AURIN
Australian Urban Research Infrastructure Network

NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative

THE UNIVERSITY OF MELBOURNE

Big Data, Smart Cities and Urban Research Infrastructure

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Overview

- **Urbanisation** is occurring at a rapid rate as cities continue to exhibit strong **agglomeration economies**.

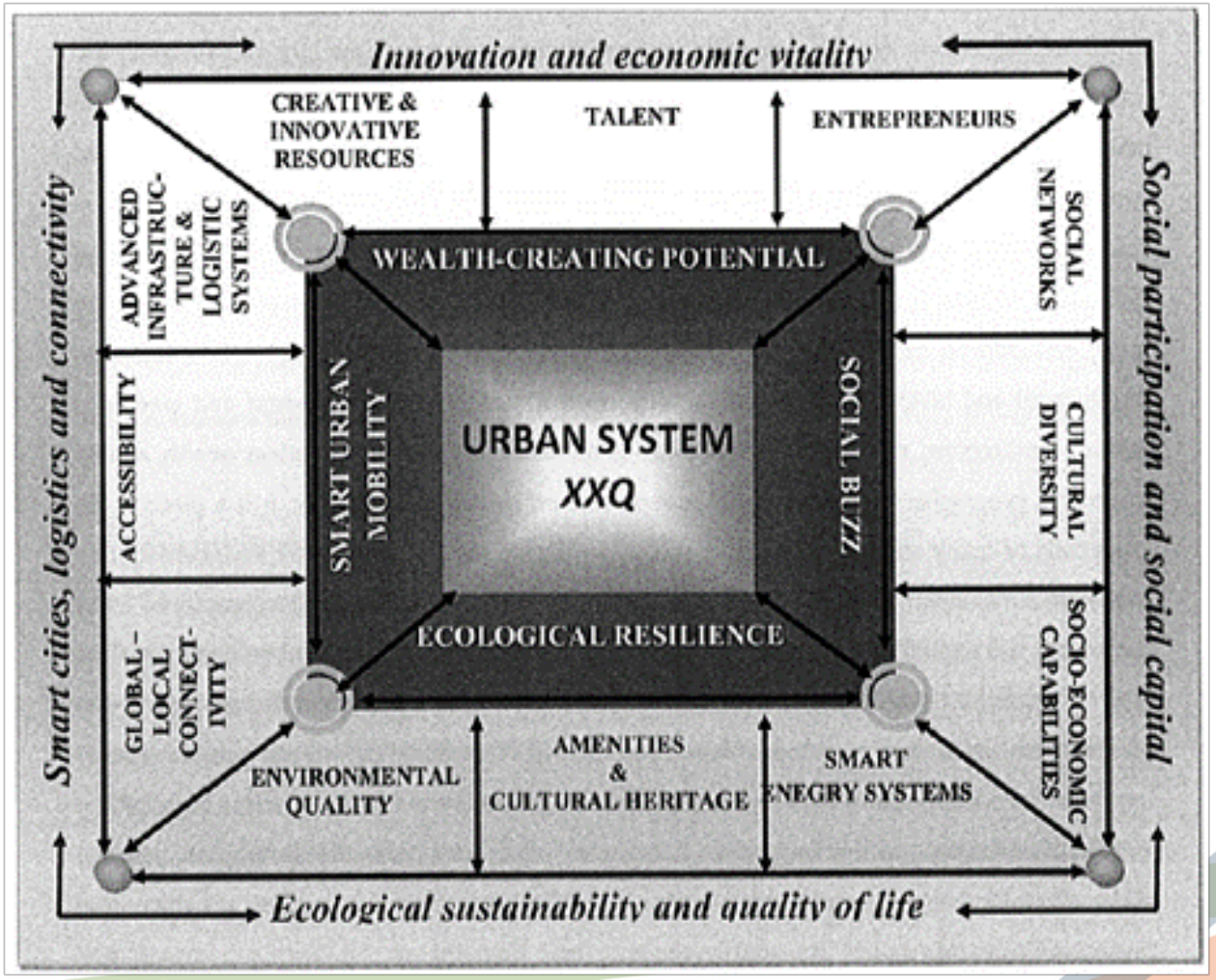
- The **'Smart City' concept** has been capturing increasing attention as **'Big Data'** opens opportunities to capture and interrogate vast amounts of new data and open up access to much more existing data through the implementation of **'Open Data' initiatives.**

- This has the potential to operationalise innovative new approaches to an integrated urban analysis, such as the 'New ***Urban World-Urban Piazza' framework*** proposed by **Kourtit, et al.** (2014).

- **Research infrastructure initiatives** such as the **Australian Urban Research Infrastructure Network (AURIN)** are facilitating implementation of such an integrated approach to urban analysis in the context of **'Smart Cities'** using **'Big Data'**.

The New Urban World – Urban Piazza framework

(Source: Kourtit, et al. (2014: p. 105).



Centre for Applied Spatial Analysis (CASA 2012) at University College London sees 'Smart Cities' as being all about...

- *"…how computers, data, and analytics which consist of models and predictions, are being embedded into cities. Cities currently are being extensively wired, thus generating new kinds of control and new kinds of services, which are producing massive data streams – 'big data'. To this end, we need powerful analytics to make sense of this new world and our focus on doing this is through visualisation."*

- However, the **'Smart Cities'** concept is not particularly new.

- Michael Batty remids us that he first started writing about them in the 1980s when Singapore was being promoted as the 'Intelligent Island' in an era when the focus was on the idea of the **'wired city'** (see Dutton, et al. 1987) using WAN technology, which was later followed by use of ICTs.

The Evolutive User-centric Networks for Intraurban Accessibility (EUNOIA) web site refers to 'Smart Cities' as...

- *"... a holistic concept encompassing not only the use of modern technology (including transport or energy technologies, in addition to ICT), but also the investment in human, social, and environmental capital, to create sustainable development and high quality of life."*

- This opens up opportunities to make progress in three important directions:

  - **automated collection of spatial and temporal movement data** to enhance traditional data sources such as census data;

  - develop **new theory and better models for the quantitative assessment of different scenarios andpolicy options**; and

  - support an **increased participation of citizens** to enable collaborative, multi-stakeholder policy assessment and decision-making.

As with any "buzz term", the definition varies

- **Boima and Bonfa** (2012):
  - *"… a conceptual framework that enables a city or region, to be interconnected, in an intelligent way, to address ...[inter alia] ... social, economic, climatic and pollution issues through the infrastructure in terms of its structure, how it is managed, the relationships between its different components and how companies, organisations and the public interface with it. Key relevant components in the infrastructure include power, transportation, water, telecommunications, healthcare and big data (space and non) analytics cloud based. It allows more efficient use of resources by bringing together government, industry, organisations and individuals to pool resources for the common good."*

- **Violino** (2014):
  - *"… in general, [Smart Cities]refers to using information and communications technologies to deliver sustainable economic development and a higher quality of life, while engaging citizens and effectively managing natural resources."*

- The new urban technologies that are rapidly emerging already produce **massive streams of data in real time and space** that we now refer to as **'Big Data'.**

- **Boima and Bonfa** (2012) claim t the 'Smart Cities' concept is
  - *"... largely a result of the huge gains in computing", along with that the emergence of 'Big Data'*
  - especially through wireless technologies.

World Smart City Forum 2011: Conceptual Framework

Urban Computing

- **Yu Zhen** (2013) says that **'Big Data'** "*implies rich knowledge about a city*" helping it to tackle major issues when used correctly.

- Using it for what he calls '**urban computing**', he notes that:

  - *"… Urban computing is a process of acquisition, integration, and analysis of big and heterogeneous data generated by a diversity of sources in urban spaces, such as sensors, devices, vehicles, building, and human, to tackle the major issues that cities face. Urban computing connects unobtrusive and ubiquitous sensing technologies, advanced data management and analytics models, and novel visualization methods, to create win-win-win solutions that improve urban environment, human life quality, and city operation systems."*

Hilbert (2013) makes the important point that...

- *"... the crux of the 'Big Data' paradigm is actually not the increasingly large amount of data itself, but its analysis for intelligent decision-making". (p. 4)*

❑ **'Big Data Analysis'** is a more fitting term as:

- *"... the key feature of the paradigmatic change is that analytic treatment of data is systematically placed at the forefront of intelligent decision-making. The process can be seen as the natural next step in the evolution from the 'Information Age' and 'Information Societies" to 'Knowledge Societies': building on the digital infrastructure that led to vast increases in information, the current challenge consists in converting this digital information in to knowledge that informs intelligent decisions. (p. 4)*

‘Big Data’ and computational and GIS advances

- Advances in data modelling capabilities using ‘Big Data’ - such as **data mining** and **large scale simulation models** and **agent-based techniques** - have considerable potential to enhance urban research.

- ‘Smart Cities’ research using ‘Big Data’ is also enhanced through powerful advances in **Geographic InformationSystems (GIS)** technologies and what **Gilroy (**2014) refers to as:

  - *“.. the availability of consistent and accurate detailed geographic information [that] is a key enabler for the growth of national economies.” (Gilroy 2014)*

- **Geospatial data**, and the maps derived from them, are:

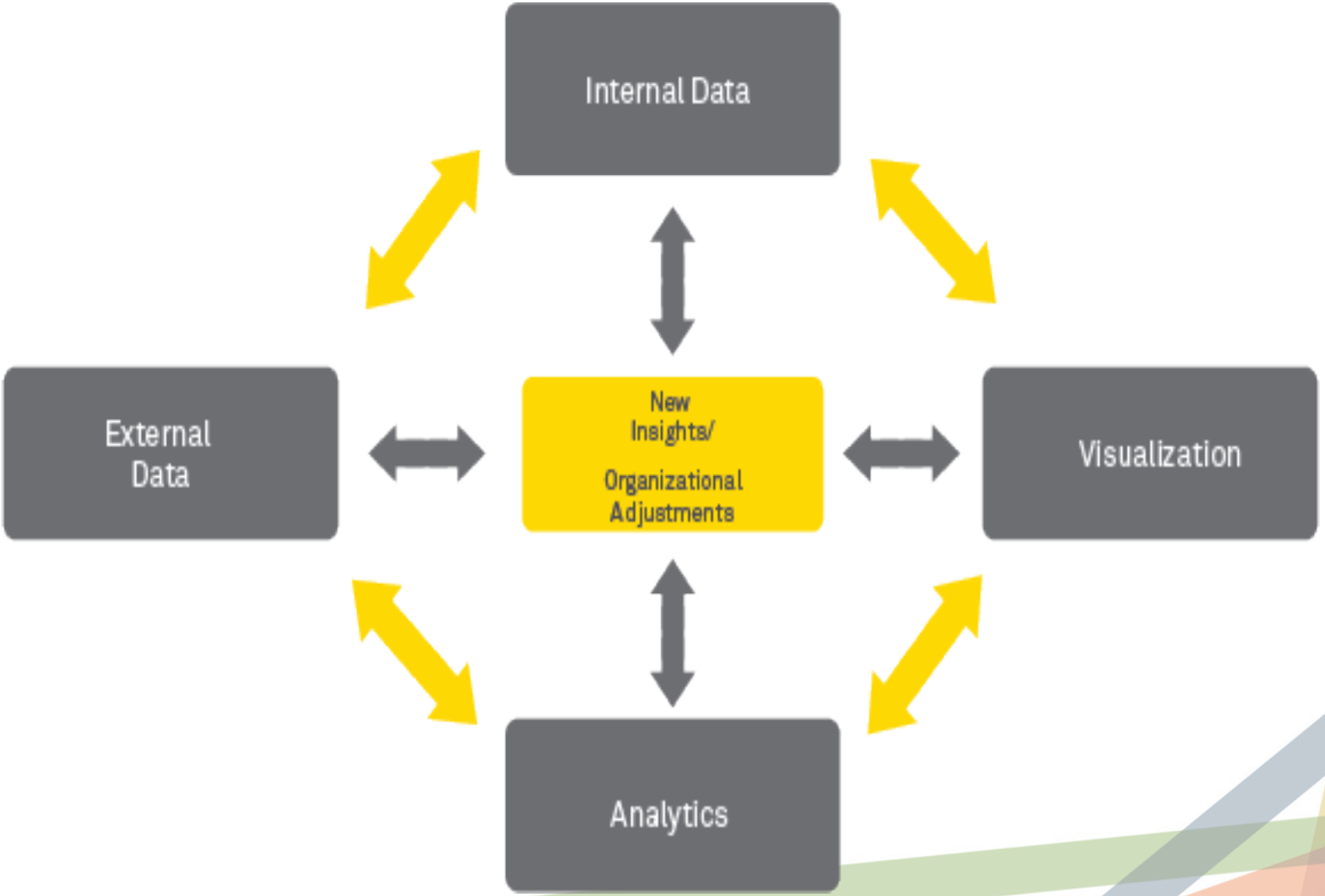
  - *“... fundamental to effectiveness and productivity in sectors including government, utilities, building, construction, emergency services, defence, primary industry, mining, energy, transport and tourism.” (Gilroy 2014)*

- **Digitisation means geospatial data can now be ‘intelligent’**:

  - *“... [it can] accurately reflect the world in terms of real world objects and their inter-relationships that can be interpreted by other information systems rather than through cartographic points, lines and polygons requiring human interpretation.” (Gilroy 2014)*

The ‘Big Data’ revolution

Source: Malvey, et al. (2013)



Big business and cities are now into 'Smart Cities' and 'Big Data'

- Big business is joining the **'Smart Cities' bandwagon** - including internationals such as **IBM**, **Siemens**, and **Cisco** - and that involvement is being driven by 'Big Data'.

- **IBM** sprukes the line that 'Smart Cities' will "drive sustainable economic growth" as their leaders have the tools to:
  - *"... analyze data for better decisions, anticipate problems to resolve them proactively and coordinate resources to operate effectively." (Latimore 2013)*

- Many **city administrations** are now engaged in **'Smart City', 'Big Data', 'Open Data' initiatives**.

- According to Ferguson (2012), 'Smart Cities'are
  - **"... popping up around the globe",**

  and their development:
  - *"... involves a wide scope of technology, everything from renewable energy, green buildings and smart grids to traffic management, urban security and medical technology."*

Smarter Cities: Turning Big Data Into Insight

City Planning and Operations

$1 Trillion
global annual savings could be attained by optimizing public infrastructure.
Source: McKinsey

$57 Trillion
in infrastructure investments will be needed between 2013-2030.
Source: McKinsey

Transportation Analytics

50 Hours
of traffic delays per year are incurred, on average, by travelers.

30 Billion
people all over the world travel approximately 30 billion miles per year. By 2050, that figure will grow to over 150 billion miles.

