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multi-scale infrastructure systems analytics

A Geospatial Framework for Integrated Urban and Infrastructure Systems Modelling

Stuart Barr

School of Civil Engineering & Geosciences

Newcastle University

CSIC Emerging Connections Workshop Tomorrow's Cities and their Infrastructure

Robinson College, Cambridge: 23 June 2017

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Urban Systems Modelling

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Infrastructure Systems Modelling

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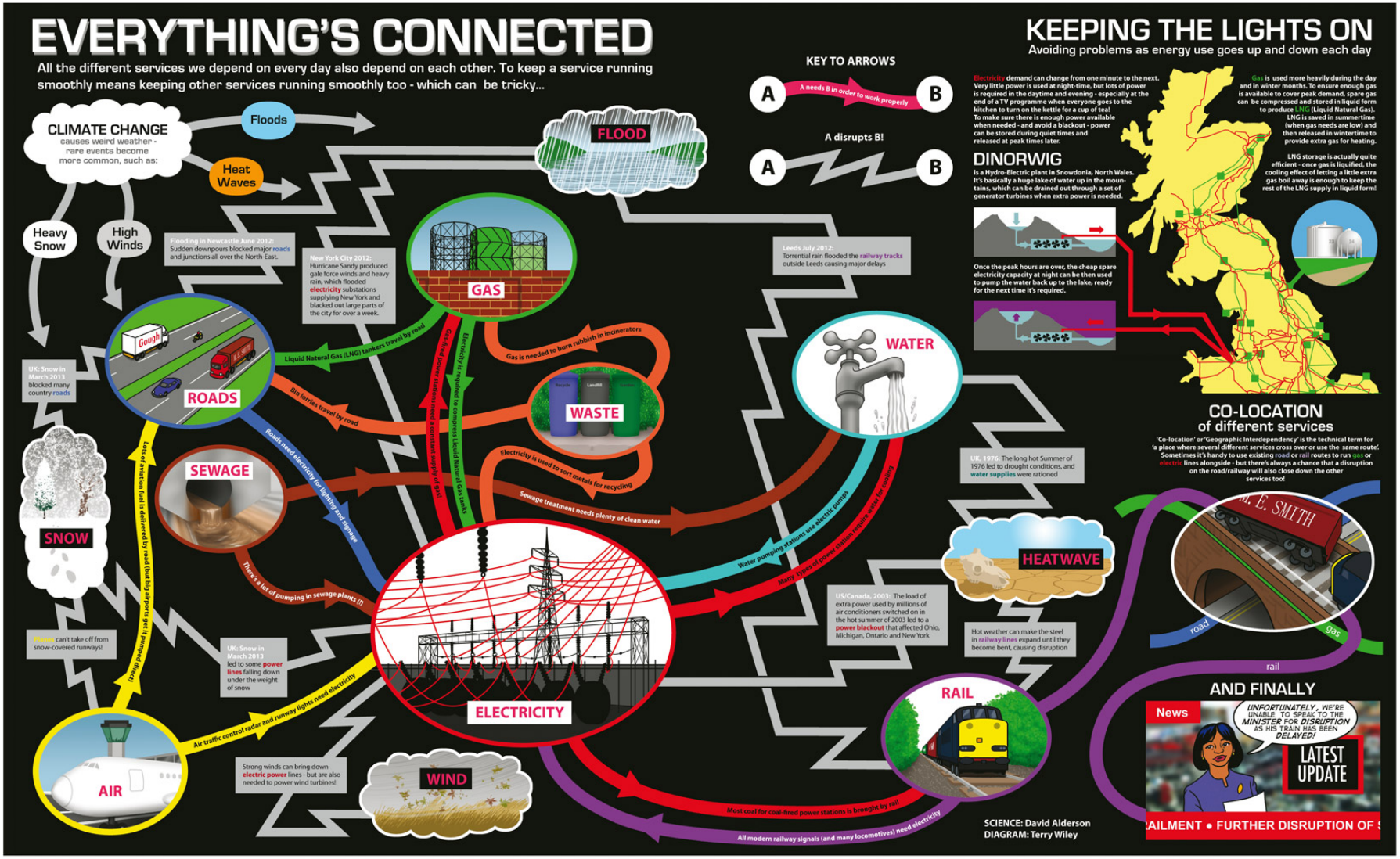
Infrastructure Interdependencies



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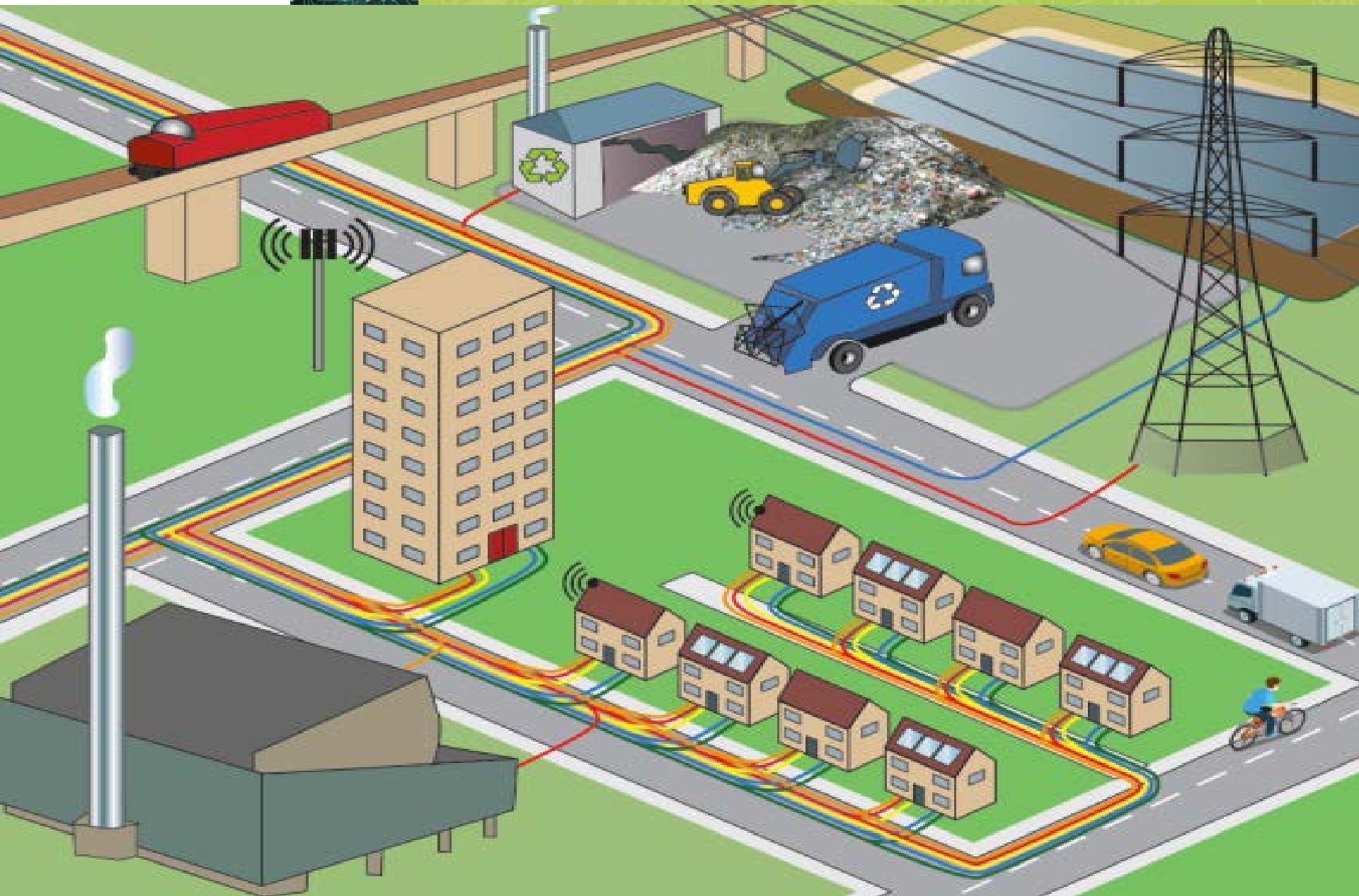
Urban-Infrastructure Systems



