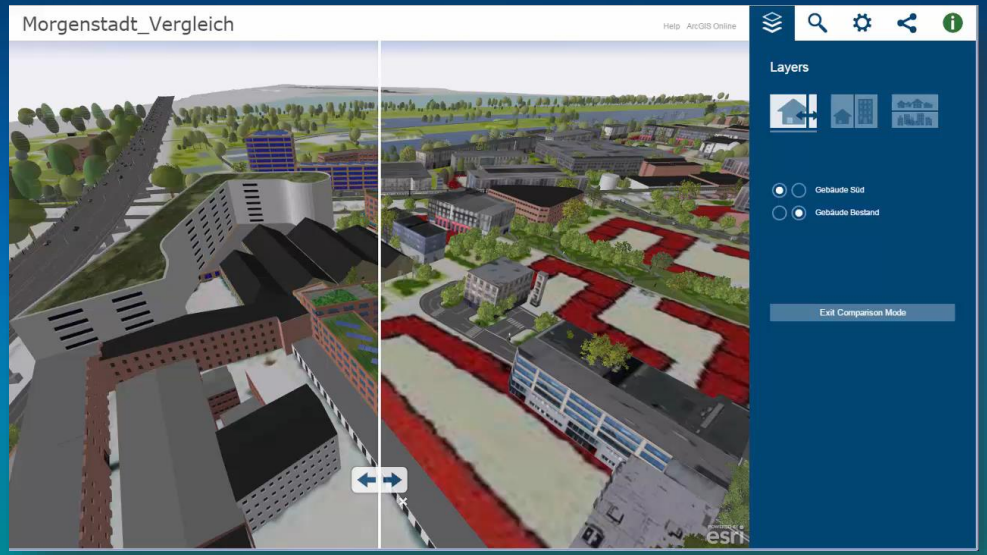
VIDEO:
Details
Lindgens
Areal

# Development Scenario Mülheim South
# City Engine 3D Model

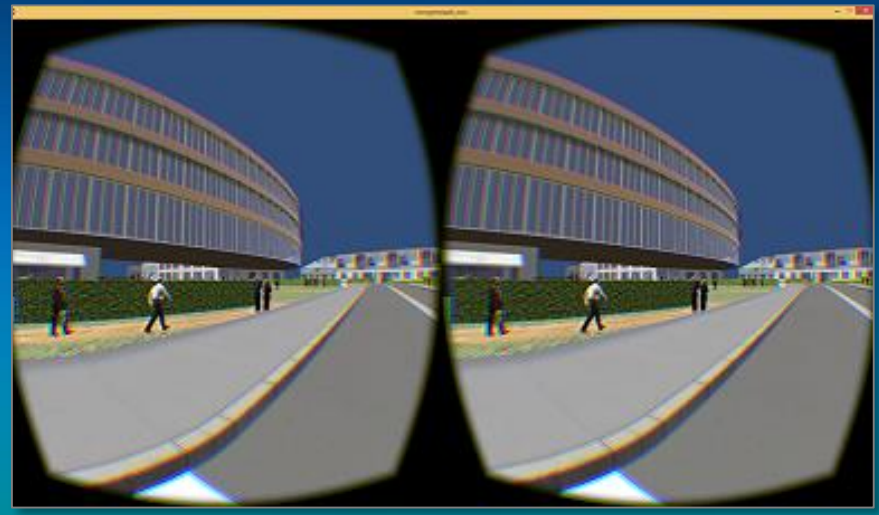
VIDEO:
Details
River
Bank

# Development Scenario Mülheim South
# City Engine 3D Model

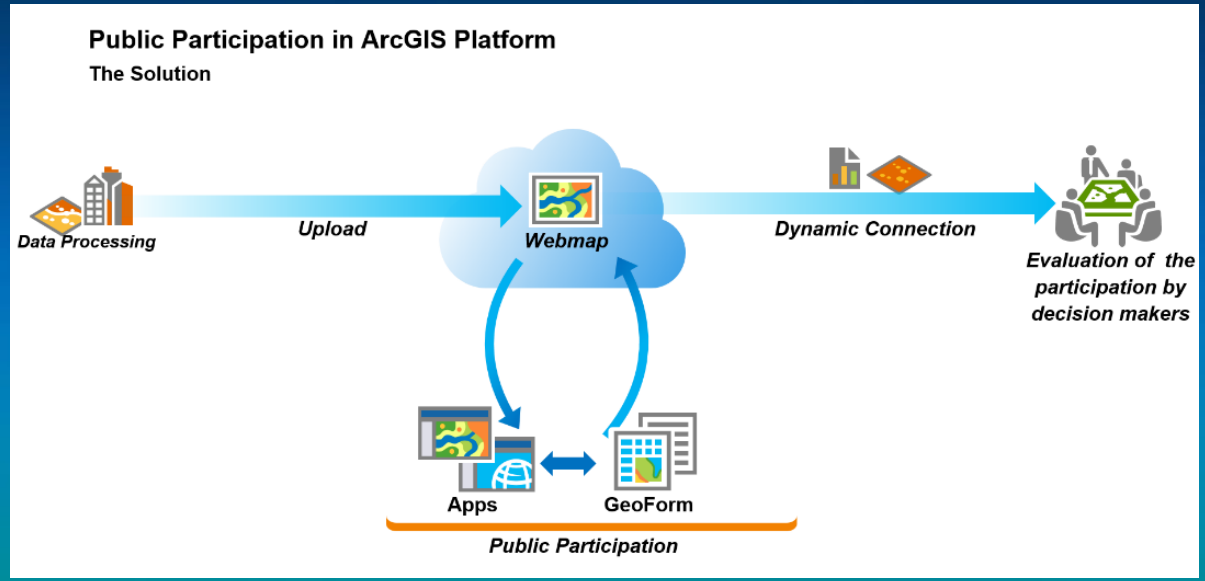
VIDEO: Webscene with slider: Status Quo / Future Scenario