Water Management

60%
of water allocated for domestic human use goes to urban cities.

$14 Billion
in potable water is lost every year because of leaks, theft and unbilled usage.
Source: World Bank

Open Cloud

37,000
cloud experts support IBM's industry team alone.

$6 Billion
has been invested by IBM in more than a dozen acquisitions to accelerate its cloud initiatives.

IBM Intelligent Operations software is designed with cities, for cities, to provide the tools to monitor, visualize and analyze vital city services such as water and wastewater systems, transportation, infrastructure planning, permit management and emergency response.

IBM

European Smart Cities

Enel SMART CITY FORUM

I ITALIAN SMART CITY FORUM

Genova

GTUG Palermo

GreenCity
Per un futuro sostenibile

TORINO SMART CITY

GCE
Green City Energy

BARI SMART CITY

EXPO
MILANO

SMART CITY
CITTA' CREATIVA

SmartCity

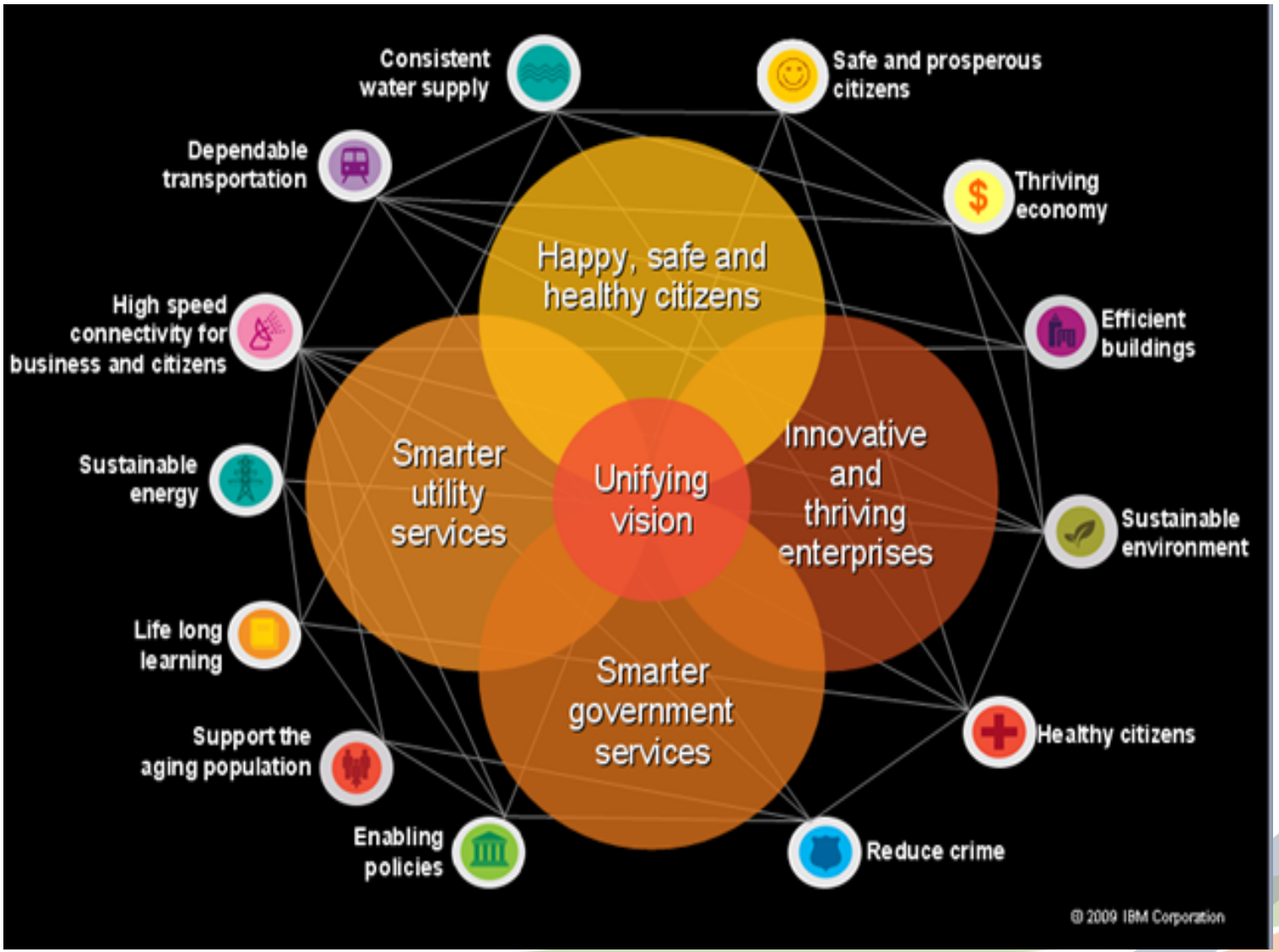
ANCI

TELECOM

smartCities by

CITTÀ SOSTENIBILE

‘Smart Cities’ and ‘Big Data’: A unifying vision



Research Infrastructure to Facilitate 'Smart Cities' Research and Analysis

- There are **many initiatives occurring** around the world to build the **smart infrastructure** to facilitate imntegrative urban research using 'Big Data' in the pursuit of 'Smart Cities' with a common objective being to provide spatial decision support systems which is being enabled through advances in e-researchinfrastructure approaches.

- Examples include:

  - The Center for Urban Science and Progress (CUSP) at the New York University and NYU-Poly.
  - The MIT SENSE*able* City Laboratory.
  - The Evolutive User-centric Networks for Intraurban Accessibility (EUNOIA).
  - Infrastructure for Spatial Information in the European Community (INSPIRE).
  - Urban Big Data Centre (UBDC), University of Glasgow.
  - **The Australian Urban Research Infrastructure Network (AURIN).**

The Australian Urban Research Infrastructure Network (AURIN) Project

- **AURIN** (**www.aurin.org.au**) is a A**$24 million project** funded by the **Australian Government** which was initiated in 2010 and continues in the current funding phase through to 30 June 2015.
  - It is led by The University of Melbourne.

- **AURIN's objective** is to establish facilities that will:
  - facilitate urban and built environment research and enhance urban resource use and management

  by:
  - providing a state-of-the-art **e-research ifractructure** that offers **seamless and secure access to data** from **diverse sources** and the on-line capability to **integrate data** and **interrogate data** using open source statiatical and spatial analysis and modelling and visualisation tools (including scenario modelling tools)

  to:
  - support multiple **research activities** and **policy analysis**
  - that will:
    - **enhance understanding of key issues** across the urban components of Australia's settlement system.

- **More than 75 institutions are involved in the AURIN network.**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THE UNIVERSITY OF MELBOURNE
Australian Government
Department of Education
NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative
NATSEM
UNIVERSITY OF CANBERRA
AUSTRALIAN ACCESS FEDERATION
LOW CARBON LIVING CRC
NICTA
crc•si
ands
AUSTRALIAN NATIONAL DATA SERVICE
IBM
Australian Bureau of Statistics
nectar
Victoria
The Place To Be
apm
australian property monitors
THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
PSMA
AUSTRALIA LIMITED
UNSW
THE UNIVERSITY OF NEW SOUTH WALES
Landgate
Government of South Australia
City of Townsville
Griffith UNIVERSITY
CITY OF MELTON
qcif
Government of Western Australia
QUT
CITY OF MELBOURNE
NSW GOVERNMENT
INTERSECT
University of Wollongong
PHIDU
University of South Australia
THE UNIVERSITY OF WESTERN AUSTRALIA
CSDILA
THE CENTRE FOR SPATIAL DATA INFRASTRUCTURES & LAND ADMINISTRATION
CITYFUTURES
UNSW Built Environment
RMIT UNIVERSITY
JAMES COOK UNIVERSITY AUSTRALIA
SSSI
ICA
ACI
CofFEE
Centre of Full Employment and Equity
CSIRO
THE UNIVERSITY OF NEWCASTLE AUSTRALIA
SWINBURNE UNIVERSITY OF TECHNOLOGY
Curtin
University of Technology
THE UNIVERSITY OF ADELAIDE
AUSTRALIA
OSGeo
Your Open Source Compass
isprs
information from imagery

e-Research (or e-Science) has much to offer urban research through….

- Software solutions addressing the **heterogeneity of distributed data sets** and **associated metadata** .

- It:
  - facilitates **data discovery**
  - supports **finer-grained access control** and **single sign-on** reflecting the autonomy of the data providers involved
  - enables **inter-operability across data** in a coordinated manner
  - supports **accounting and auditing** information on access to and usage of the facility.

- It provides **definition and enactment of workflows** that allow researchers to share and repeat the way in which they access and use a wide variety of data sets and associated tools.

The Challenge

- **Australia**, as indeed is the case with many other countries, faces numerous **challenges in the growth and planning of its cities**.

- There is surprisingly **little integrated infrastructure** that allows for the complex information that might inform policies and research agendas more generally to be accessed and processed for informed decision making based upon qualitative data.

- Researchers have been left with having to tap into swathes of distributed data sets from multiple organizations.

- **Stimson** (2011):

  - *"… It is fair to say that, till now, ad hoc data access and management solutions have been the primary way in which urban and built environment research has been undertaken. Organizations have created silos of data with their own heterogeneous access demands and data models that prohibit or severely restrict researcher access and use by the wider community." (p. 5)*

- **The objective of the AURIN project is to overcome these deficiencies**.

