



# KIC-T Project Overview

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# Mitigating climate change as a result of urbanisation

- Populations in cities are increasing
- Huge demand for a high quality of life in urban areas.
- Restricted by limited resources, such as food, energy and water, lack of sustainable strategies to preserve these resources.
- Need to combat the negative impact urbanisation has on climate change
- **The KIC-T project will present climate data on an interactive platform, outlining mitigation and adaptation strategies and promoting more informed decision-making.**



# Smart Sustainable City Systems [1]

- City infrastructures need to more sustainable
- SO: infrastructures need to be designed smarter
- &: infrastructures need to be operated smarter



# Climate Change-Aware Urban Planning

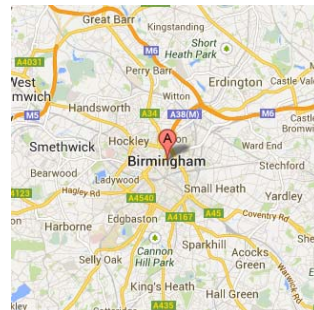
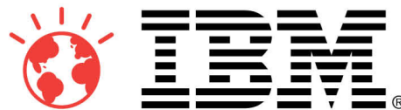
- KIC-T project enables the re-use of current and future modelling tools and data by creating plug and play standards
- Provides an open and scalable means of assisting cities with climate-change aware urban planning.
- By utilising an innovative, web-based portfolio of assessment tools, accessible to communities and stakeholders
- Project funded by Climate-KIC, network of European partners
- Each of whom plays an invaluable development role
- Technology will assist analysis of environmental impacts
- More informed decision making for city planners, designers and communities
- **Putting sustainability at the forefront of urban planning**



# Project Participants



- **4 x EU States:** France, Netherlands, Switzerland, UK
- **3 x Academic:** BCU, ETH Zurich, TNO
- **3 x SMEs:** Aria, GreenHill, SBC
- **3 x Cities:** Birmingham, Utrecht, Zurich
- **2 x Corporates:** ESRI R&D, IBM





- KIC-T will create an integrated environment
  - Data from cities; simulation and models of city systems and a variety of visualisation tools accessed and combined by “plug and play” mechanisms
  - Standards will be developed and implemented by the project technical partners
  - Provide a future framework within which models created for a specific purpose can be repurposed by the “plug-in” standards created for data, models and visualisation tools.
- 
- Repository for city systems models and simulations
  - Repository for city data
  - Gateway to local and remote execution environment



# Smart Sustainable City Systems [2]

- Modelling and Simulation
- Daisy-Chaining of Models
- Portability and Reuse of Models and Data Sets



# COMPLETE PICTURE

## PARTNER - Data - Model - Visualisation

- ARIA – Air Pollution
- TNO – Noise Pollution, Traffic etc.
- ETHZ – Microclimate and Economic
- BCU - Energy
- GREENHILL - Sustainability
- SBC - Visualisation
- ESRI-Arc GIS (MQTT to Arc GIS, as to IBM IOC)



## ARIA – Air Pollution Web services Road Map

### Without KIC-T

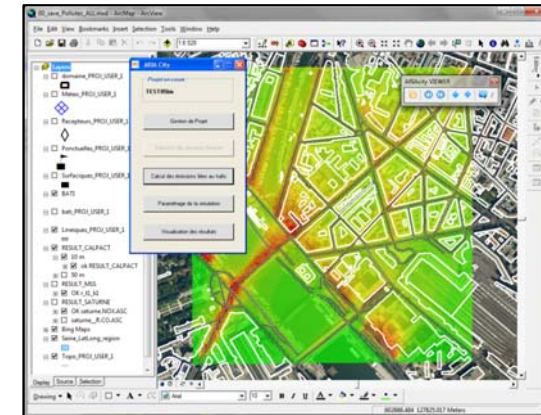
ARIA City – Desktop version

- plug-in for ESRI ArcMap
- 3 urban scale-air quality models inside
- 2 new licenses in 2014 (+2 others ~90%)

### With KIC-T

Web services development

- to be plugged to any heavy (3D) web client (ESRI, IBM,...)
- can be plugged to light web client (in house for example)
- to be provided to customer with a web client (not just the API)
- Feedback from desktop version users: the required machine resources by the models can be too large. HPC/Cloud computing connected to a web API would be useful. ARIA have already completed one financial transfer from one of the desktop version users to run their calculations on ARIA's HPC.