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Building Level Attribution

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Ordnance Survey

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Future Urban Built Form

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Building level Infrastructure Demand

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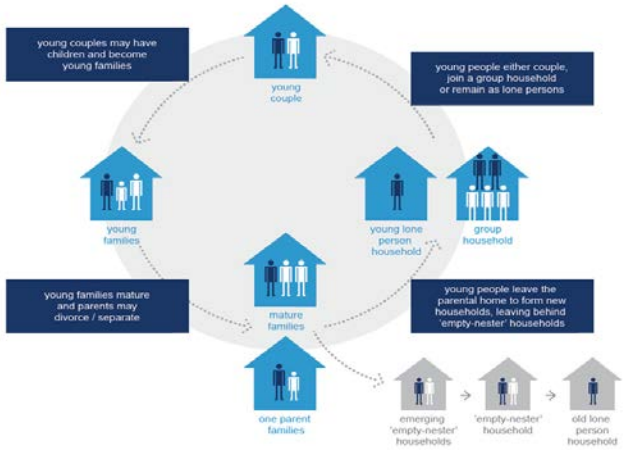
Building Infrastructure Demand



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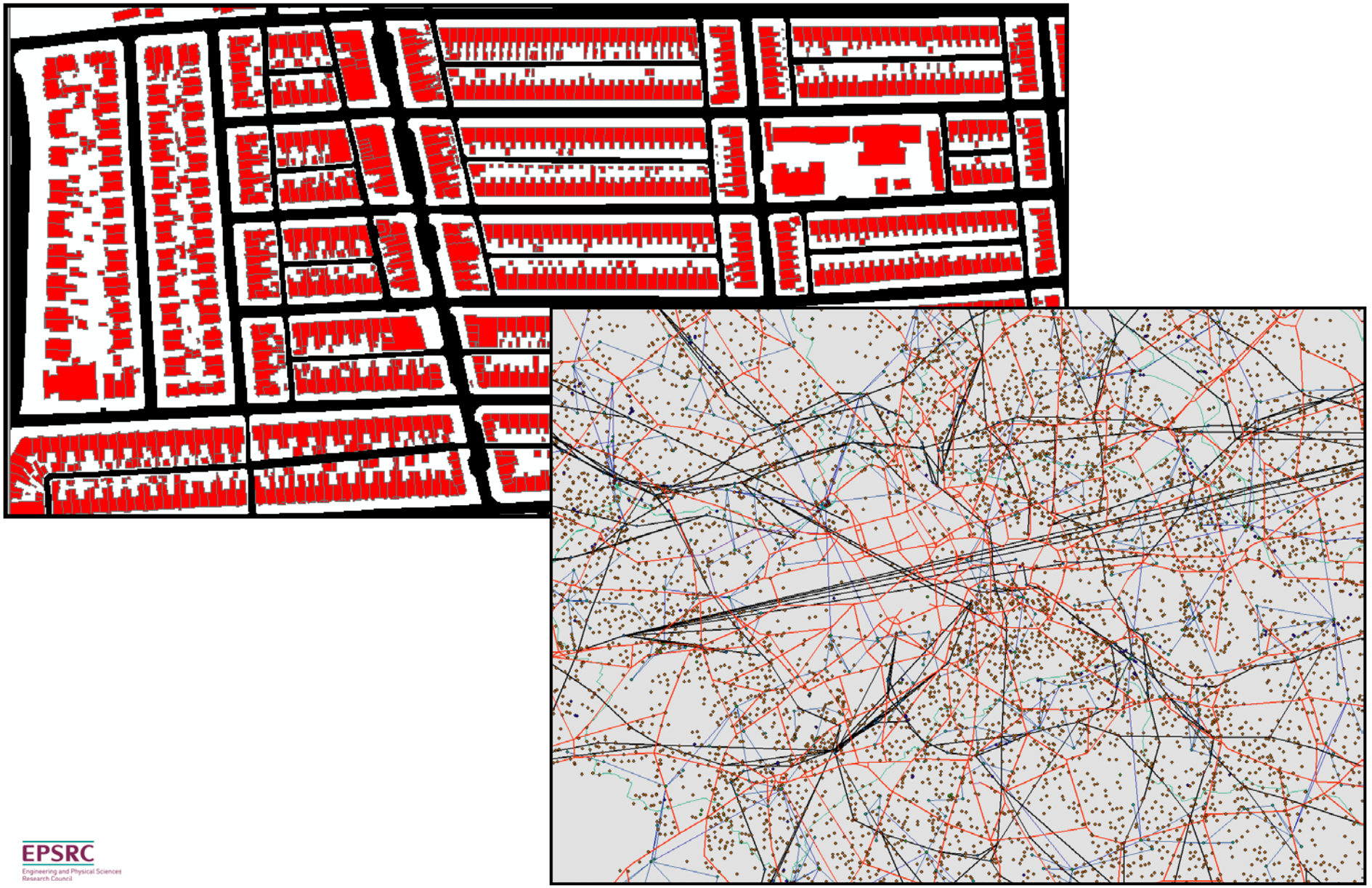
Building-Infrastructure Coupling