AURIN core e-Infrastructure

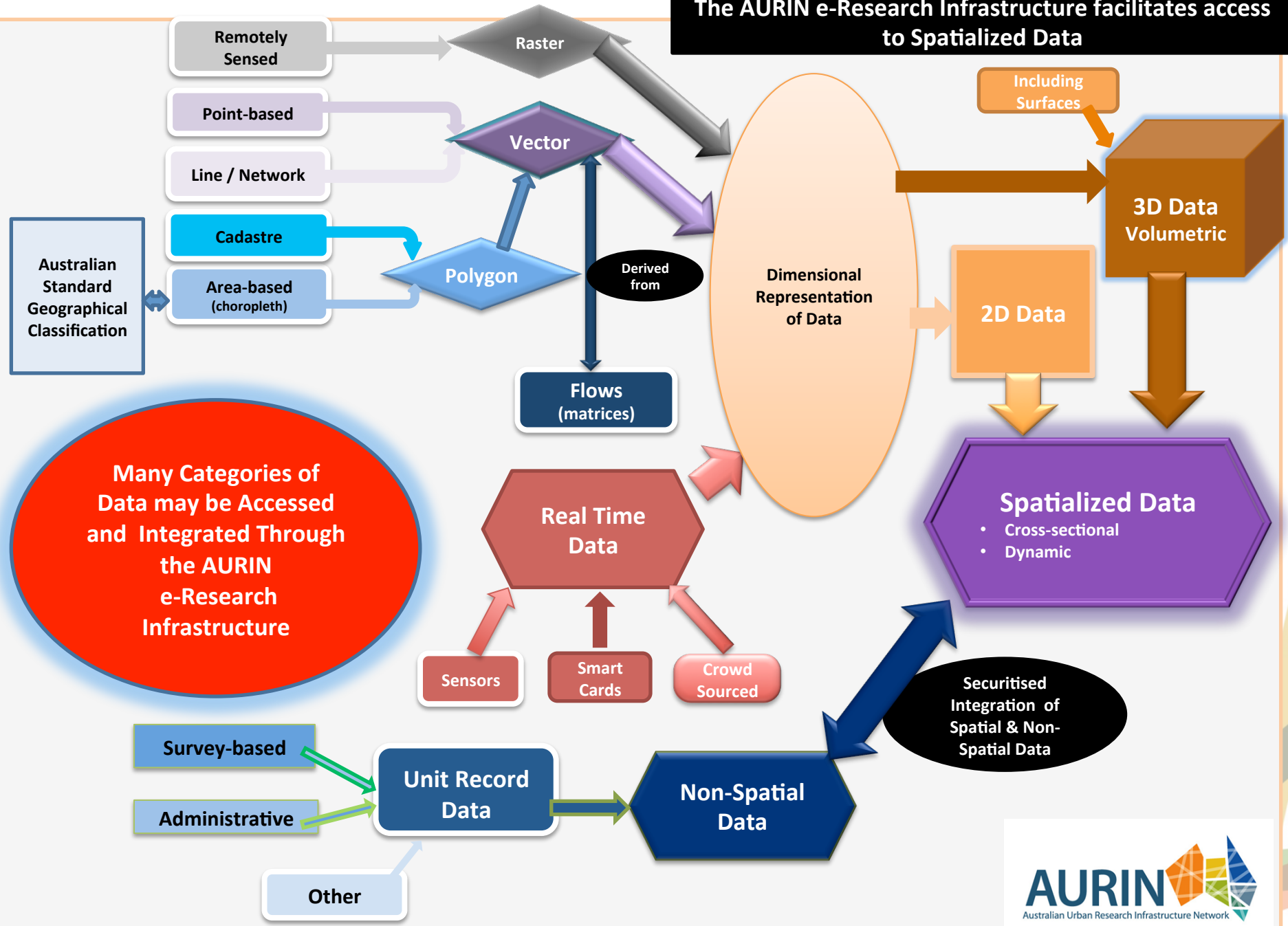
- **Single sign-on**, Portal-bas

AUSTRALIAN ACCESS FEDERATION

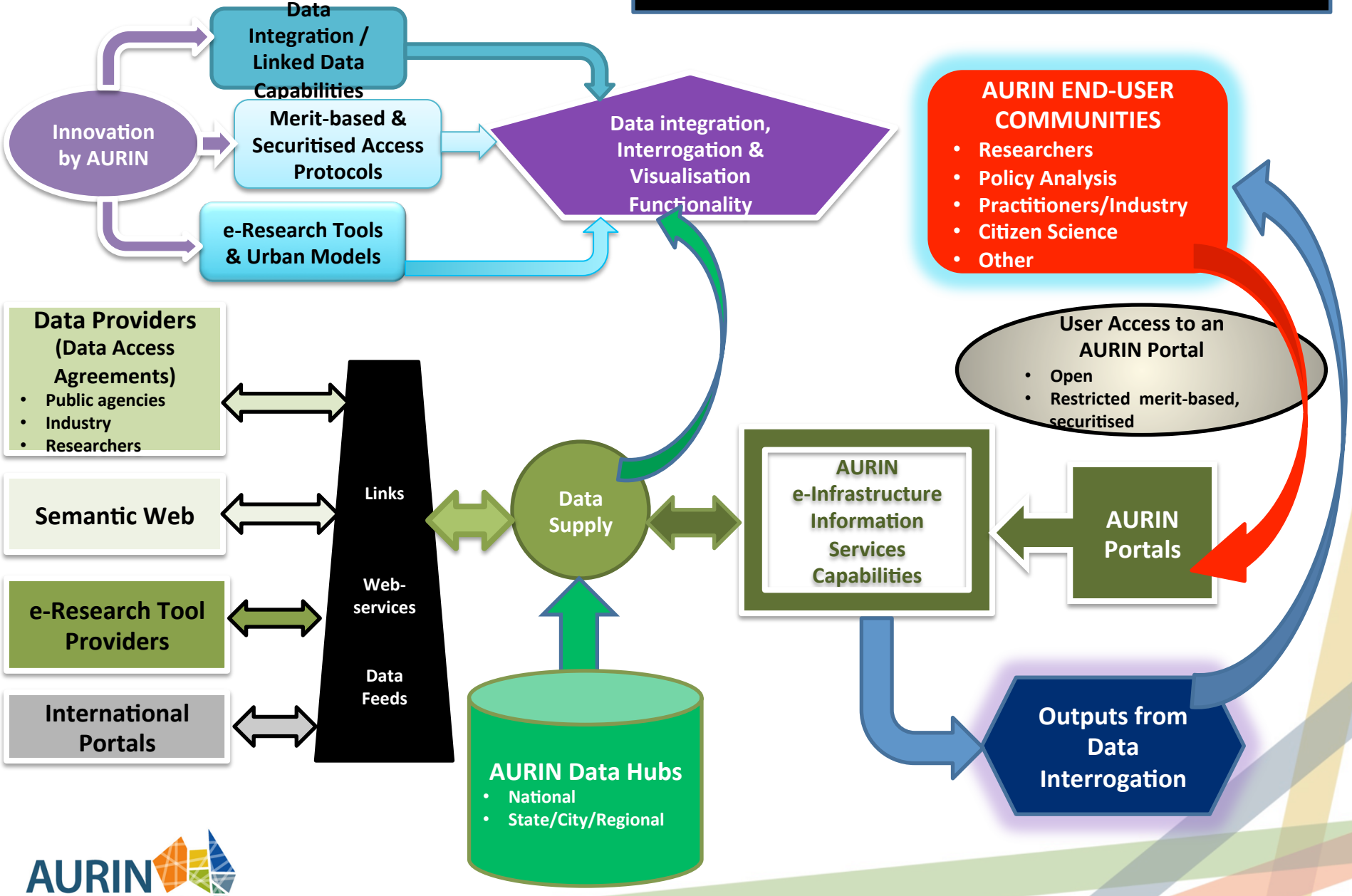
- **Merit-based access**.
- **Security-based** – space for collaboration, secure data playgrounds.

- Supports both **domain-specific** and **multi-disciplinary** research:
  - Assists with wicked policy problems; eg. Ageing population, city resilience.

The AURIN e-Research Infrastructure facilitates access to Spatialized Data



Accessing the Features of the AURIN e-Research Infrastructure



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AURIN Lenses

AURIN Expert Lenses

Lens 1: Population and demographic futures and benchmarked social indicators

Lens 2: Economic activity and urban labour markets

Lens 3: Urban health, well-being and quality of life

Lens 4: Urban Housing

Lens 5: Urban Transport

Lens 6: Energy and water supply and consumption

Lens 7: City logistics
Lens 8: Urban vulnerability and risks
Lens 9: Urban governance, policy and management

Lens 10: Innovative Urban Design

- ❑ **Interrogation of inter-regional migration flows matrices**
- ❑ **Nationally consistent small area population projections**
- ❑ **OECD Benchmarked Social and Economic Indicators**
- ❑ **NATSEM Small area social indicators for the indigenous population and Small area wellbeing /quality of life.**
- ❑ **Risk and Vulnerability (VAMPIRE)**

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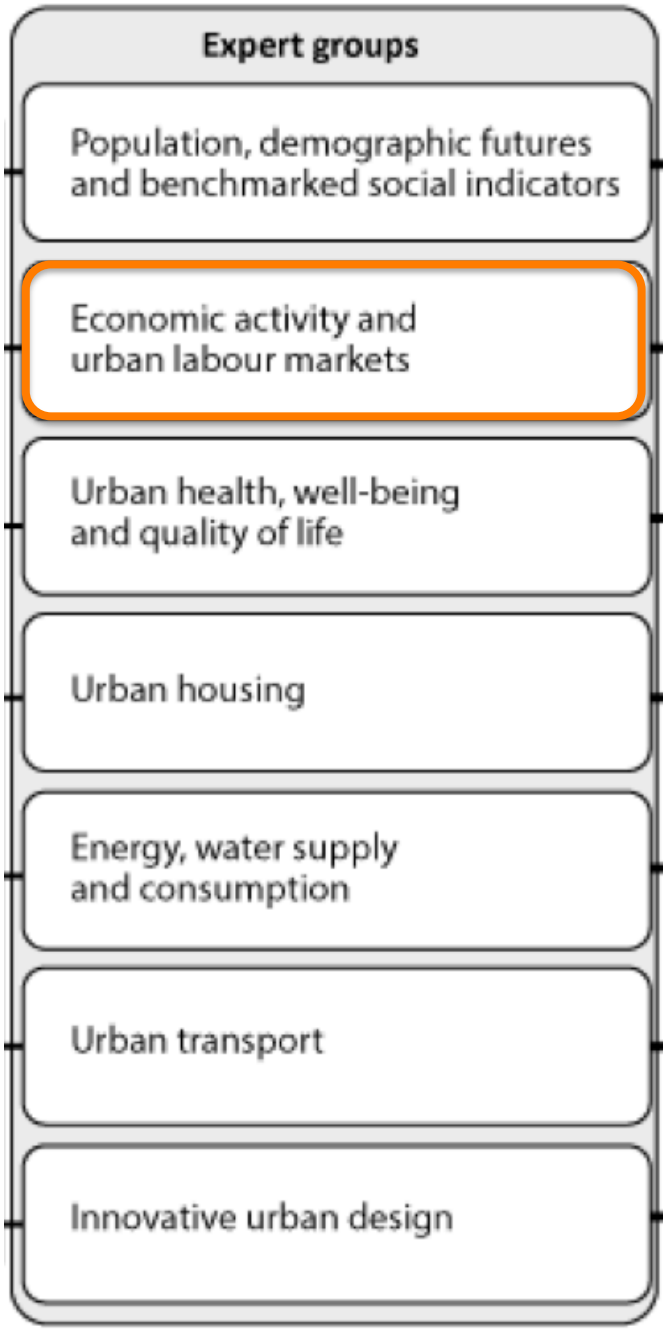

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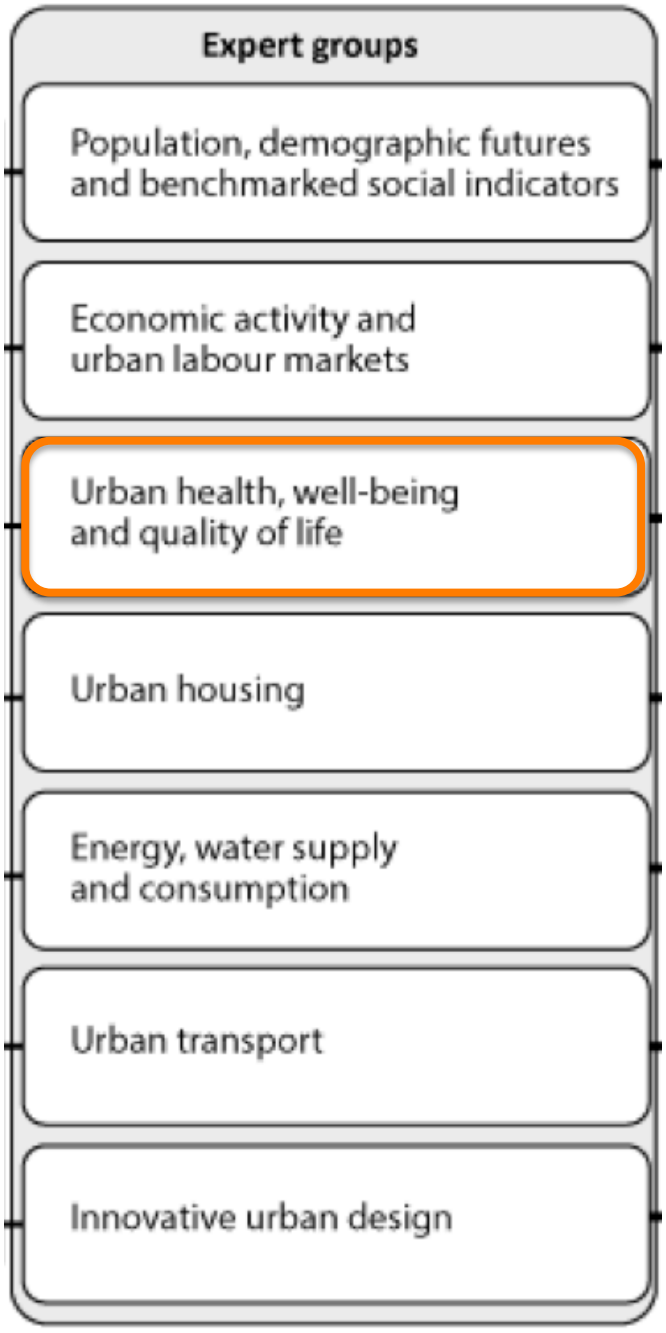
- Functional Economic Regions
- Economic spatial statistics and Regional impact analysis
- Input-Output Tables for Australia,
- Assessing Risk with spatial Indexes of Economic Prosperity and Employment Vulnerability (API/ AVI).
- National Industry Data project
- Provision of infrastructure and data integration for Functional Economic Regions 2011
- Economic Spatial Statistics addition of Concordance Table



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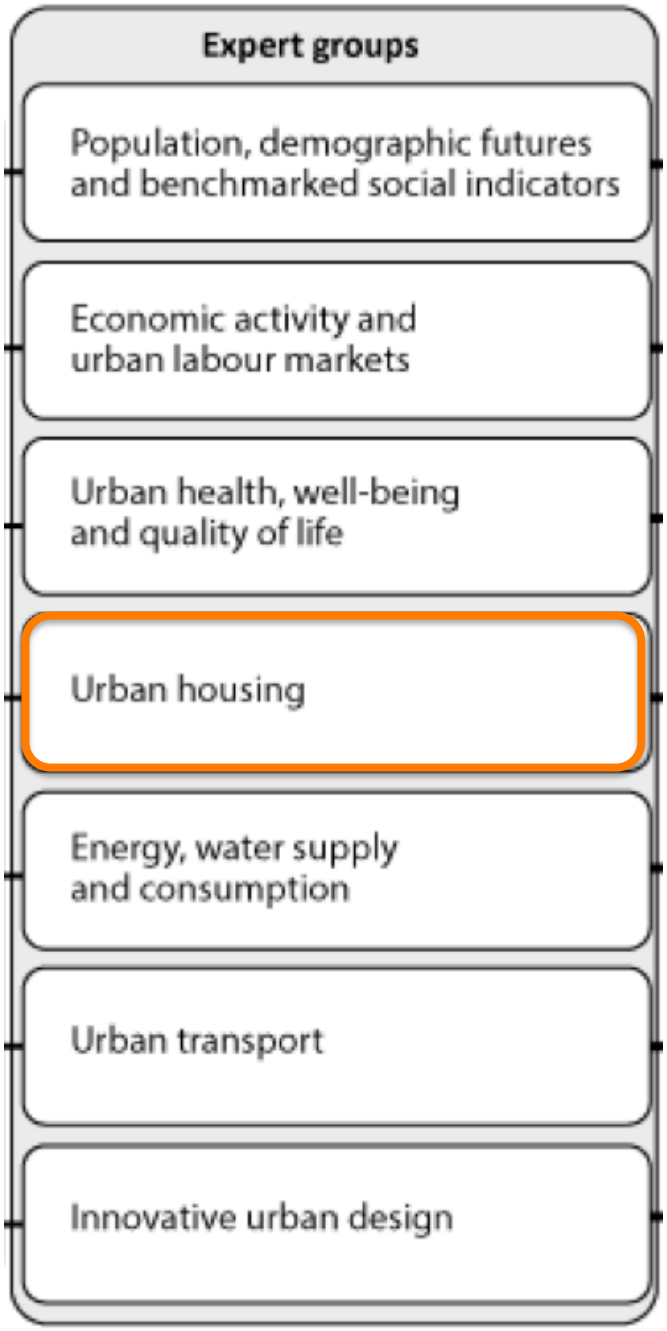
- ❑ **National data set and infrastructure provision (NDIP)**
- ❑ **Walkability**
- ❑ **VicHealth Data Provision**
- ❑ **Development and trial of an automated open-source**



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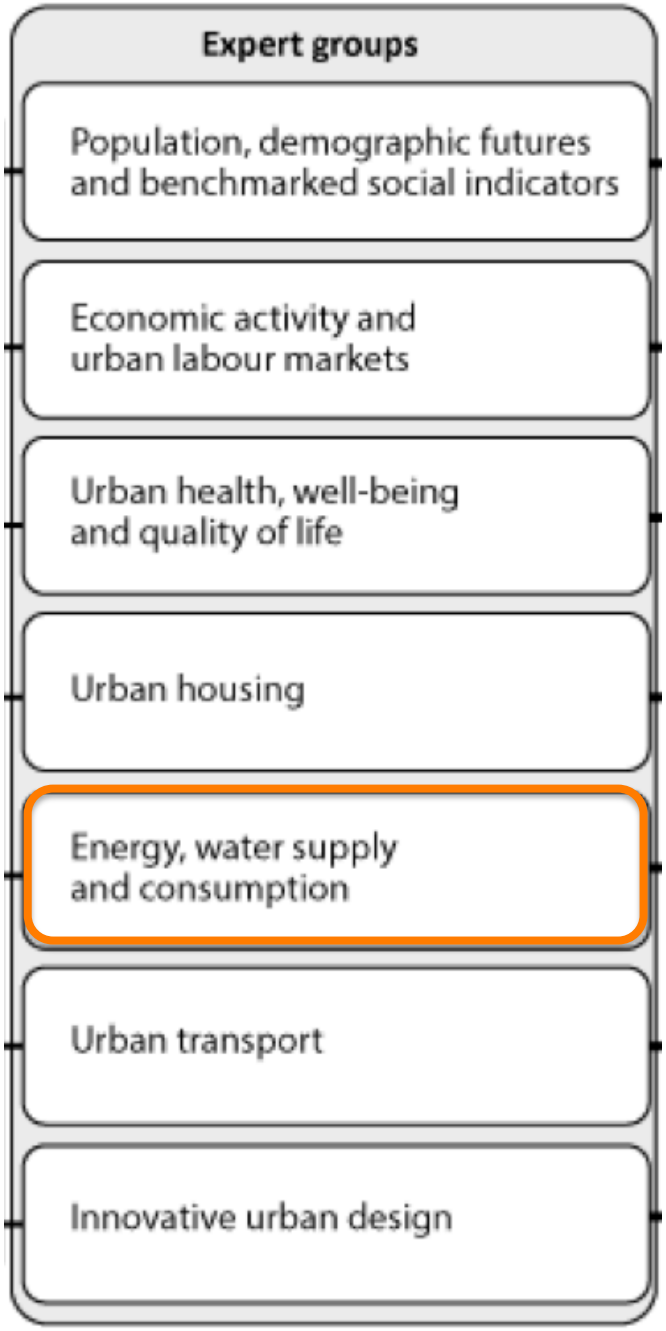
- ❑ **Provision of residential property data (TAD/2)**
- ❑ **Housing microsimulation e-Research tool**
- ❑ **Report on the state of play of housing related data and eResearch tools in Australia (Scoping Study)**