# TNO – Noise Pollution, Traffic etc.

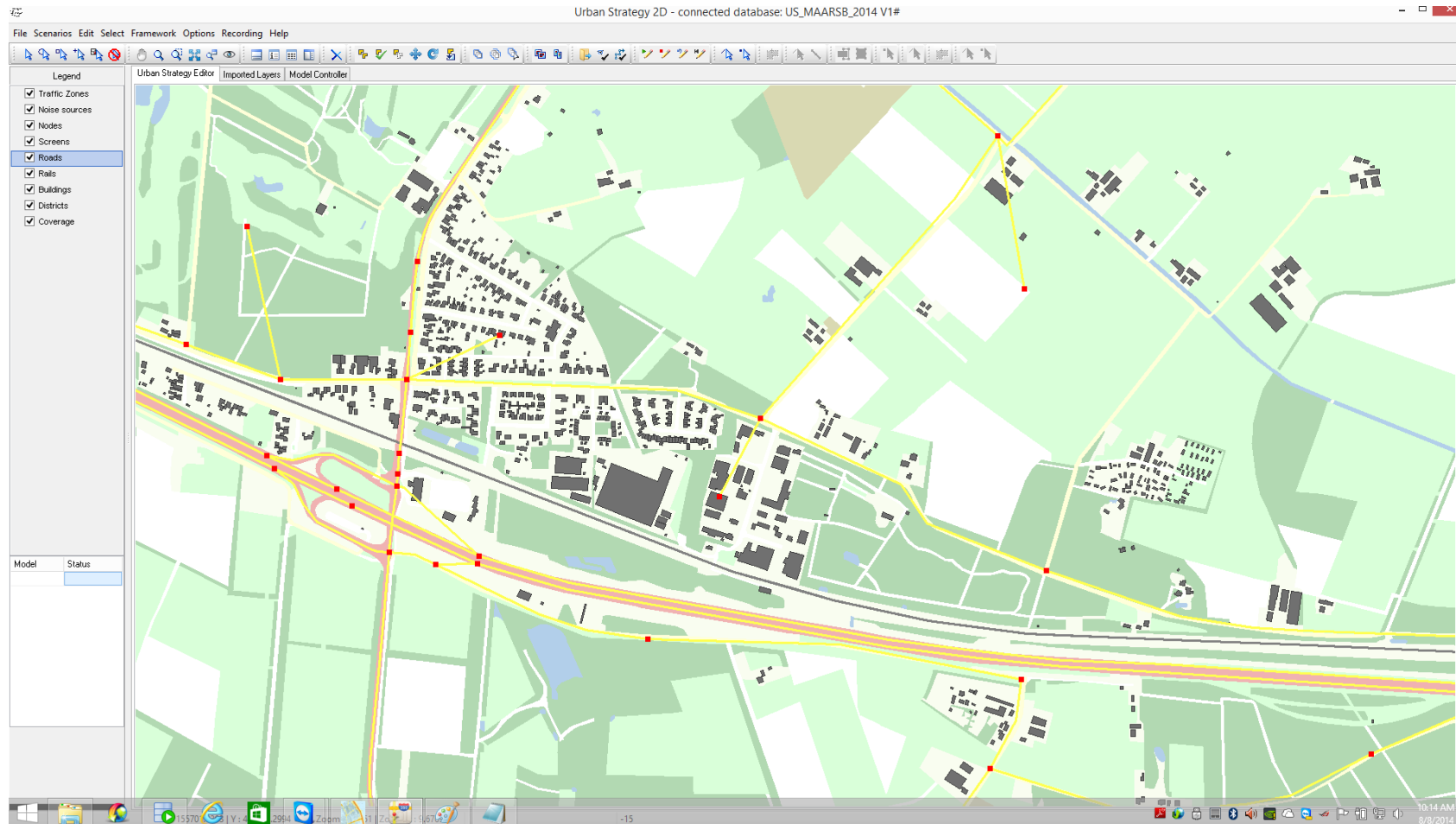
## Utrecht Case Study

The province is interested in

- an environmental assessment of the Maarsbergen area (noise, air pollution).
- knowing the benefits of the KIC-T platform and its applications with respect to their MKP-Maptable.
- they would like to know how KIC-T could be coupled to their own environmental assessment method (MKP- maptable)
- the solar potential of the plan