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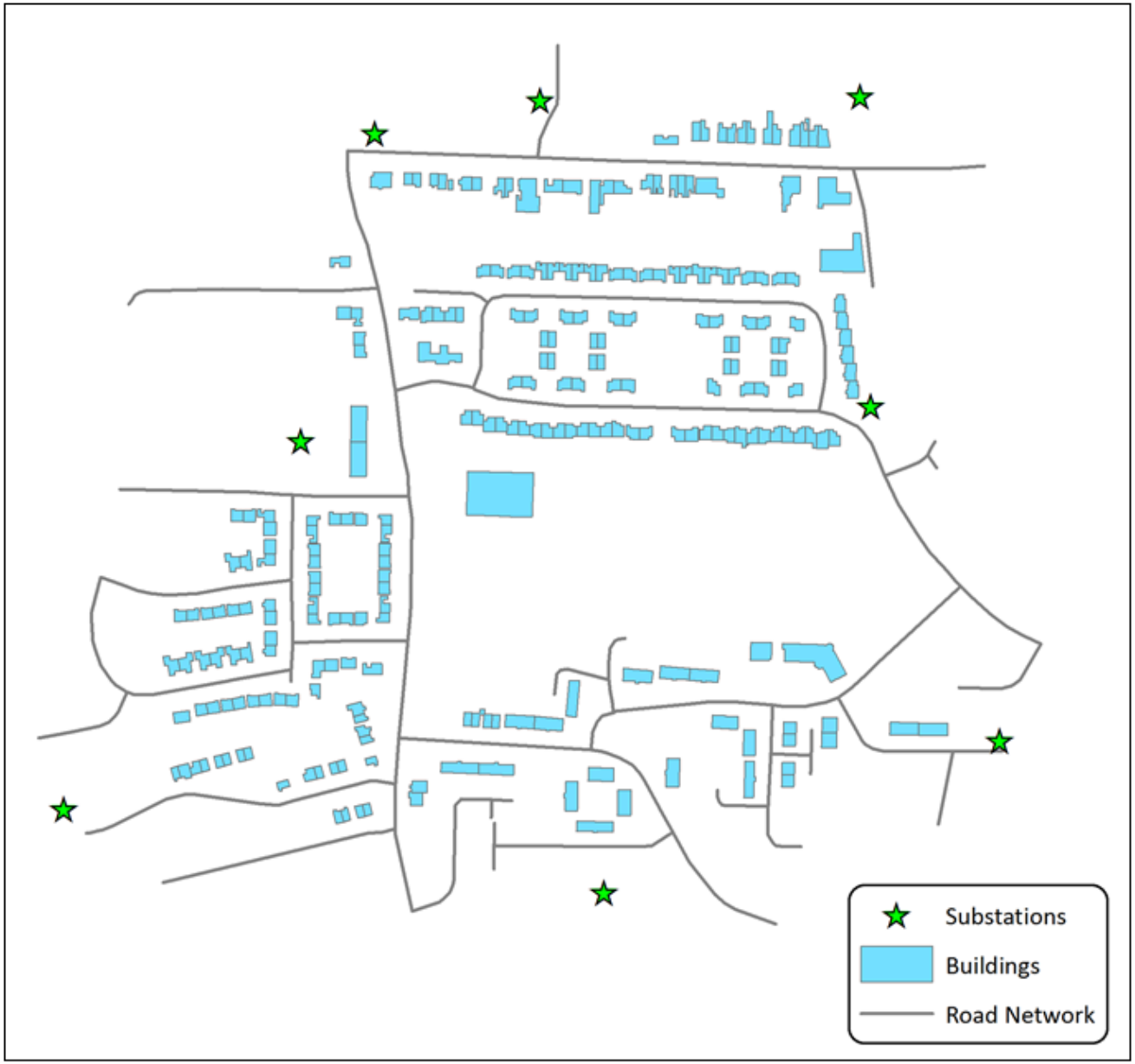
Data Structure & Relationships



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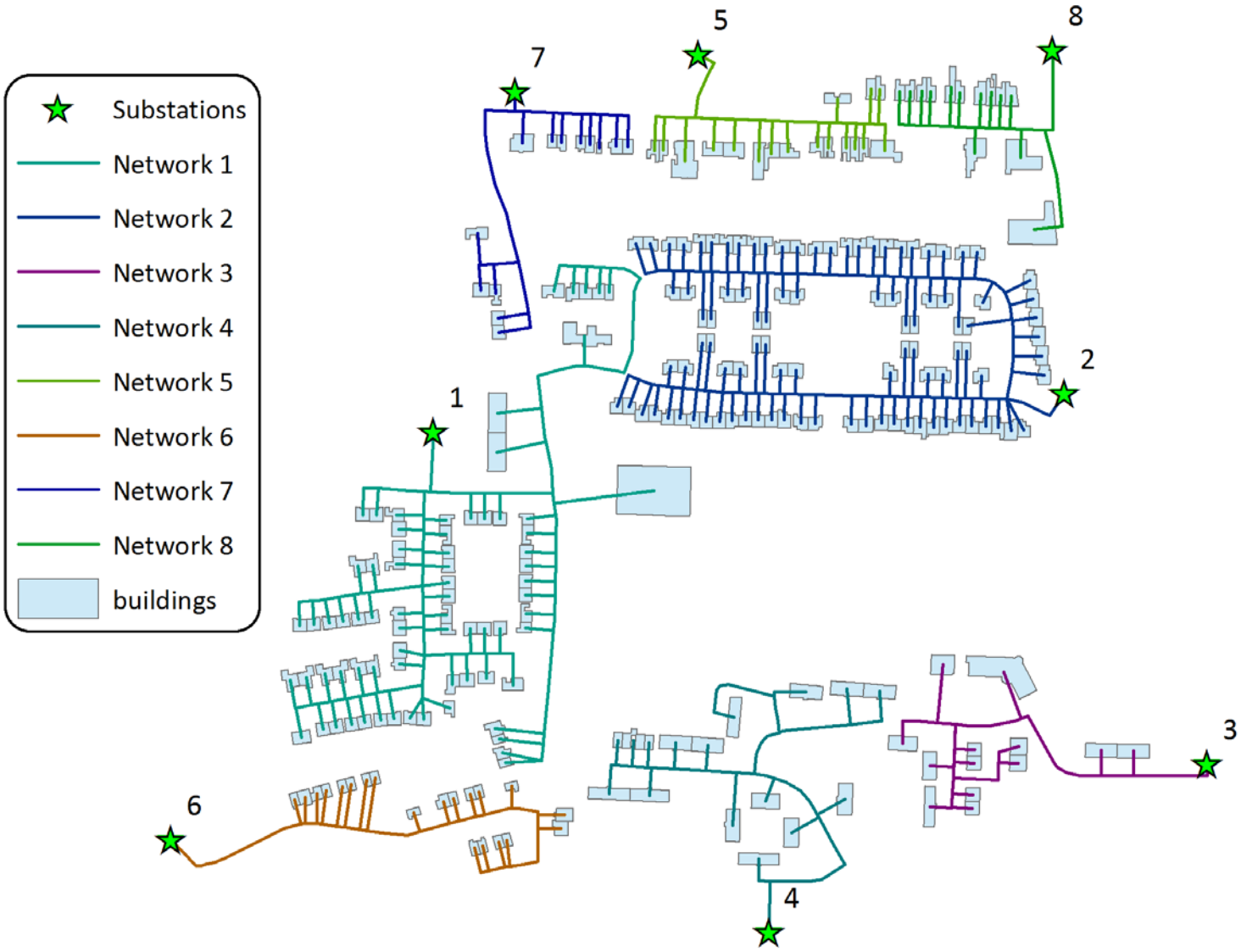
Inferred LV Distribution Networks