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- **Negotiation and development of consistent protocols regarding access and use of energy and water data for research and policy analysis.**

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- A model-free and multi-modal transport network coding for Australia
- Transport network performance (SCATS & micro-simulation centric)
- Household Travel Survey Harmonisation
- Harmonizing motor vehicle data and environmental efficiency for Australian cities

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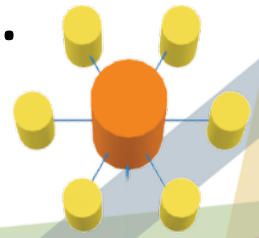
- ❑ **Integrated infrastructure design for Australia's cities**
- ❑ **Socio-spatial Statistical Analysis, Modeling and Visualisation What If? GIS Planning Support tool**
- ❑ **ENVISION**
- ❑ **ENVISION Scenario Planning Tool**

AURIN Data Hub Concept

- AURIN **Datahubs** are both a technical solution and community of users/providers
- Allow users to **search** for a variety of data.
- Allow users to **access** and use this data.
- Provides data in a discrete set of formats.
- Allows users/data custodians to **contribute** data to the hub.
- Allows for **programmatic access** to data.
- Provides information about the data (**Metadata**)



The Australian Urban Research Infrastructure Network

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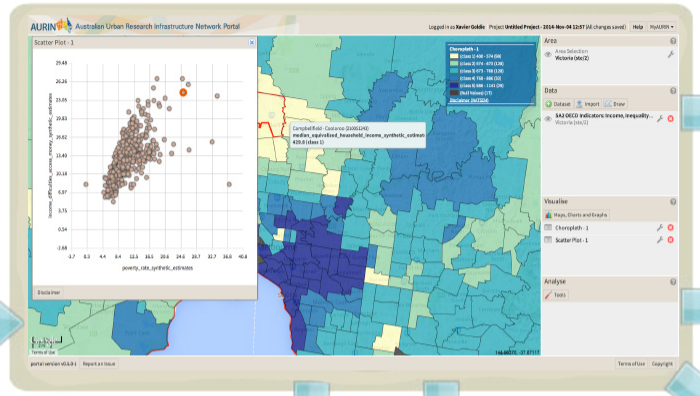
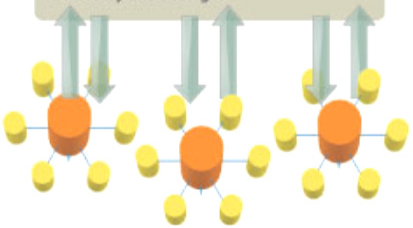
aurin.org.au



Raw data
export/import

Federated access
for urban researchers

Over 1000
premium datasets



Federated data hubs
from over 40 custodians

Cloud-based
processing and
user accounts

100 Analytical tools

Extended Applications

Jellyfish Transport accessibility	**3D Volumetric** Urban modelling and analysis	**CKan** Metadata catalogue, discovery and delivery	**Envision** Built environment typology analysis
Input/output Economic impact assessment model	**What-if?** Multiple-criteria decision making	**Metadata tool** Online metadata management	**ESP** Envision Scenario Planner

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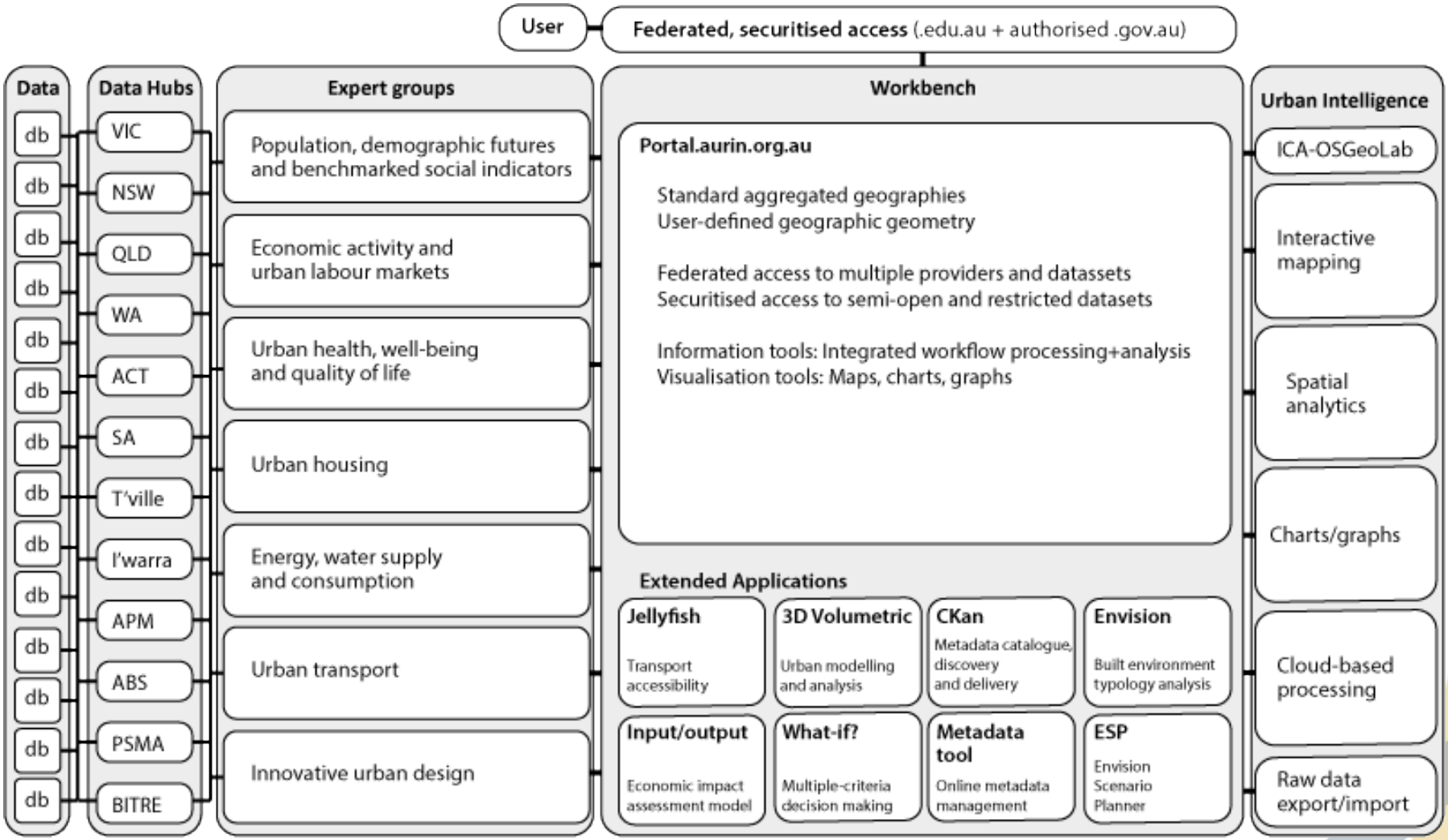

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Over 1,800 datasets

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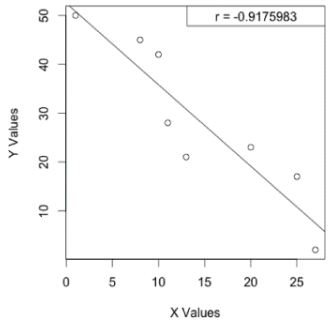
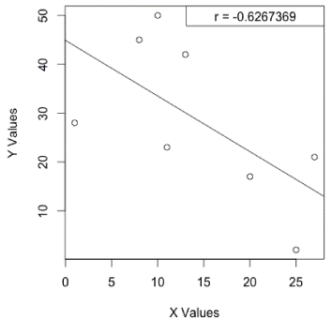
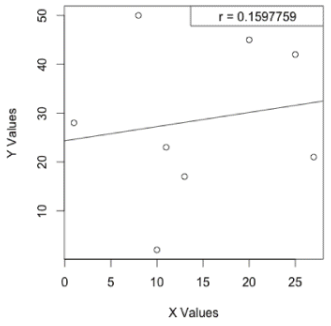
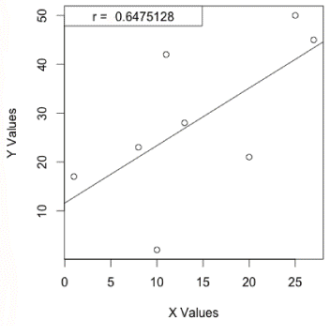
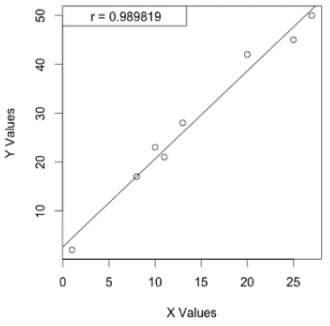
100+ Analysis tools @Beta 6