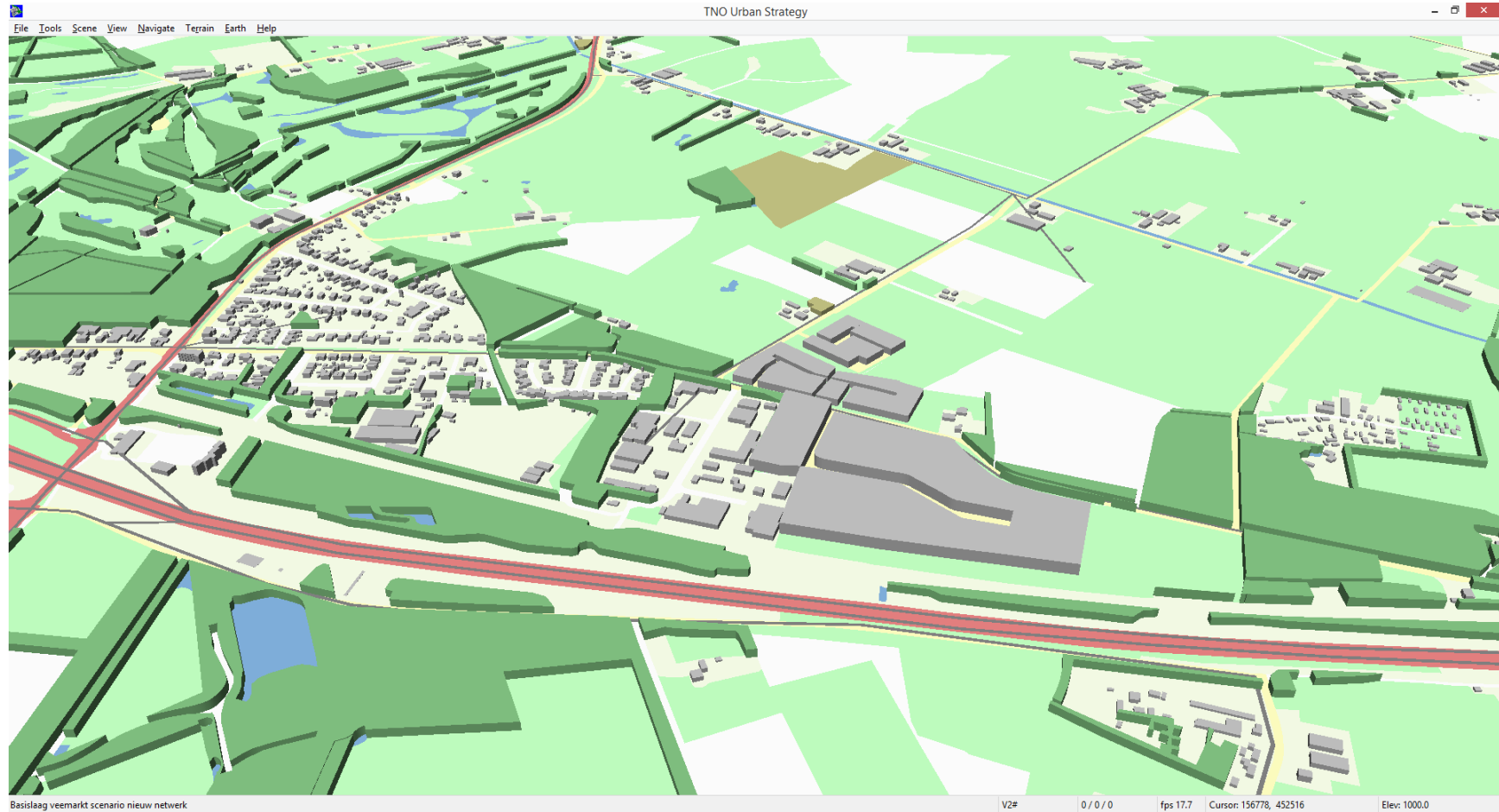
# US2D Map view

Current situation



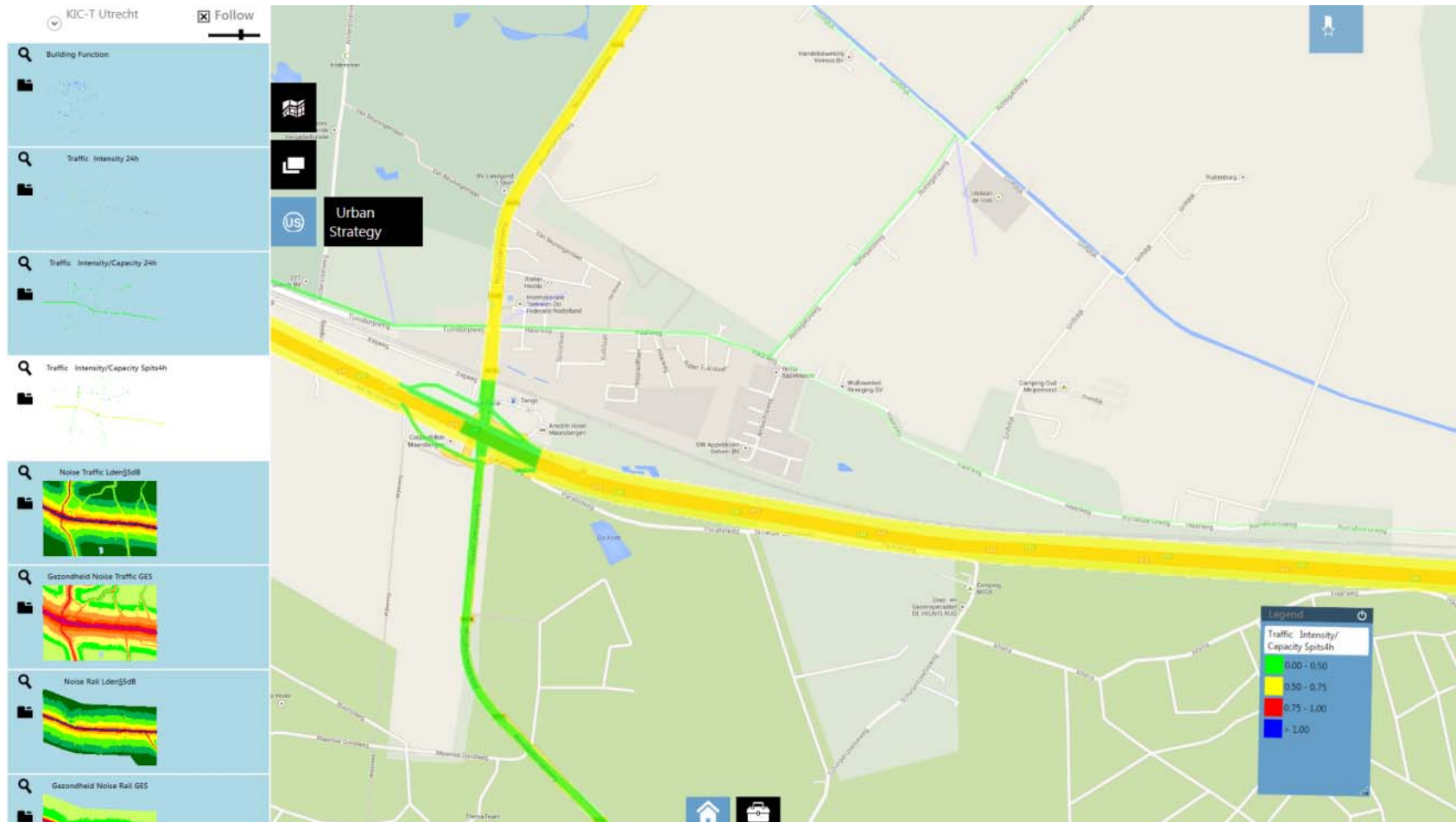