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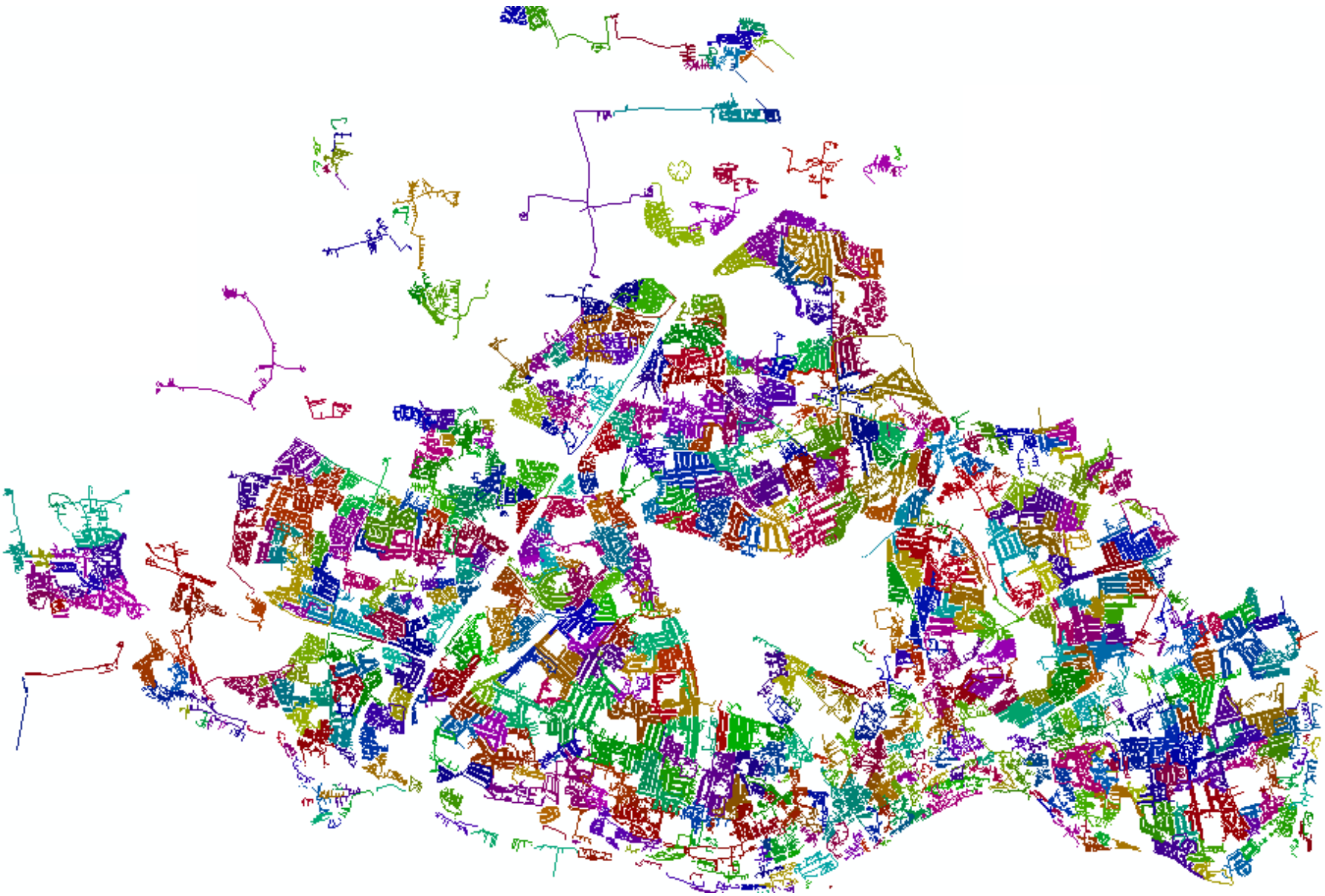
Newcastle LV Distribution Networks