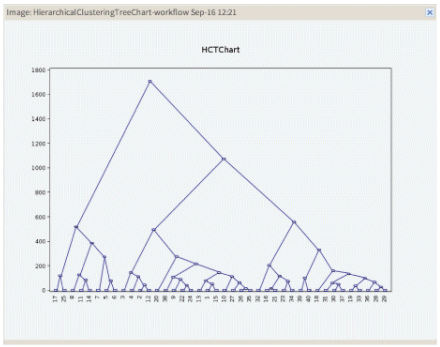


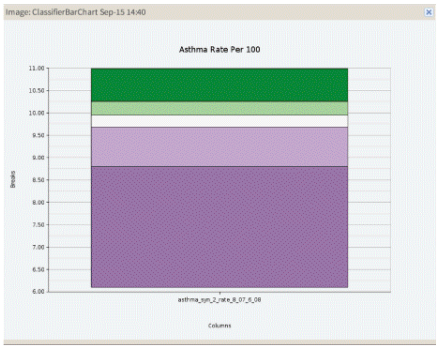


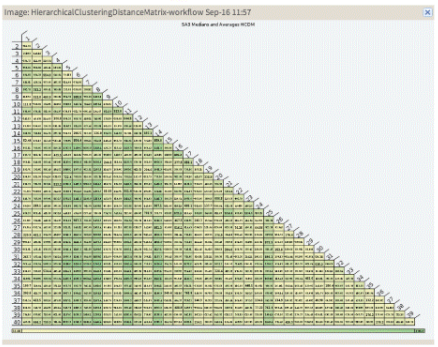


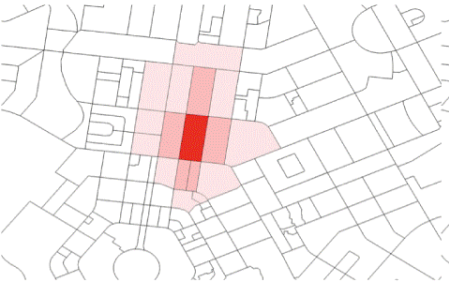


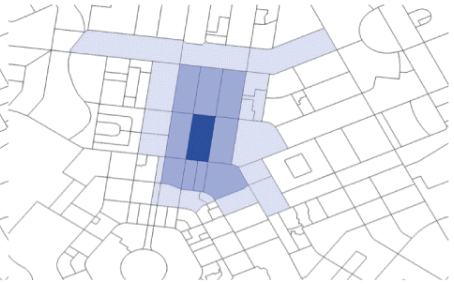


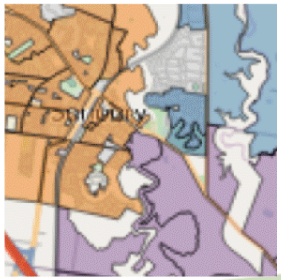


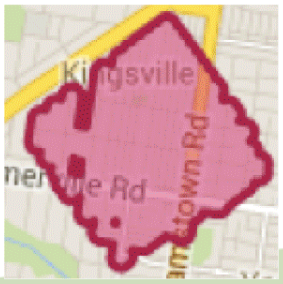


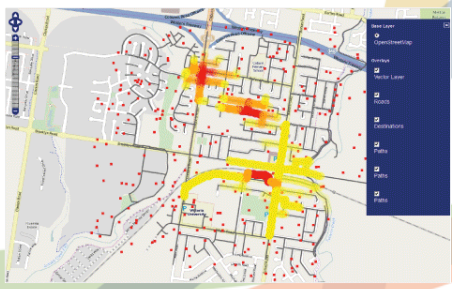












Open Source e-Research Tools to facilitate data interrogation

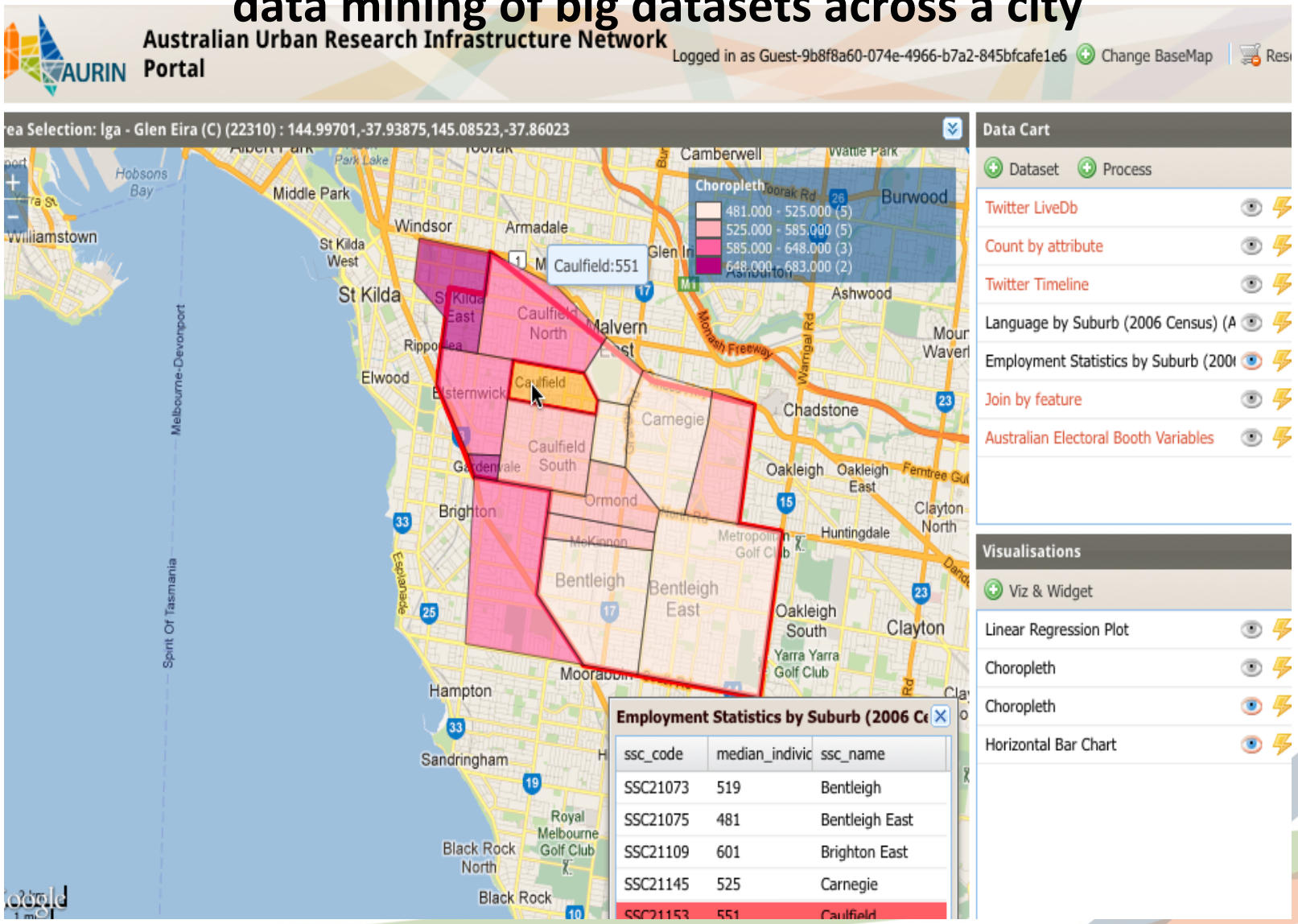
- **Statistical analysis and modelling tools**, including:
  - correlation and regression
  - factor analysis
  - multiple discriminant analysis
  - cluster analysis
  - shift-share analysis.
- **Spatial econometrics tools** that incorporate corrections to deal with spatial autocorrelation associated with the modifiable area unit problem (MAUP).
- **Network analysis tools**.
- **Simulation modelling** which integrates national sample survey data sets with spatial data sets from the census to generate small area synthetic estimates of survey data variables.
- **3D-volumetric modelling**.
- **Map and graphic visualisation**, incorporating a range of classification routines, including the Location Quotient.
- **Spatial analysis and modelling**, including land use and urban growth simulation models - such as the *What-if?* Model - and a *Walkability* tool.
- **The generation of reports**.

What will be now demonstrated

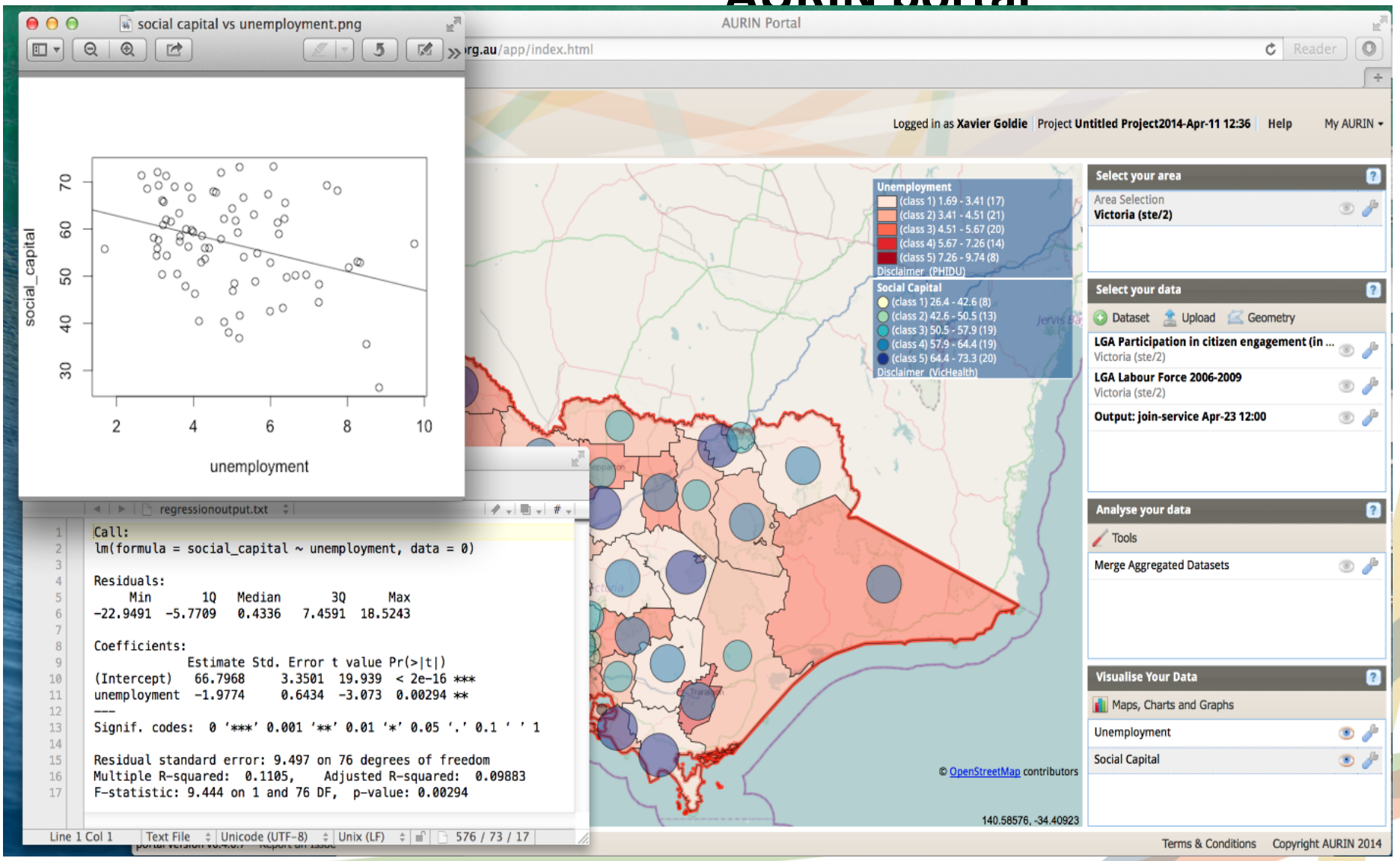
- I will present some of the **applications** that can be undertaken using the **AURIN e-infrastructure capabilities** – The **Workbench**

- That includes:
  - harvesting spatial data and conducting statistical analysis and modelling;
  - applying customised tools open source developed such as a **Walkability tool** and a **Planning What If? Tool**; and

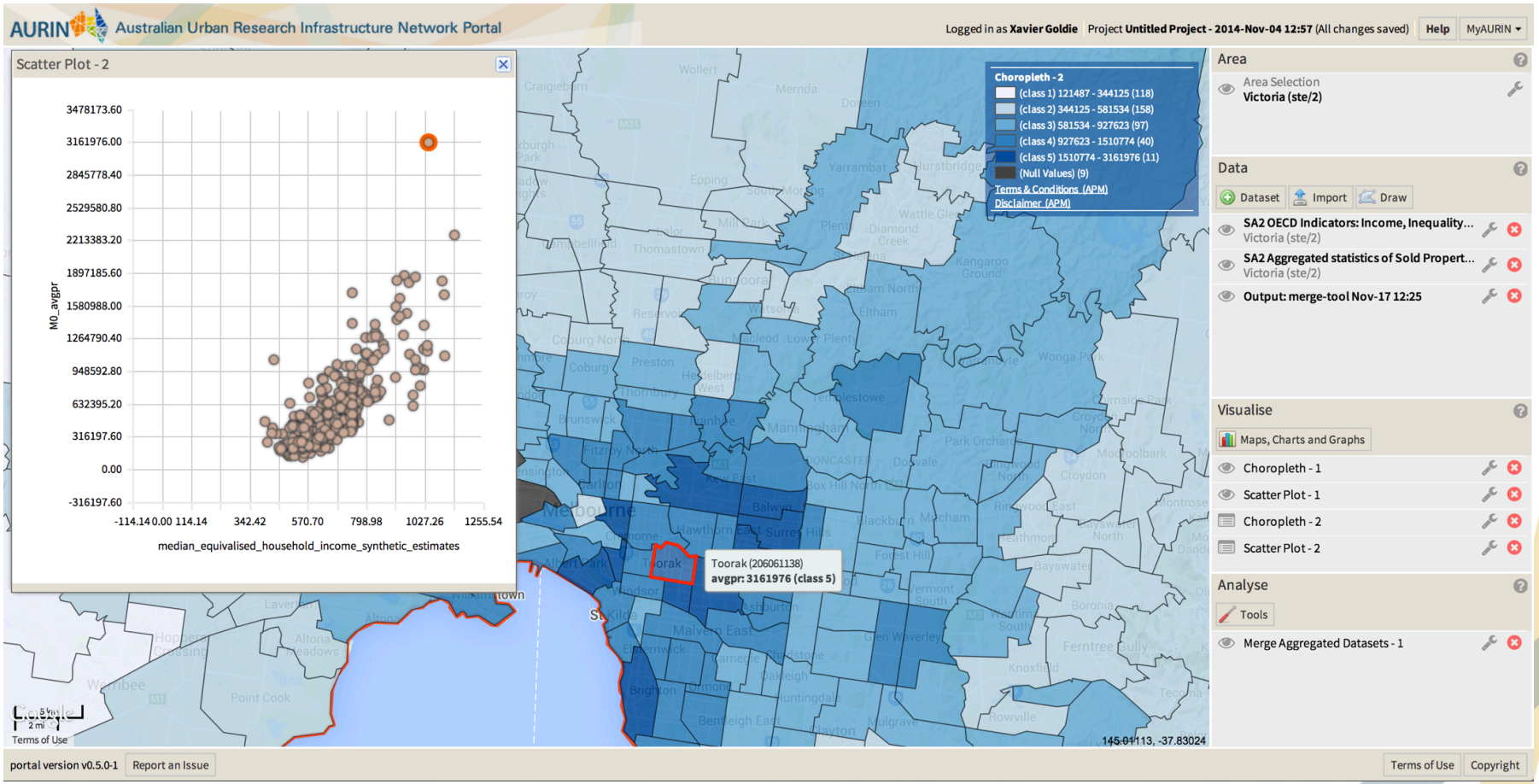
Multiple view visualization capability enables analysts to automatically link tabular and map data to support visual data mining of big datasets across a city



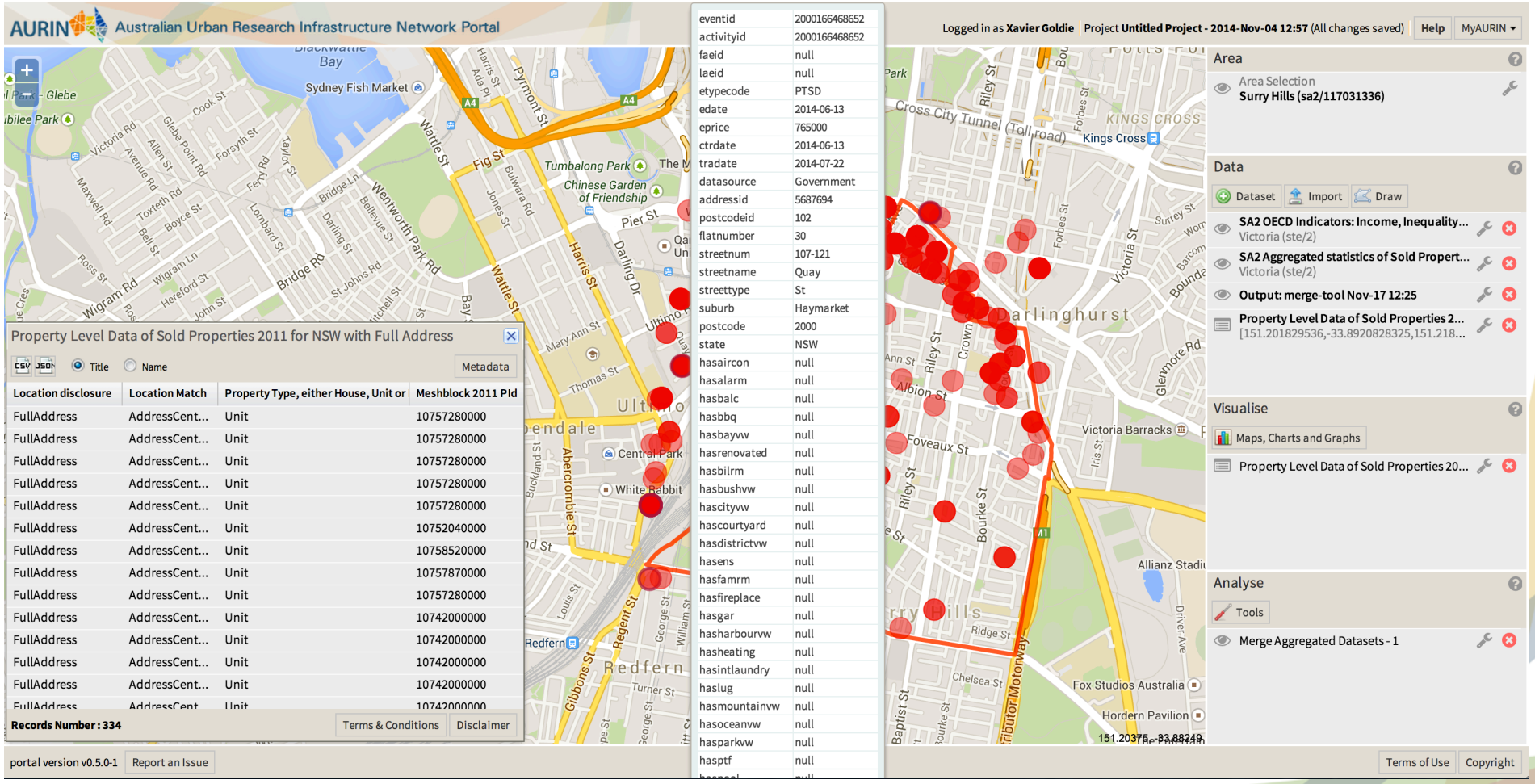
Statistical tools and supporting charting and mapping visualisations available via the AURIN portal