# US3D view

Future situation



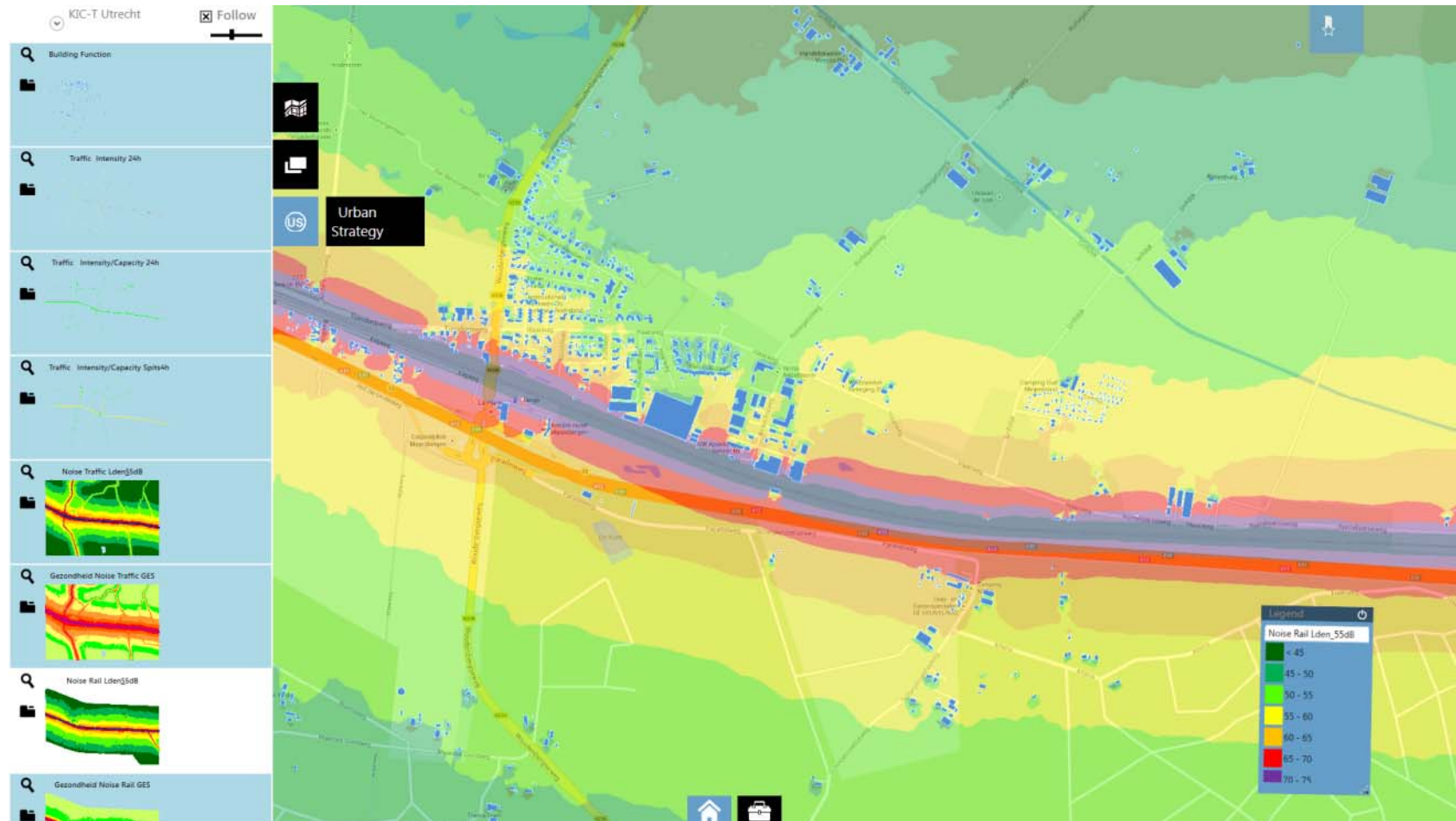
# Traffic congestion (I/C)