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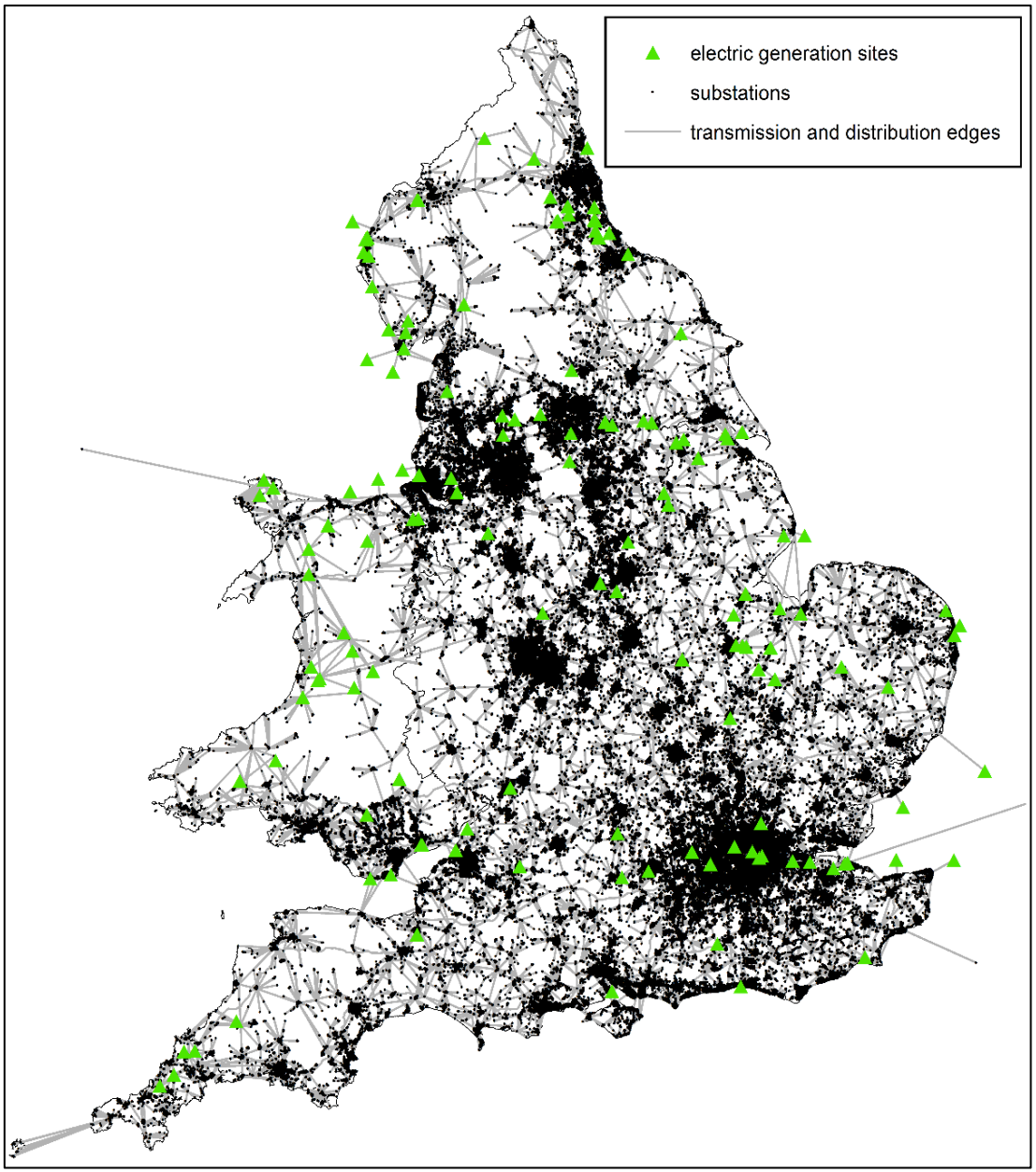
Integration to National Transmission and Distribution



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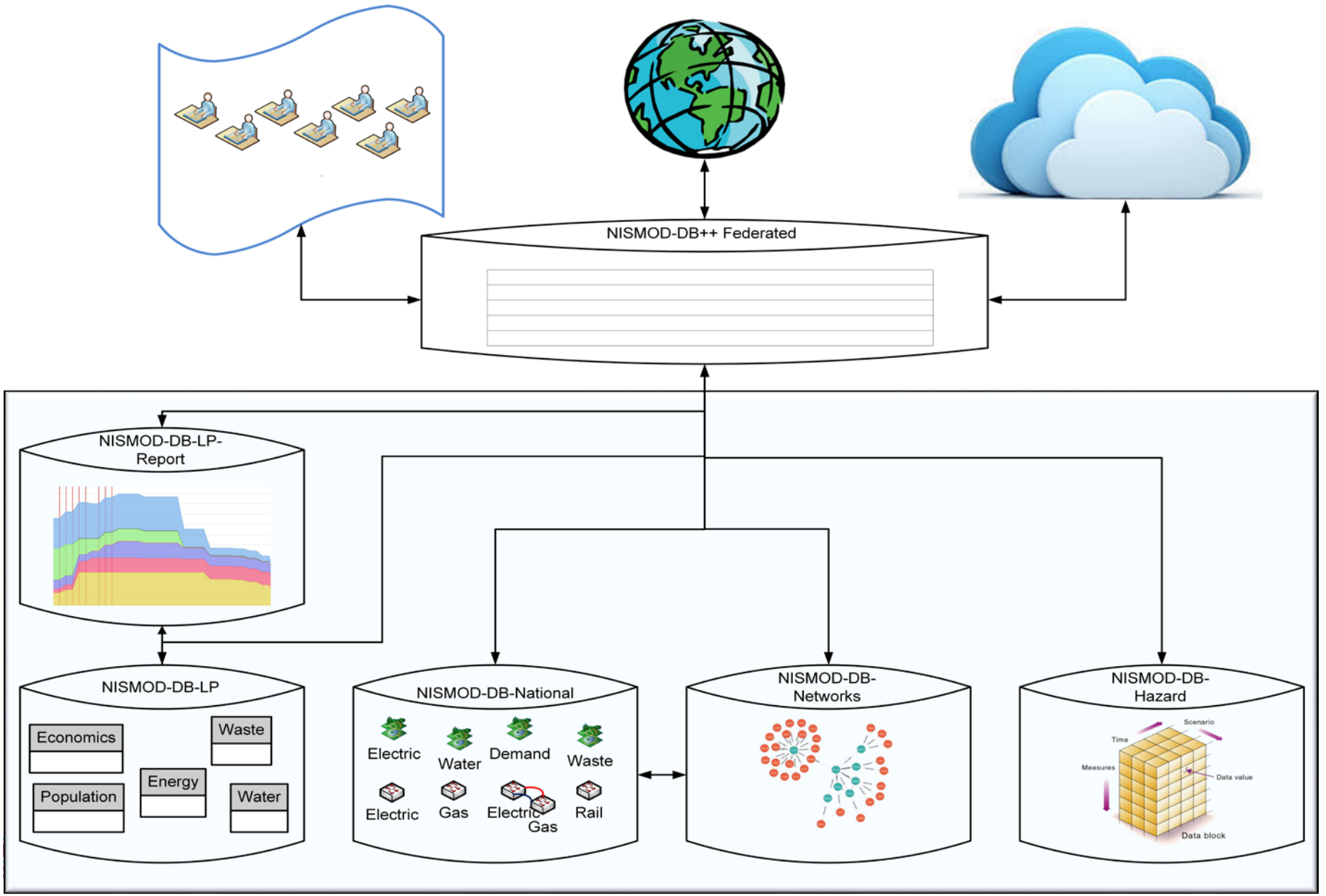
MISTRAL NISMOD-DB++



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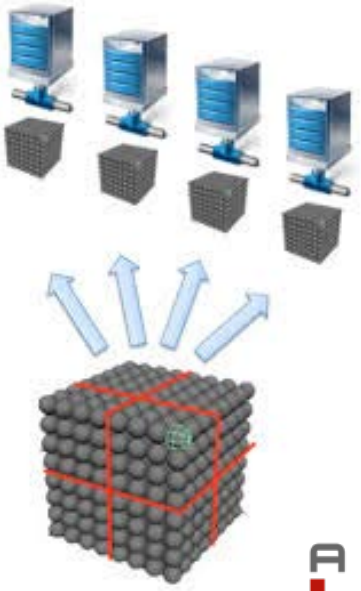
NISMOD-DB++ Technology Stack