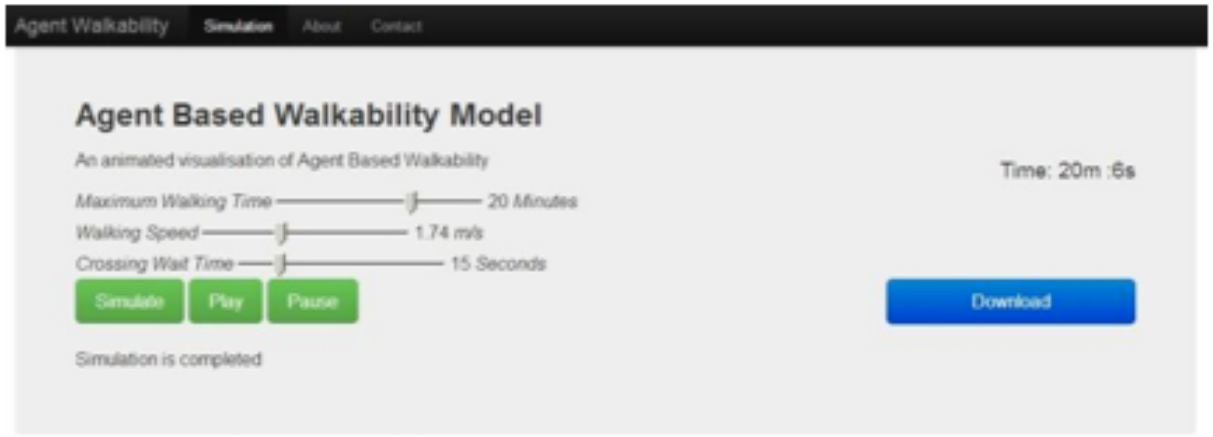


APM Property Data – Aggregated
(Median Price vs. Median Income)



APM Property Data – Unit Records

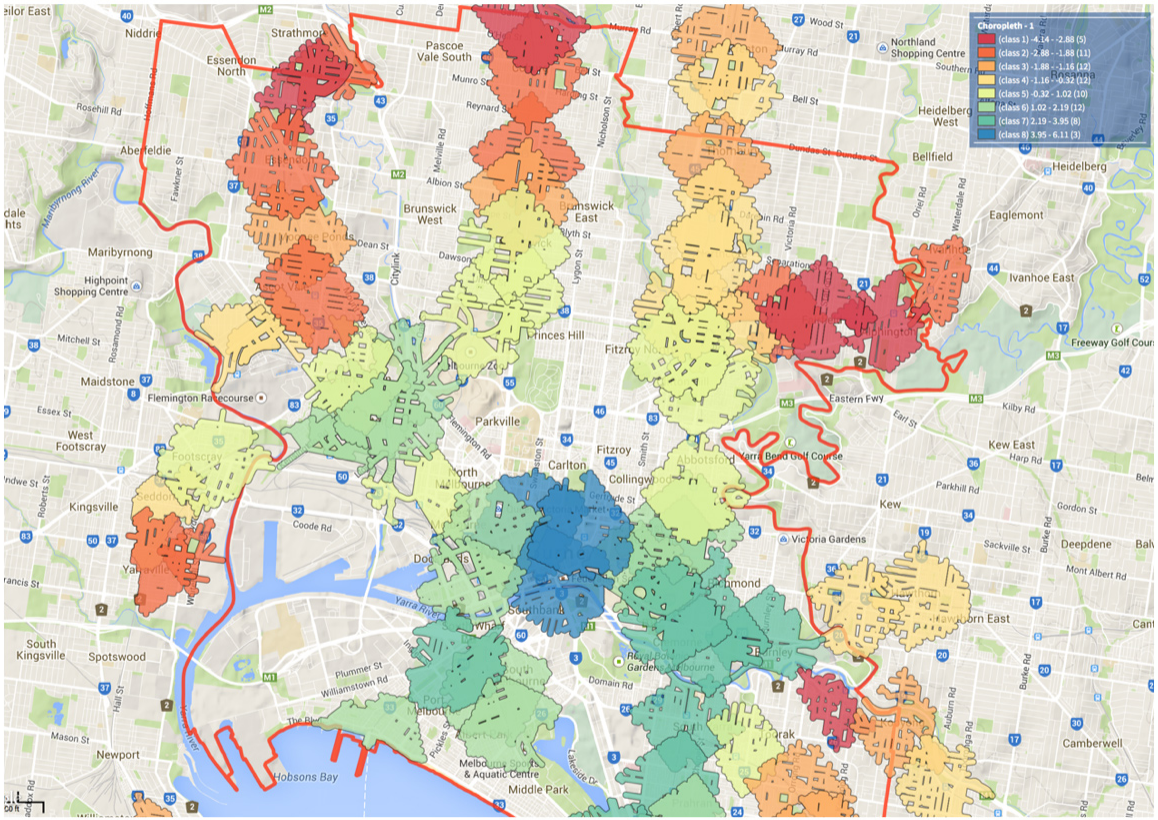




AURIN Agent based *Walkability* tool:

Calculating walkability from Transport Oriented Developments and enabling communities and planners to redesign the city to optimize walkability

Urban WalkabilityAnalysis
800m from train stations in Inner-Melbourne



Comparative analysis of a neighbourhood's walkability profile.

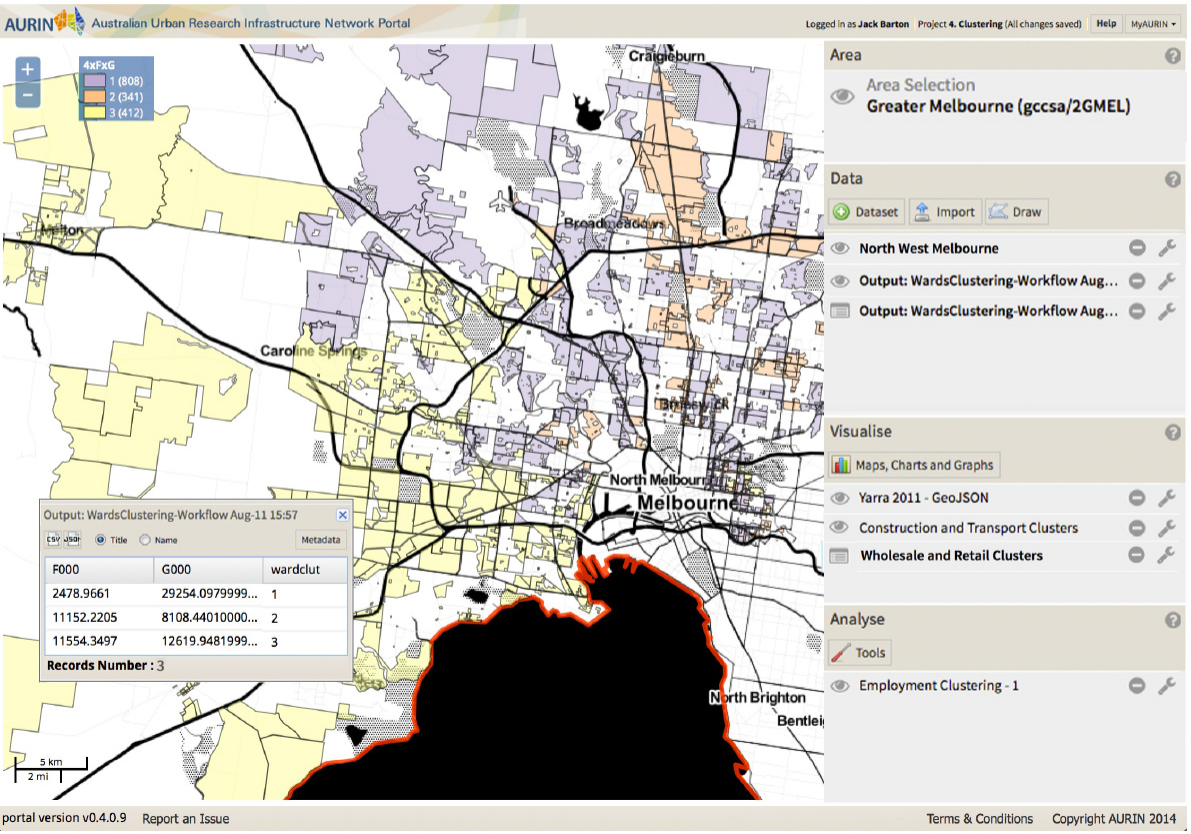
Z-scores in red indicate walkability below-average around trains stations, while Z-scores in blue indicate relatively high walkability catchments.

INPUT:
Points of interest
Street networks
Population data
Land-use data

OUTPUT:
Proximity catchments (downloadable)
Density analysis + Z-score
Number connections + Z-score
Land-use mix + Z-score

Industry Clustering Analysis:

Wholesale vs Retail in North-East Melbourne



INPUT:
Australian Bureau of Statistics destination zone job counts +input parameters from user

OUTPUT:
Wards clustering analysis by industry type

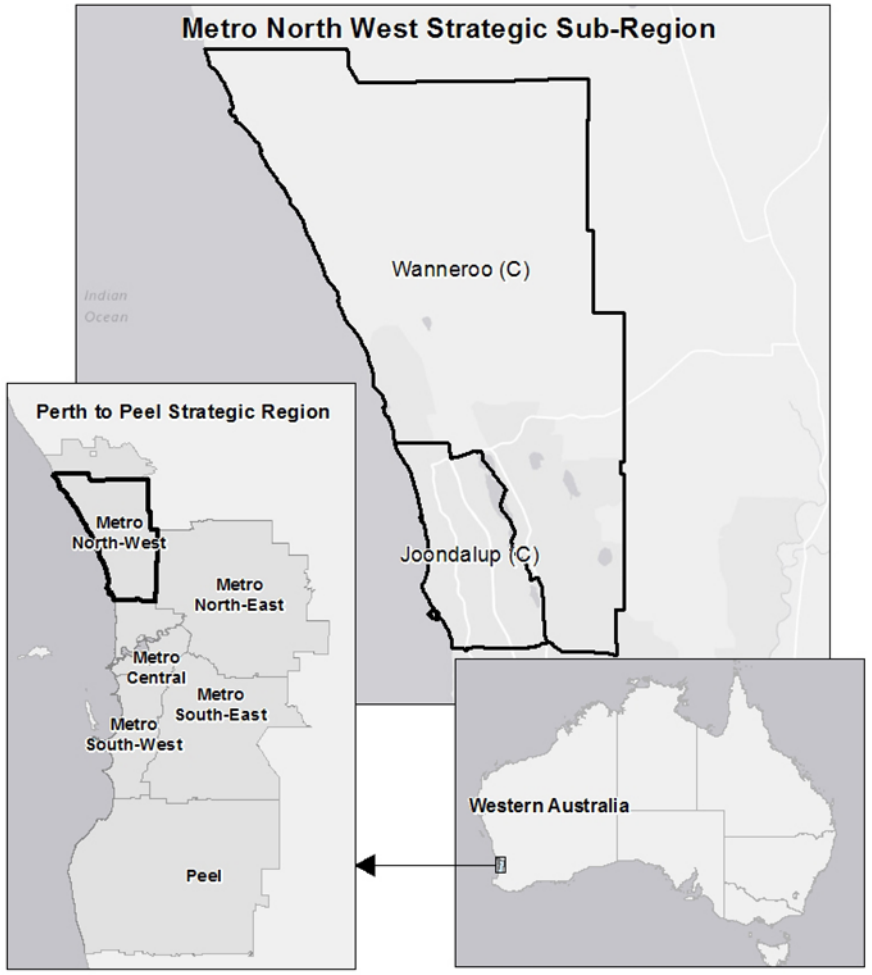
= Comparative analysis of a neighborhood's industry clusters

Planning Decision Support Systems Tools

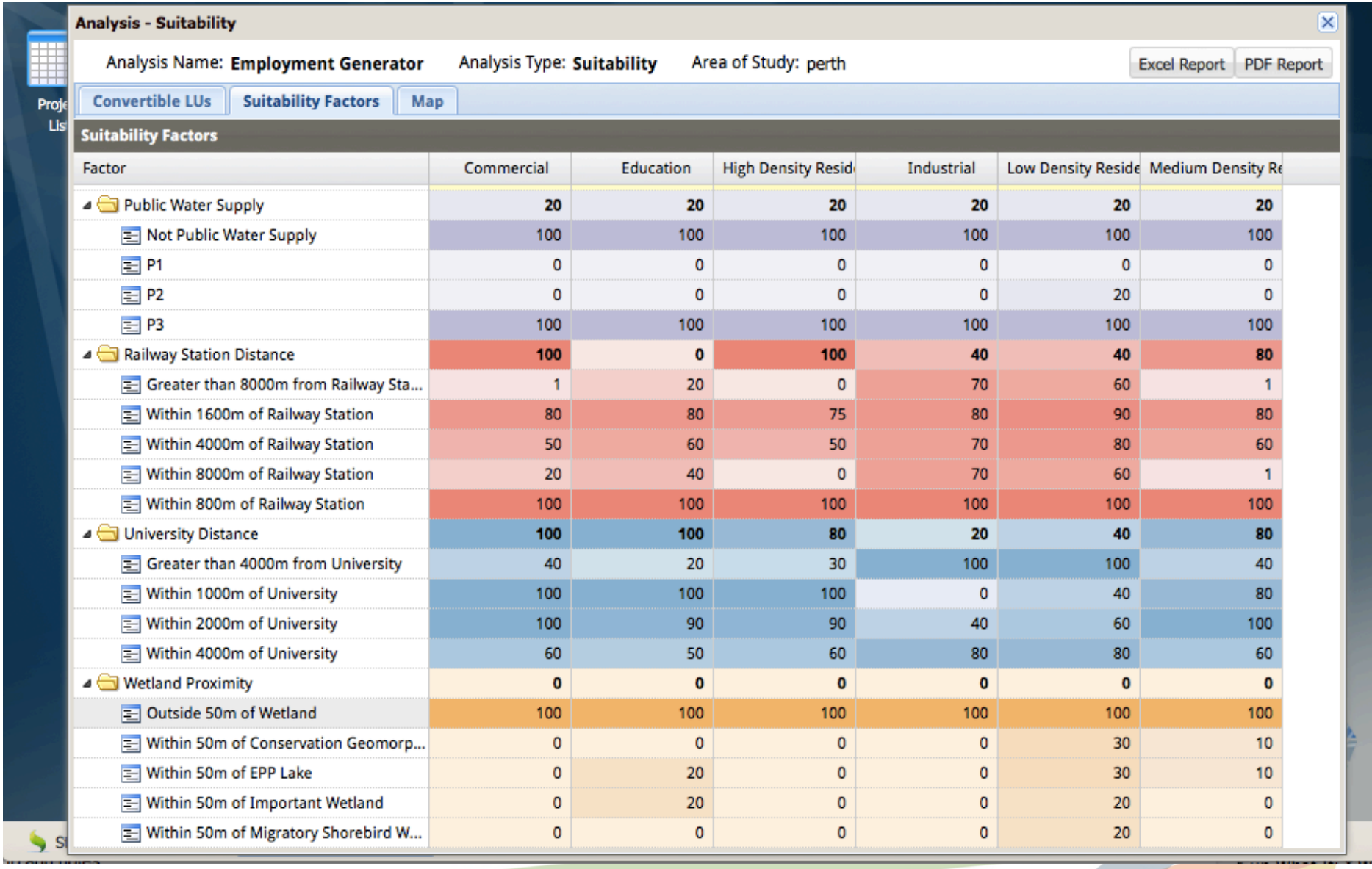
- ❑ What if?
- ❑ Envision
- ❑ Envision Scenario Planner (ESP)
- ❑ MapTables

What-IF? Tool applied to Perth

- Perth – Australia's 4th largest city.
- Estimated population 1.65 m.
- Projected population –
  - 2.2m (2031)
  - 3.5m (2050).
- Significant environmental assets surround the city.
- Growth corridor – North West region.