Current situation



# Noise Pollution Rail ( $L_{den}$ )

Current situation



# Noise Pollution Traffic ( $L_{den}$ )

Current situation



# Air Pollution (NO<sub>2</sub>)

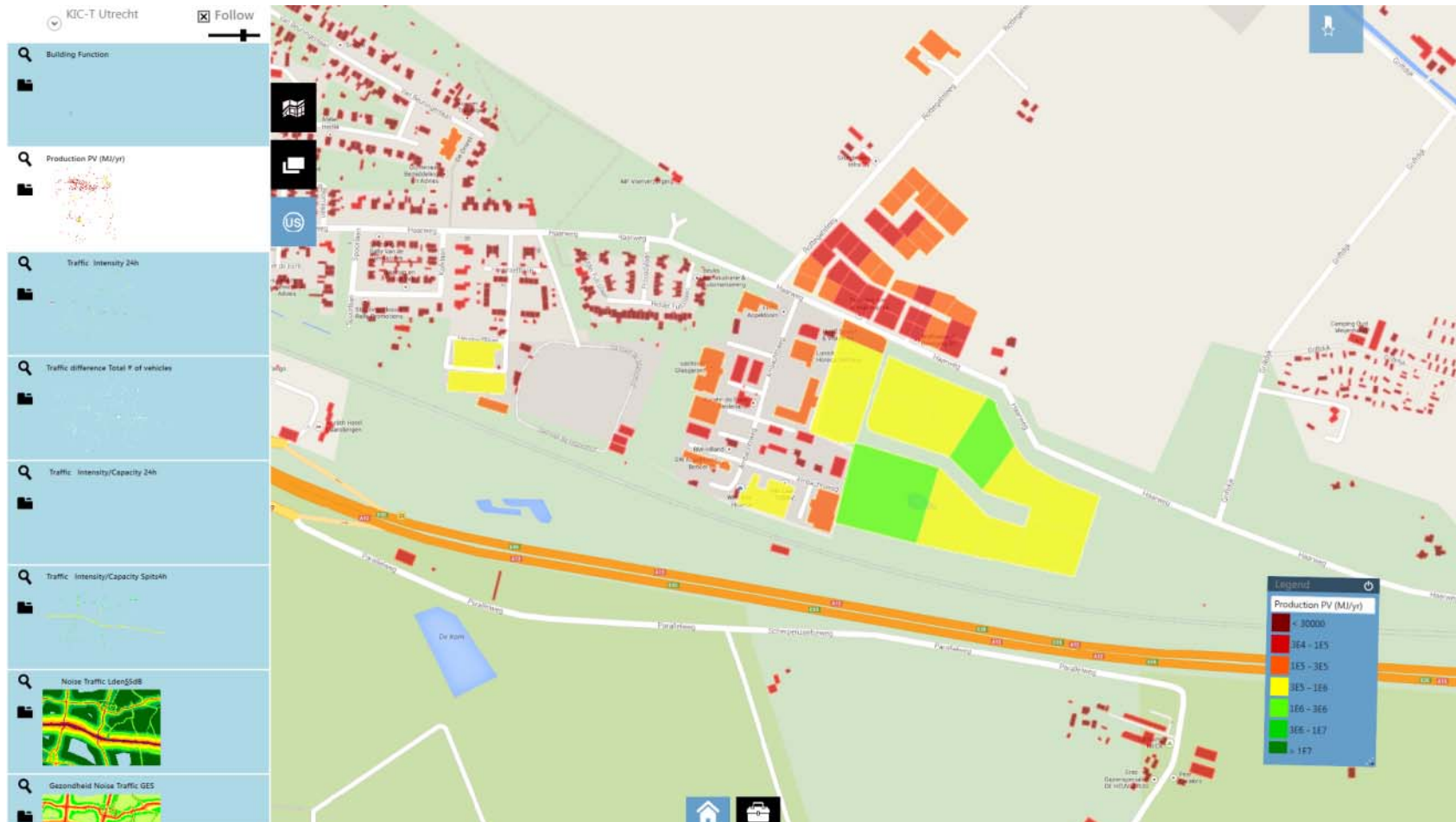
Current situation





# Solar power production (PV)

Future situation





# ETHZ – Microclimate and Economic Stakeholders workshop - Zurich

LUCY, ETH – tools

Urban Scale Economic Distribution Model

LUCY VIEWER

MainWindow

Building Footprints Statistical Data

Geometry: Import File

Services: Eco Potential Service

Residents

Employees

Connect to Lucy (localhost)

Connect to Lucy (server)

lukas ●●●● Login

Get List of Actions

- cancel
- create\_scenario
- create\_service
- create\_user
- delete
- exists
- get\_infos\_about
- get\_list
- get\_scenario

Get List of Services

- Util\_ExportForSOM
- Util\_Files
- Util\_LucyLogo
- Util\_RandomOutputs
- Util\_SampleCSV
- ecoPot

```
result: {
  "ecoPot": {
    "inputs": {
      "potentialStrength": {
        "format": "number",
        "value": ""
      }
    },
    "residents": {
      "format": "csv",
      "streamInfo": {
        "checksum": "string",
        "order": "number"
      }
    },
    "workers": {
      "format": "csv",
      "streamInfo": {
        "checksum": "string",
        "order": "number"
      }
    }
  },
  "resolution": {
    "format": "number",
    "value": ""
  }
},
"pending": [],
"tasks": [],
"providers": [
  "PCLukas"
]
```