SciDB



PostgreSQL

PostGIS

Geospatial Objects for PostgreSQL

APACHE HBASE

neo4j

cassandra

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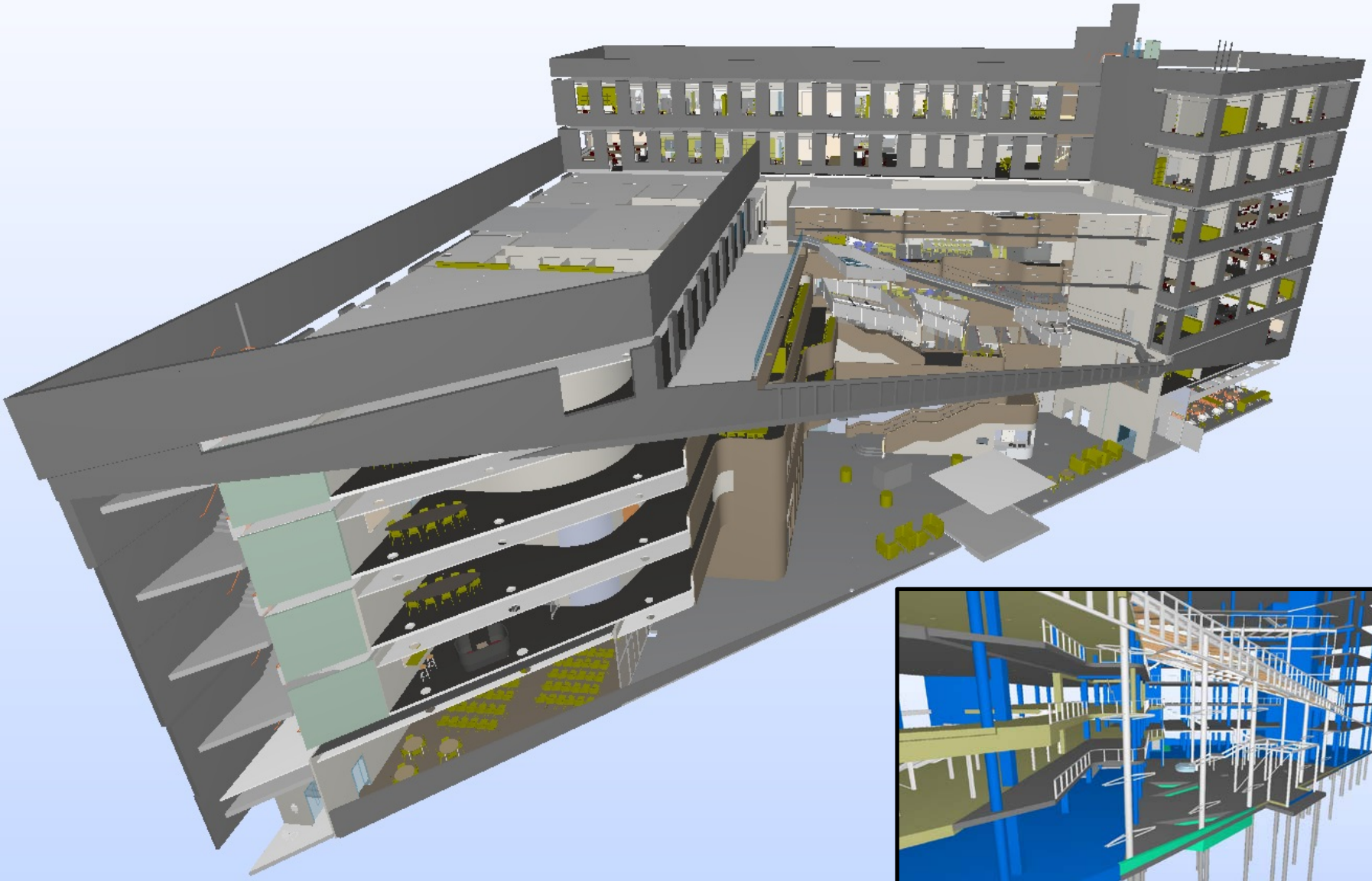
BIM, BMS, …, BEM Integration



Urban Observatory

Real-Time Building Sensing

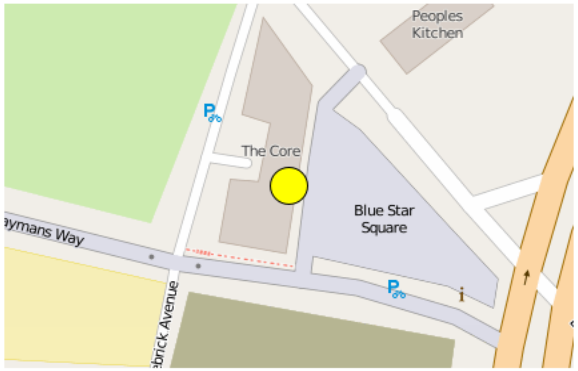
Newcastle University Urban Observatory

ScienceCentral | Newcastle University | School of Civil Engineering & Geosciences