Oculus: 3D Visualisation



# Development Scenario Mülheim South
# Citizen Participation



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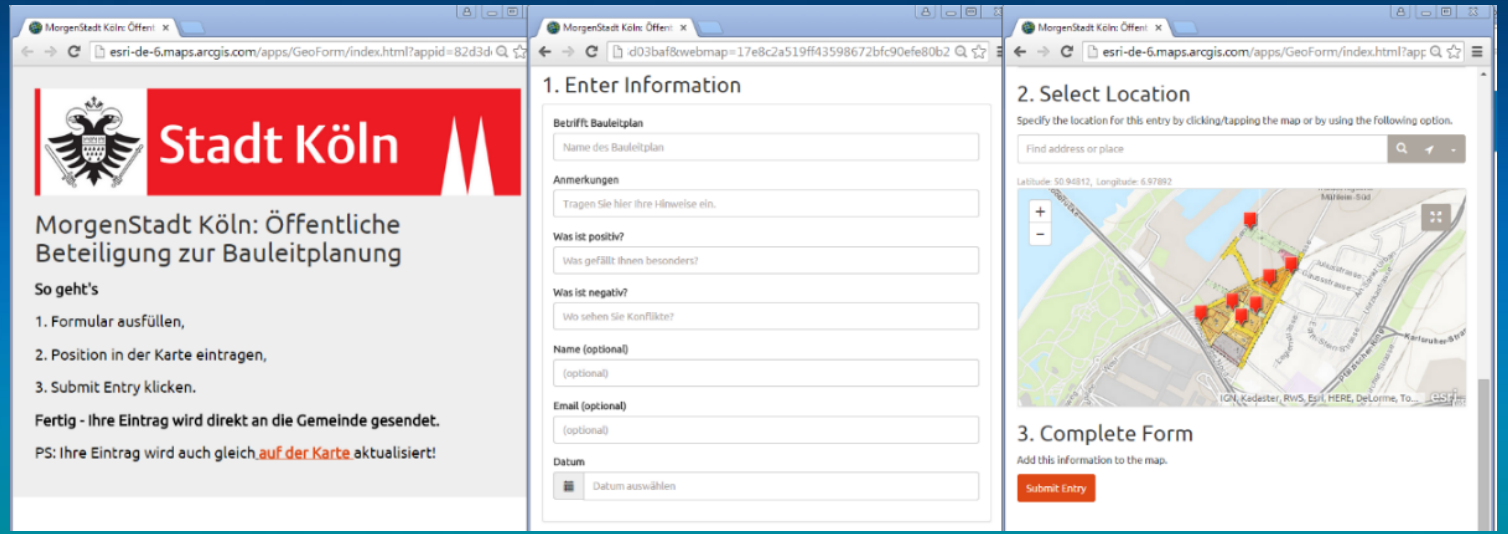


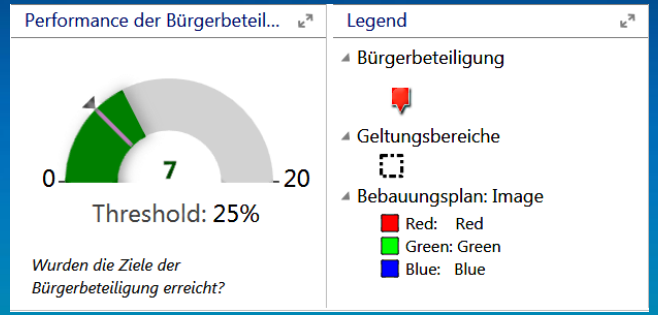

# Development Scenario Mülheim South
# Citizen Participation


VIDEO:
Development of
Web applications
for the GrowSmarter and
Morgenstadt websites
of the City of Cologne

# Thank you for your attention !

Prof. Dr. Jörg Schaller
Esri Deutschland Group GmbH
j.schaller@esri.de

# Konference GIS Esri v ČR

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