Communication with Middleware

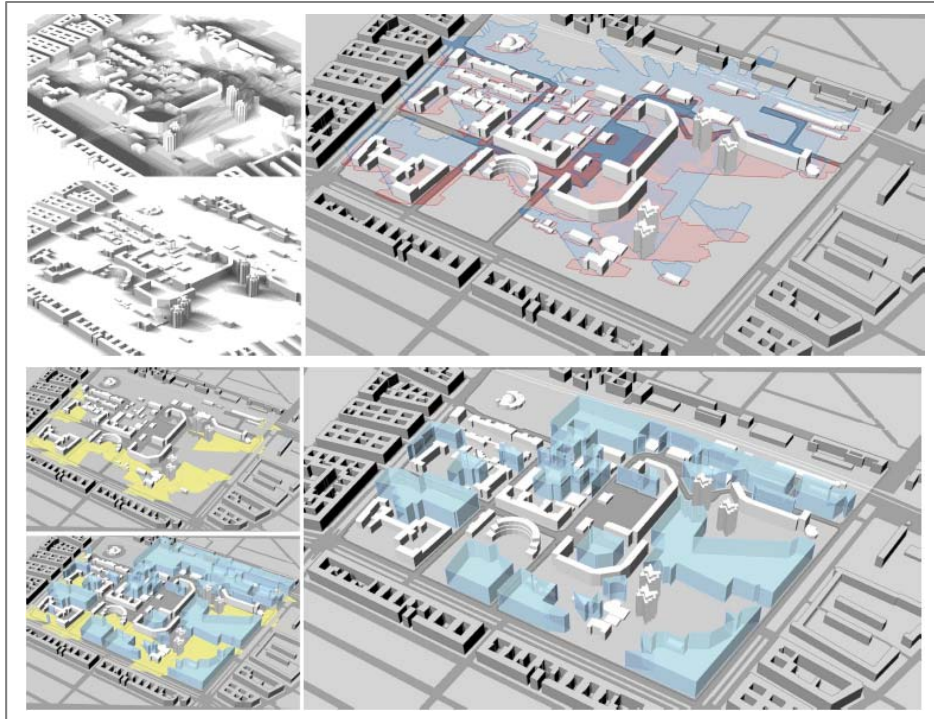
```
{
  "Util_RandomOutputs",
  "Util_SampleCSV",
  "ecoPot"
}
```