Map | Explore | Data Download | API | Admin

SC substation

Location



Live Readings

Time of readings: 2016-01-29 14:41:00

Real Power
118.0
+kW

Sensor Health

Time since last reading:
4m50s

Number of readings in last 24 Hours:
1467

Number of "suspect" readings:
0

Metadata

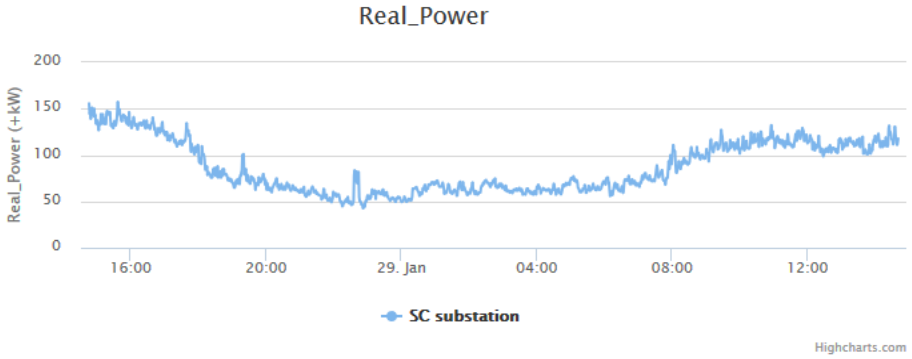
About:
Nortech Power Sensor

Sensor Document:
N/A

First Record:
2015-07-07 00:00:00

Last 24 Hours

Real Power



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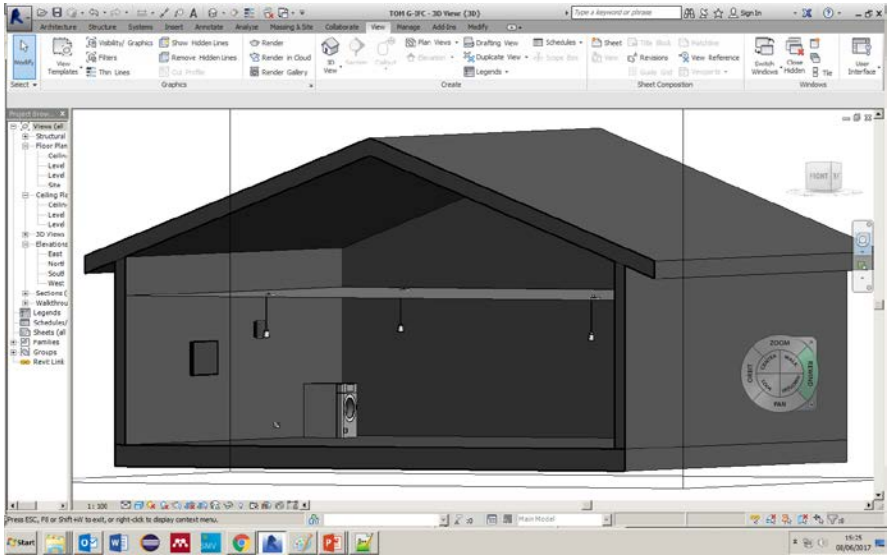
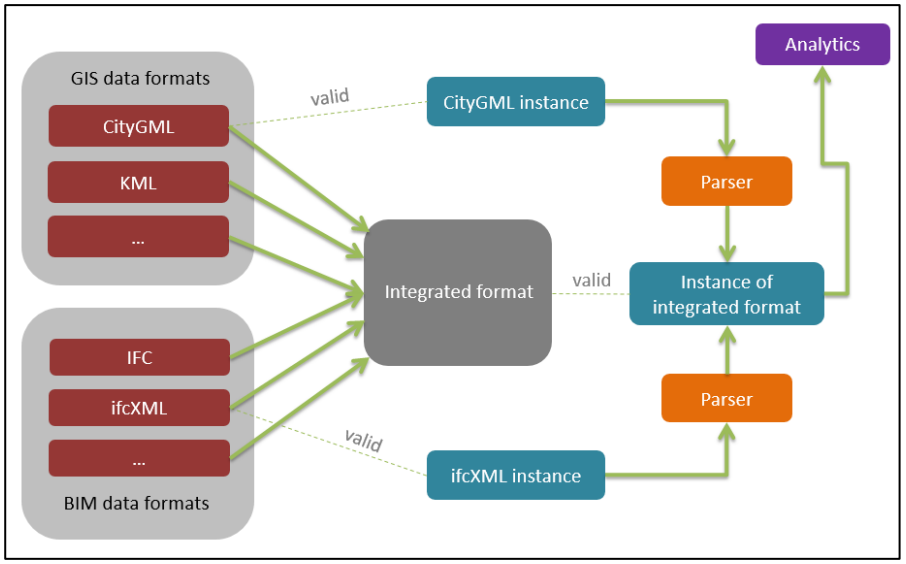
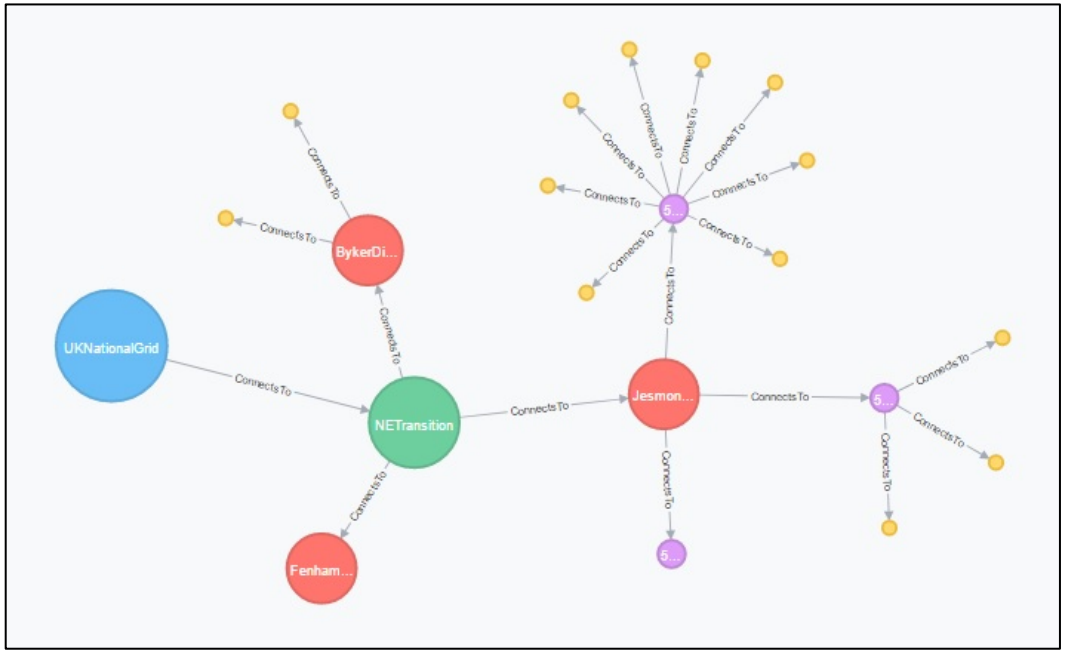
BIM, BMS, …, BEM Integration