What if? Suitability Analysis



Analysis - Suitability

Analysis Name: **Employment Generator** Analysis Type: **Suitability** Area of Study: perth

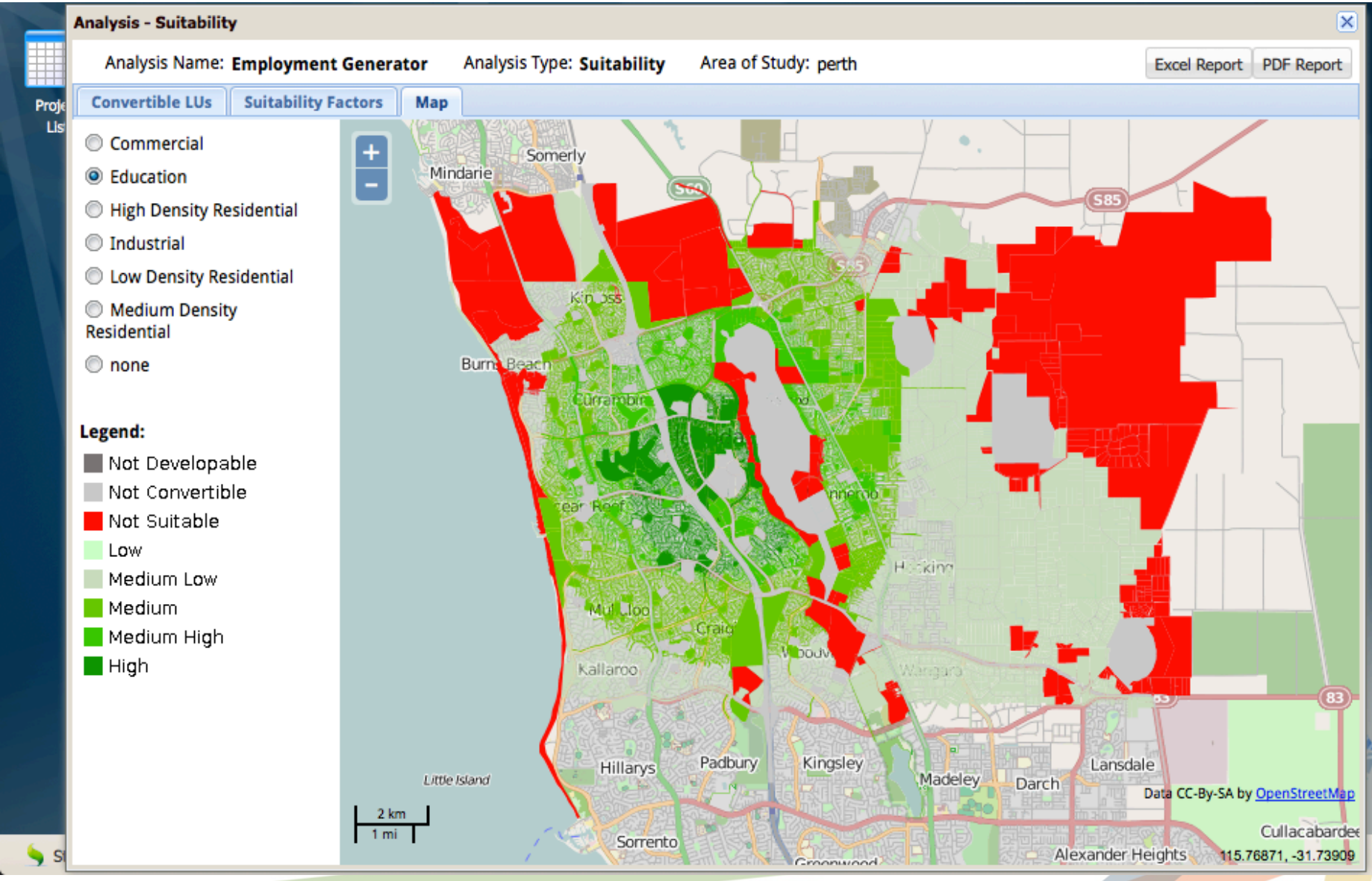
Excel Report | PDF Report

Convertible LUs | Suitability Factors | Map

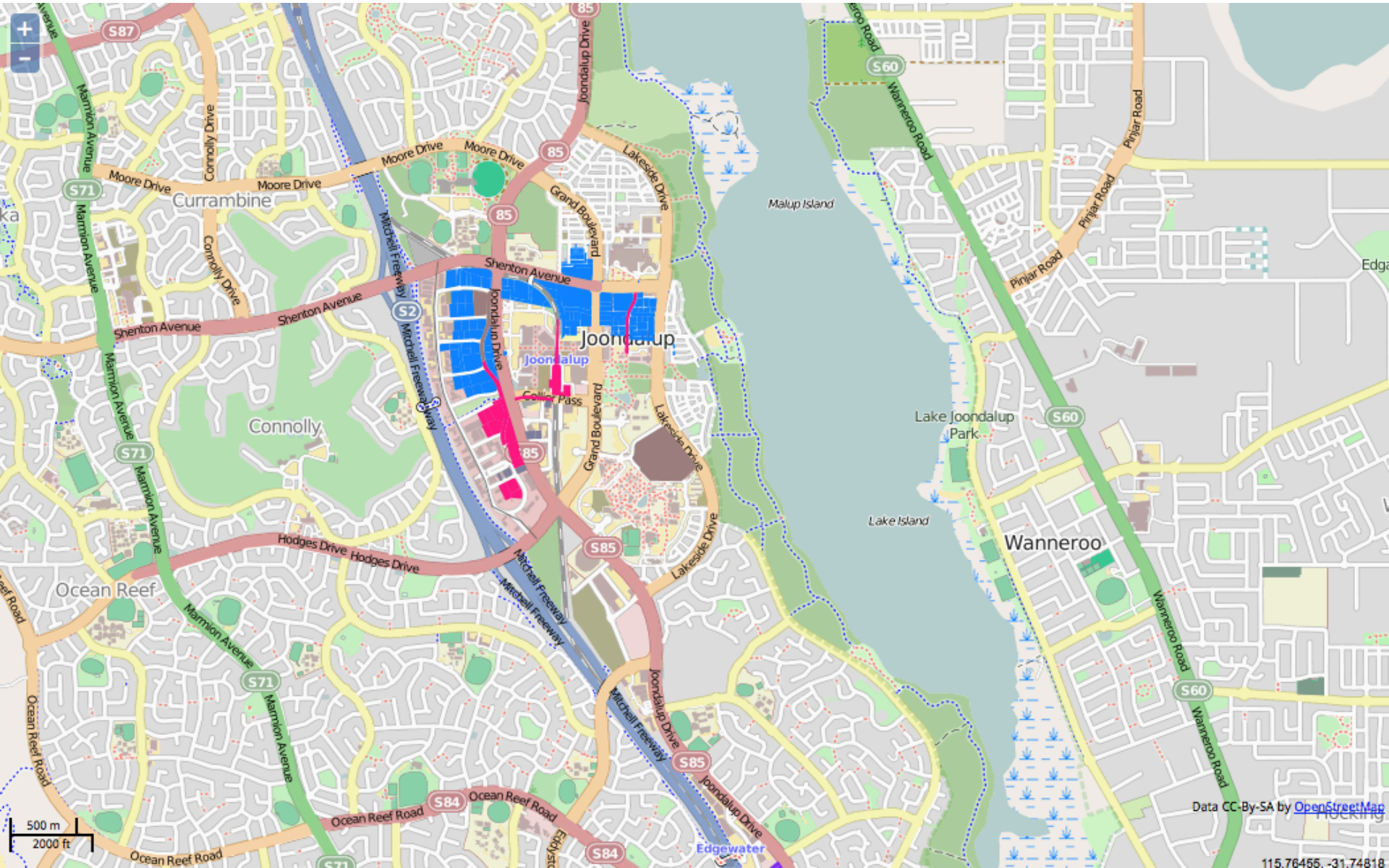
Suitability Factors

Factor	Commercial	Education	High Density Resid	Industrial	Low Density Reside	Medium Density Re
Public Water Supply	**20**	**20**	**20**	**20**	**20**	**20**
Not Public Water Supply	100	100	100	100	100	100
P1	0	0	0	0	0	0
P2	0	0	0	0	20	0
P3	100	100	100	100	100	100
Railway Station Distance	**100**	**0**	**100**	**40**	**40**	**80**
Greater than 8000m from Railway Sta...	1	20	0	70	60	1
Within 1600m of Railway Station	80	80	75	80	90	80
Within 4000m of Railway Station	50	60	50	70	80	60
Within 8000m of Railway Station	20	40	0	70	60	1
Within 800m of Railway Station	100	100	100	100	100	100
University Distance	**100**	**100**	**80**	**20**	**40**	**80**
Greater than 4000m from University	40	20	30	100	100	40
Within 1000m of University	100	100	100	0	40	80
Within 2000m of University	100	90	90	40	60	100
Within 4000m of University	60	50	60	80	80	60
Wetland Proximity	**0**	**0**	**0**	**0**	**0**	**0**
Outside 50m of Wetland	100	100	100	100	100	100
Within 50m of Conservation Geomorp...	0	0	0	0	30	10
Within 50m of EPP Lake	0	20	0	0	30	10
Within 50m of Important Wetland	0	20	0	0	20	0
Within 50m of Migratory Shorebird W...	0	0	0	0	20	0