Send To MW

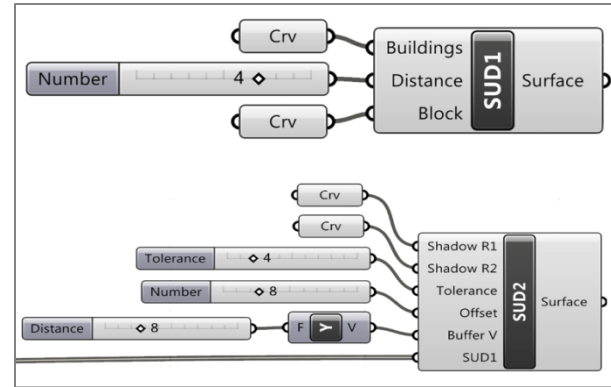
Communication with Mosquitto

# Stakeholders workshop

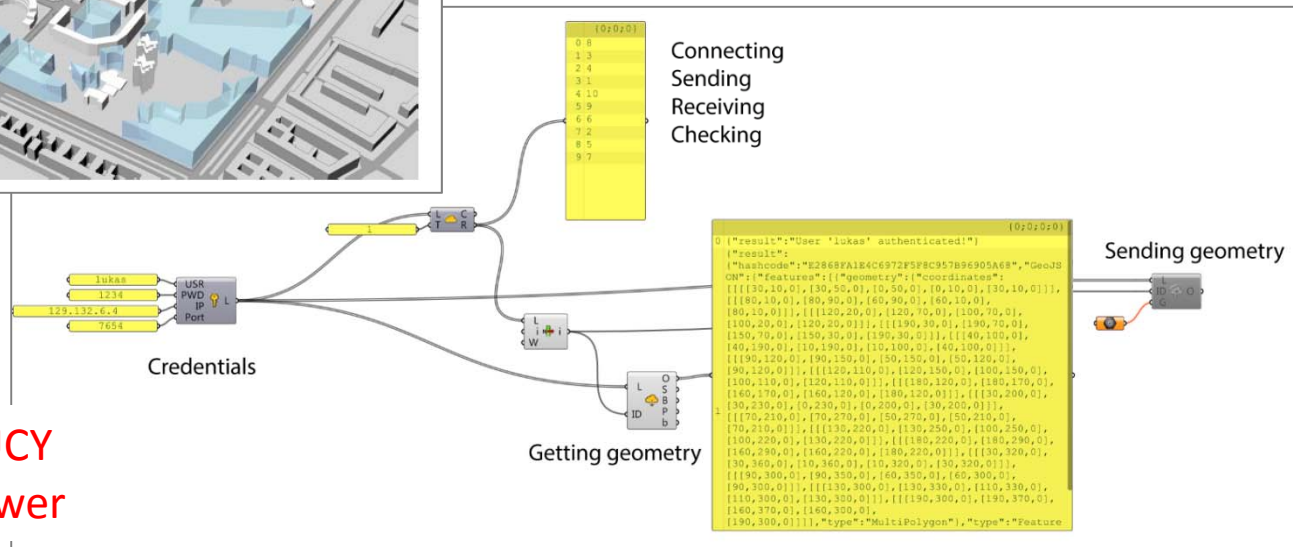
LUCY, ETH – tools



Visualization



SUD Tool



CONNECTION WITH LUCY  
Equivalent to LUCY viewer



## Birmingham City University - Energy

- Deliver the technical elements - Birmingham Case Study
- Focus - Eastside in collaboration Birmingham City Council
- One of the three city partners supporting the project
  
- Energy data from BCC public buildings to the IOC interface
- Making energy data available to other partners
- Creation of web-services so other partners “call” to access
  
- Complements work being done in Zurich by ETH and SBC and work being done in Utrecht by TNO and ARIA
  
- Different elements of sustainable city modelling and visualisation



Ortsname    Stadtübergreifend    Administration

**Sachbearbeiter: Operationen** Benachrichtigung <sup>1</sup>

Karte    Positionskarte    Liste

**MPAN**

**Speichern**    **Inhalt löschen**

Automatische Aktualisierung: 0 Minu



- Assist Greenhill to “wrap” the ADEPT spreadsheet model so it can be accessed via a web-browser
- Both to input data specific to a building to be simulated and to visualise the results from the ADEPT tool
- Either via a simple web-browser interface created by BCU or by, exposing the output data through a web-service
- Allowing the ADEPT output data to be consumed programmatically by other partners’ tools.
- BCU creates set of generic methods using standard web-services
- Decouple the input of data to and the output of data from the Greenhill model, currently an MS Excel spreadsheet.
- **Basic prototype created , demo to BCC mid September**



*Decisions at your fingertips.*

# SMARTERBETTERCITIES



**Jan Halatsch, Founder & CTO**

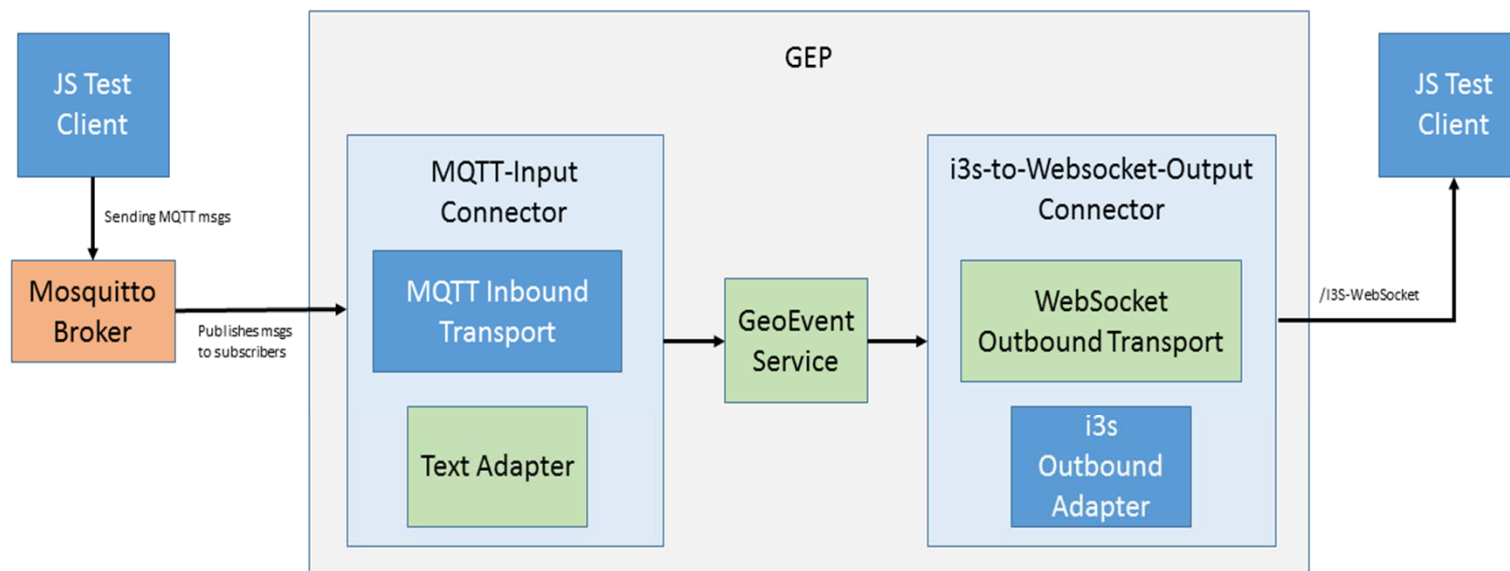
**SmarterBetterCities - Visualisation**

**Helping cities transition to a low-carbon future**



# ESRI-Arc GIS & IOC Integration

- **Goal:** Scalable 3D visualisation of time-enabled geospatial data sets
- **Why:** Identify patterns, make data accessible to decision makers