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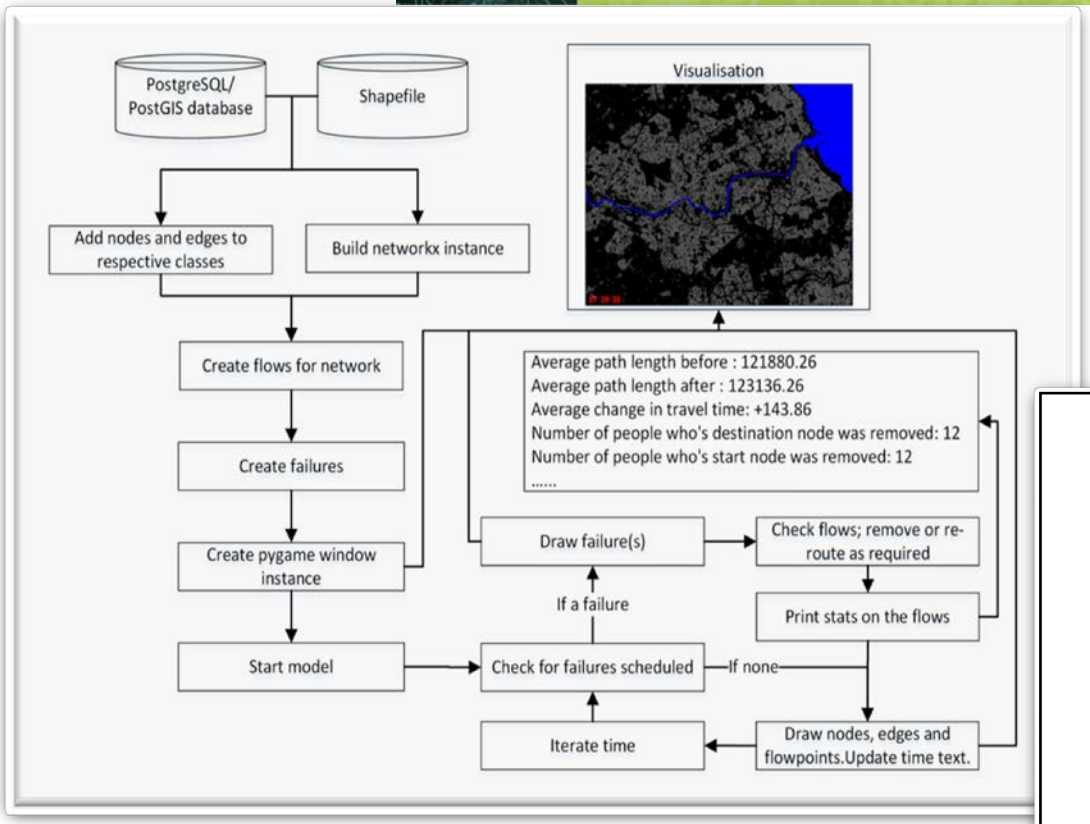
Ordnance Survey

From Structure to Dynamics



The Co-Production Challenge

Mike Batty, Modelling the World 2016

- "We need to do many things and the most important is working with decision-makers & people who will use these tools."
- "the process of translating models into tools is one which is lengthy and involved – more involved than building these models per-se and we have only just begun to recognise this"

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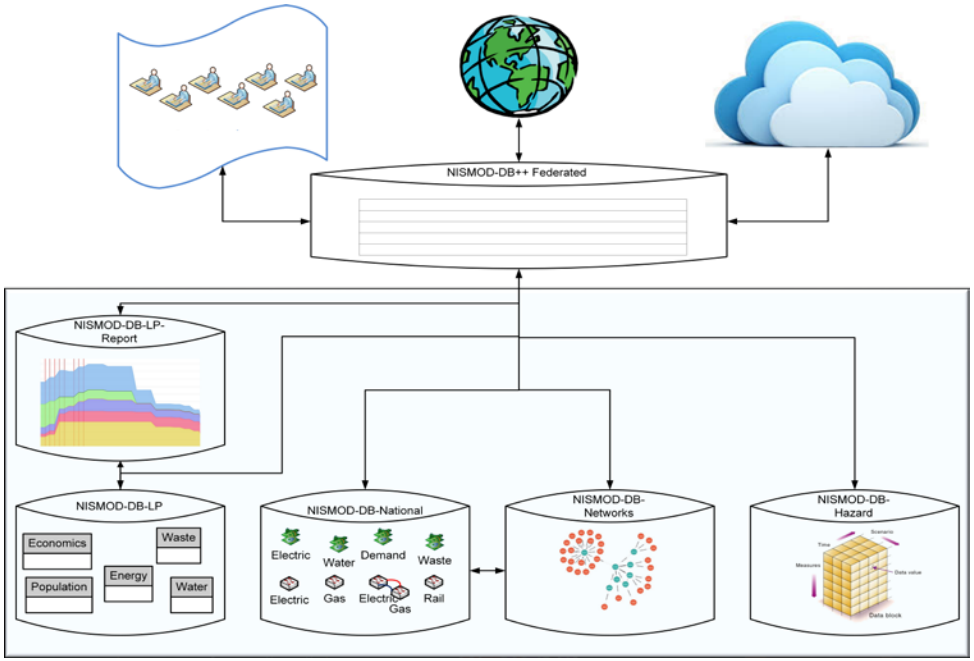
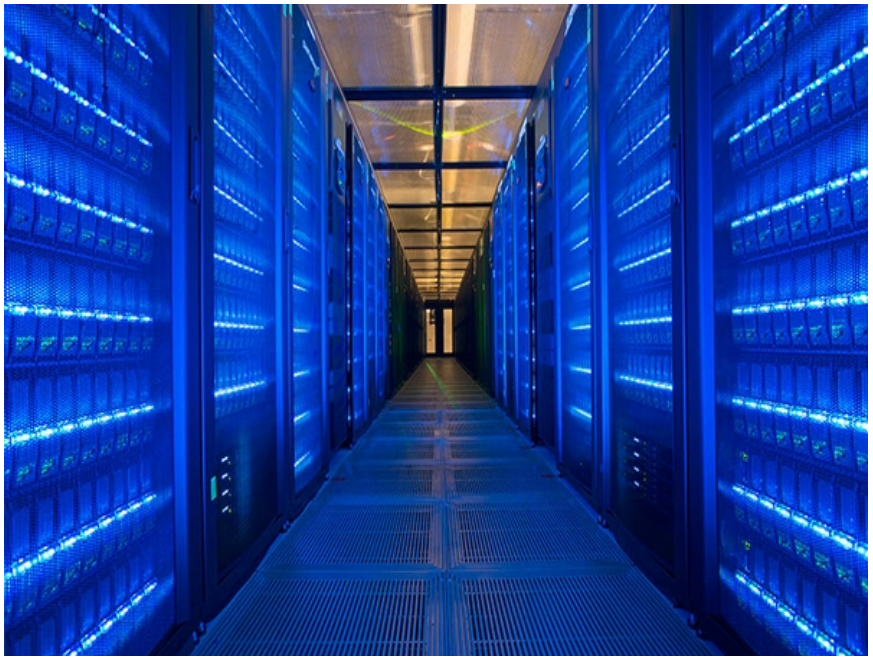
UKCRIC *DAFNI* Community Resource

ITRC & STFC development of a £8 million *D*ata and *A*nalytics *F*acility for *N*ational *I*nfrastructure

- A national infrastructure database based around NISMOD-DB++.
- HPC environment for computationally demanding Cities and Infrastructure systems analytics, modelling and visualisation.





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http://www.itrc.org.uk/dafni-data-and-analytics-facility-for-national-infrastructure