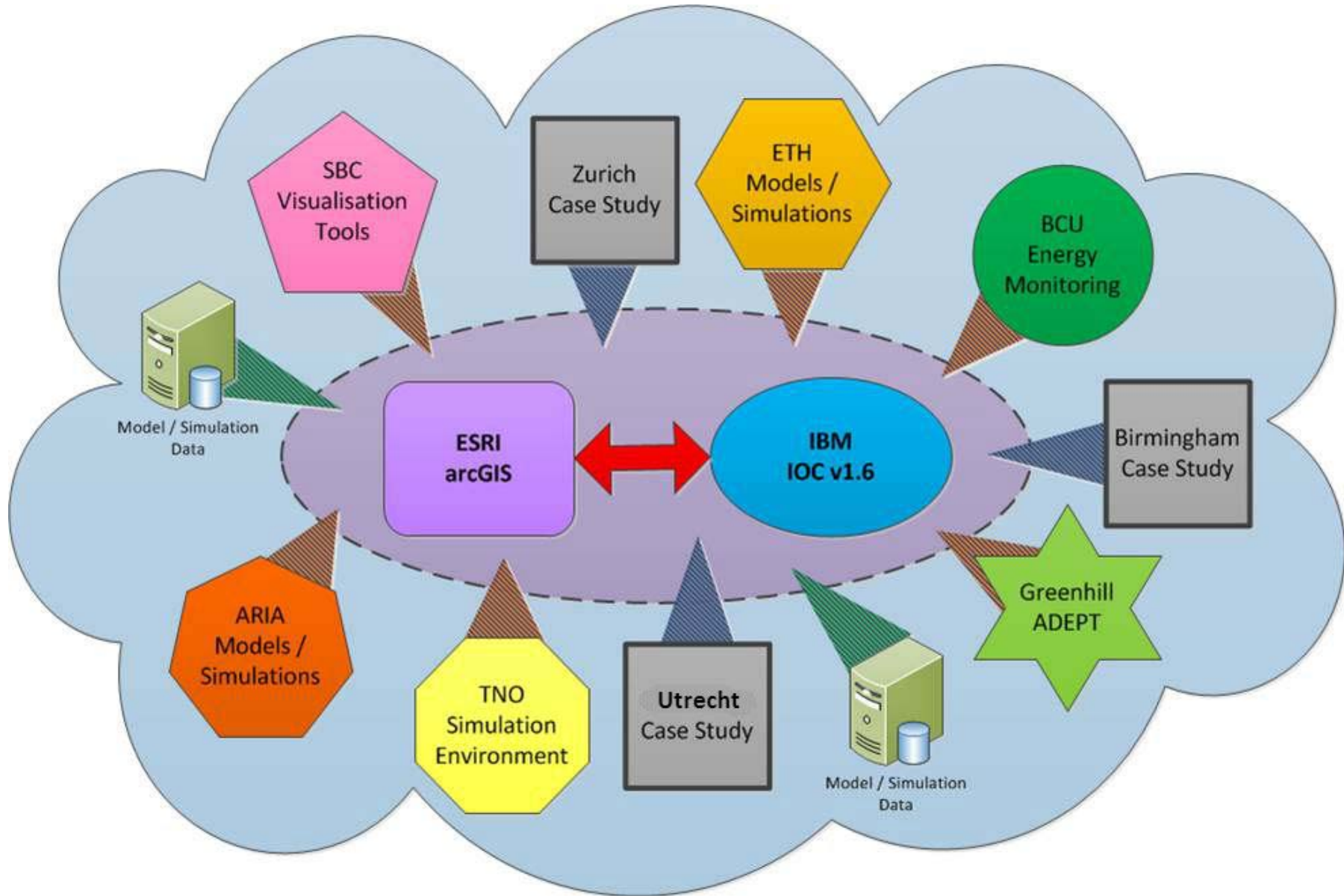


- MQTT InboundTransport
  - connects to MQTT broker
  - Sends data to adapter
- Text Adapter
  - Transforms the data to geoevents
- i3s Outbound Adapter
  - Receive geoevents
  - Transforms geoevents to i3s feature data
- WebSocket Transport
  - Provides the i3s feature data via WebSocket



# The Integration Challenge

- Many public-funded projects have developed discrete modelling and simulation tools for cities
- Generally not designed for re-use with different data in different cities or for inter-operation
- So simple way to re-use / re-purpose existing tools to leverage previous project outcomes
- Need mechanisms, standards and platform to ensure future re-usability and inter-operation
- “Plug & Play” city data, models and simulations



# KIC-T Planned Outcomes

- Future-proof & extensible modelling / simulation hosting environment for cities
- Defined “containers” for models & simulations
  - Model “containers” and Execution “plug-through”
  - Data “plug-ins” and Visualisation “plug-ins”
- Data repository for city-data
  - Data & meta-data & standards for “data plug-ins”
  - “City Mash” data fusion
- Validated by 3 City Case Studies
- Prototype sustainability applications marketplace