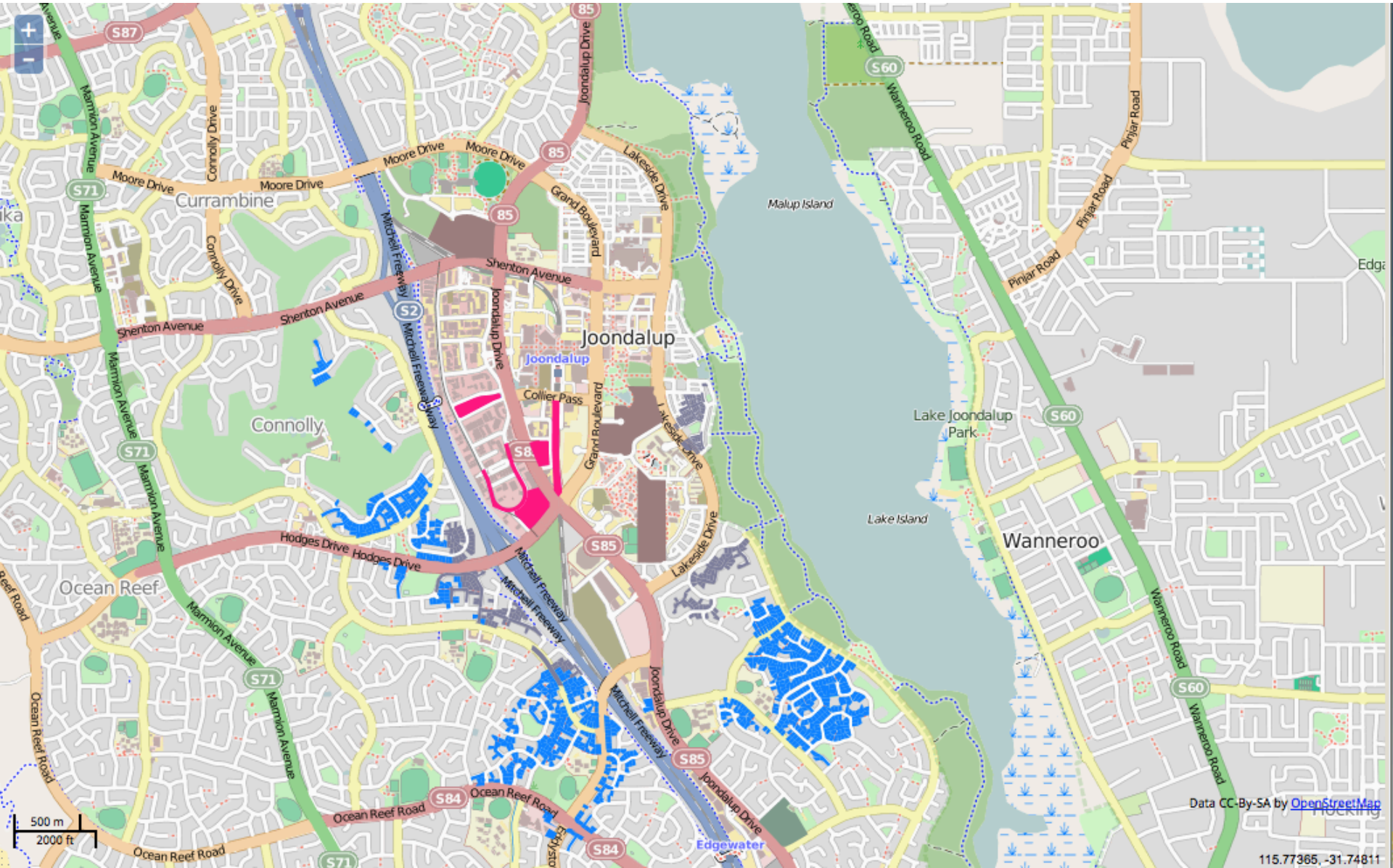
What if? Suitability Analysis



What if? Allocation Results – for 2016



What if? Allocation Results – for 2031



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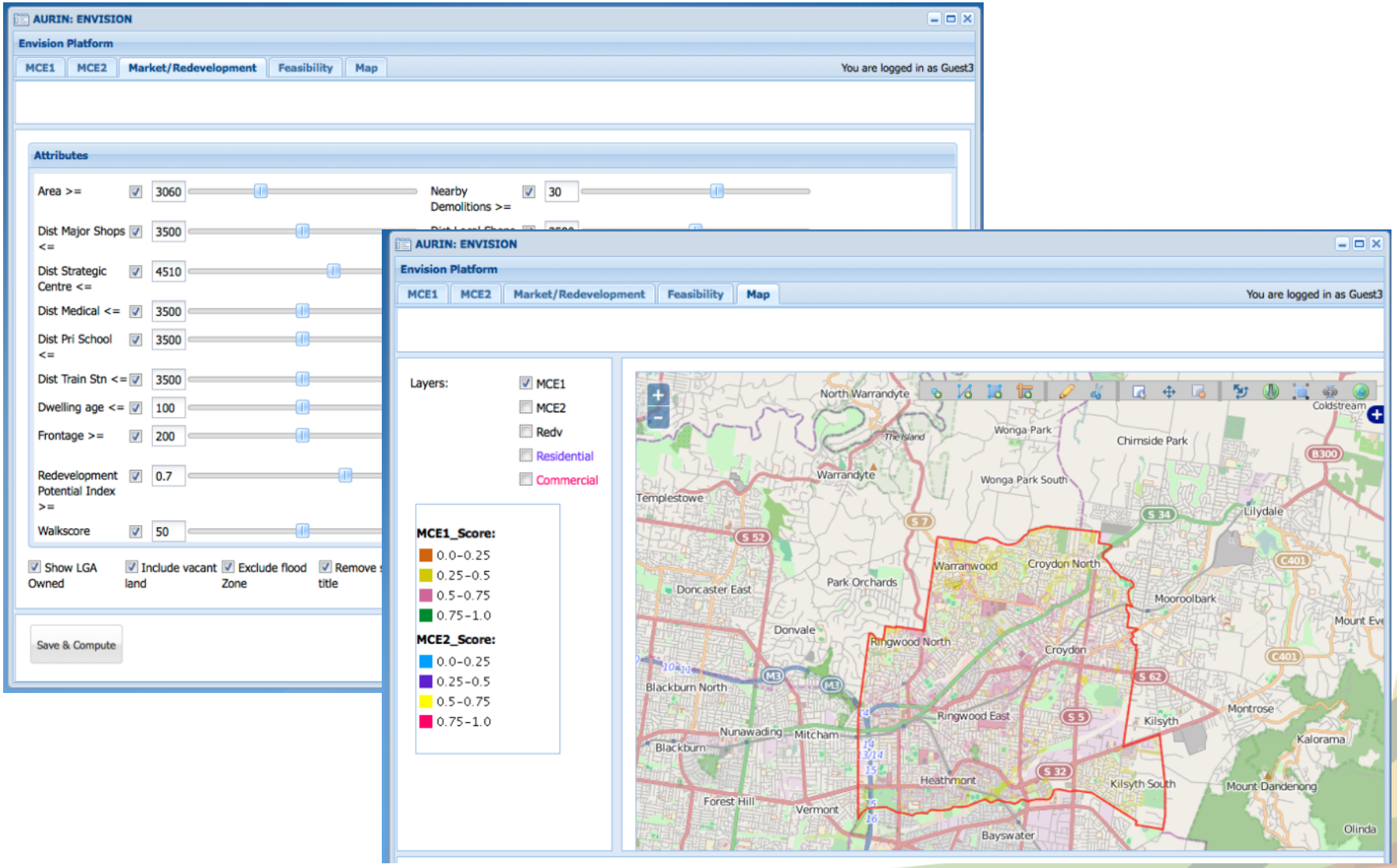
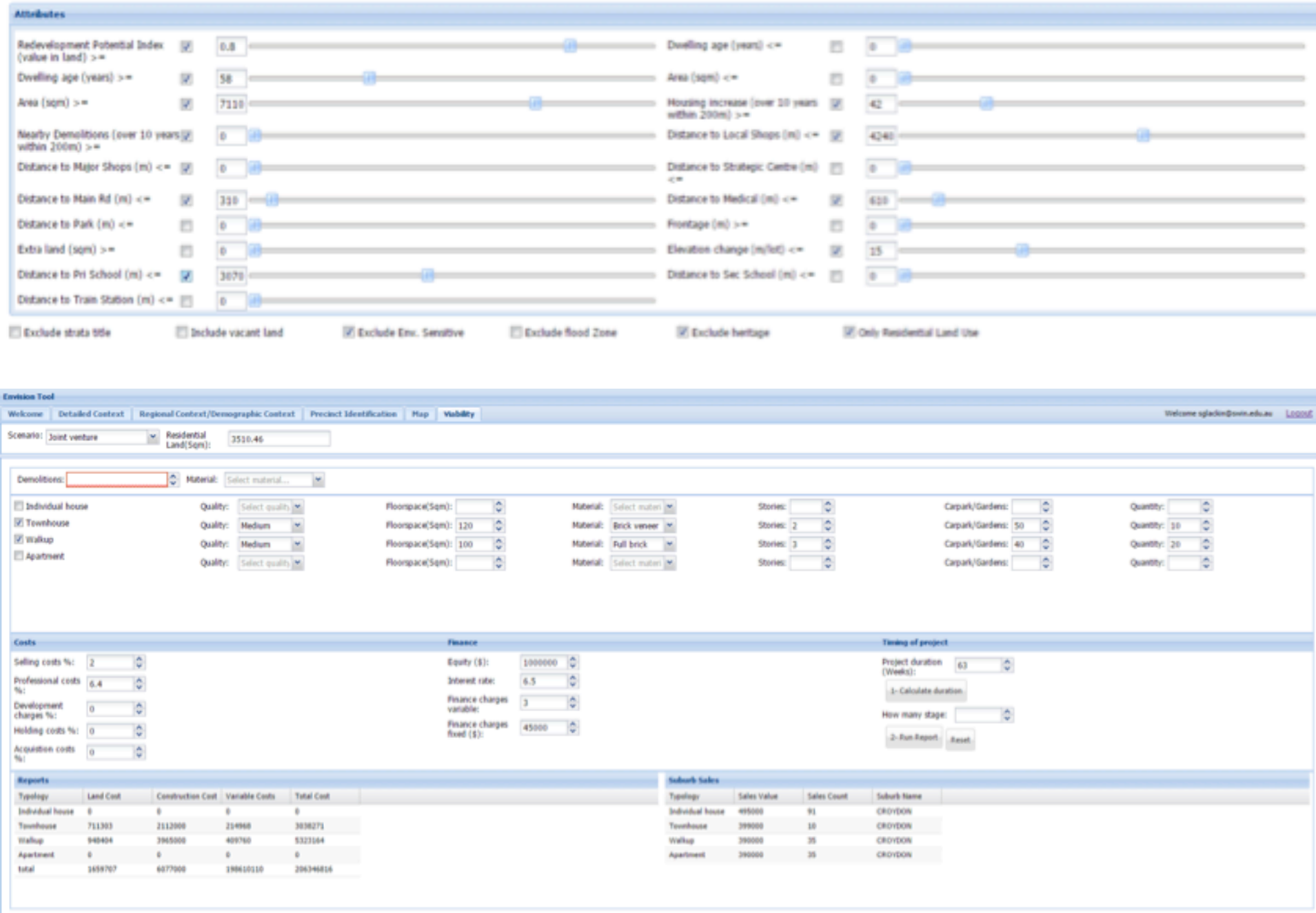
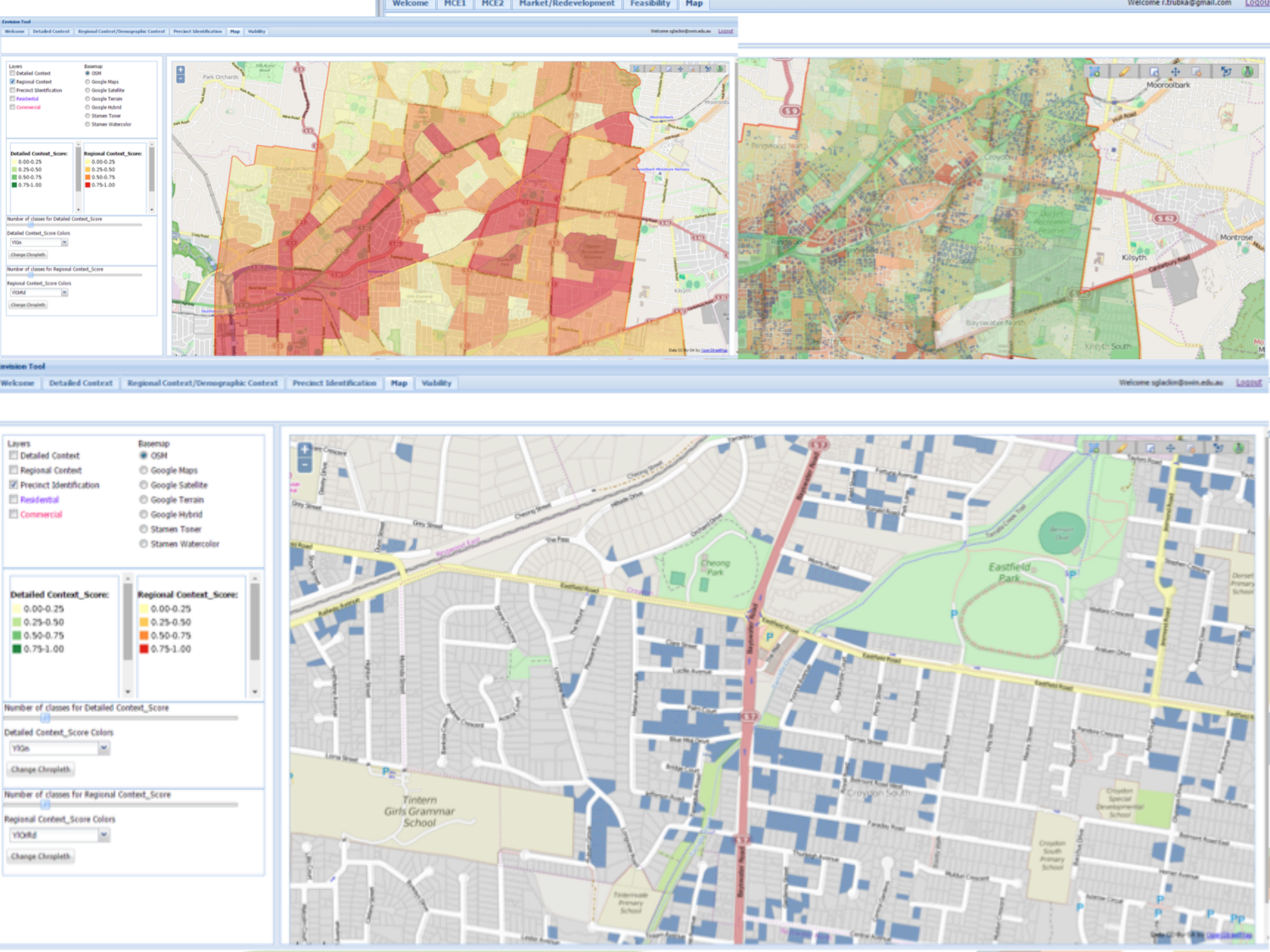
Envision planning support system




Attributes
Redevelopment Potential Index (value in land) >=
0.8
Dwelling age (years) >=
58
Area (sqm) >=
7110
Nearby Demolitions (over 10 years within 200m) >=
0
Distance to Major Shops (m) <=
0
Distance to Main Rd (m) <=
310
Distance to Park (m) <=
0
Extra land (sqm) >=
0
Distance to Pri School (m) <=
3070
Distance to Train Station (m) <=
0
Dwelling age (years) <=
0
Area (sqm) <=
0
Housing increase (over 10 years within 200m) >=
42
Distance to Local Shops (m) <=
4240
Distance to Strategic Centre (m) <=
0
Distance to Medical (m) <=
610
Frontage (m) >=
0
Elevation change (m/lot) <=
15
Distance to Sec School (m) <=
0
Exclude strata title
Include vacant land
Exclude Env. Sensitive
Exclude flood Zone
Exclude heritage
Only Residential Land Use
Envision Tool
Welcome
Detailed Context
Regional Context/Demographic Context
Precinct Identification
Map
Viability
Welcome sglackin@swin.edu.au
Logout
Scenario:
Joint venture
Residential Land(Sqm):
3510.46
Demolitions:
Material:
Select material...
Individual house
Quality:
Select quality
Floorspace(Sqm):
Material:
Select materi
Stories:
Carpark/Gardens:
Quantity:
Townhouse
Quality:
Medium
Floorspace(Sqm):
120
Material:
Brick veneer
Stories:
2
Carpark/Gardens:
50
Quantity:
10
Walkup
Quality:
Medium
Floorspace(Sqm):
100
Material:
Full brick
Stories:
3
Carpark/Gardens:
40
Quantity:
20
Apartment
Quality:
Select quality
Floorspace(Sqm):
Material:
Select materi
Stories:
Carpark/Gardens:
Quantity:
Costs
Selling costs %:
2
Professional costs %:
6.4
Development charges %:
0
Holding costs %:
0
Acquistion costs %:
0
Finance
Equity ($):
1000000
Interest rate:
6.5
Finance charges variable:
3
Finance charges fixed ($):
45000
Timing of project
Project duration (Weeks):
63
1- Calculate duration
How many stage:
2- Run Report
Reset
Reports
Typology
Land Cost
Construction Cost
Variable Costs
Total Cost
Individual house
0
0
0
0
Townhouse
711303
2112000
214968
3038271
Walkup
940404
3965000
409760
5323164
Apartment
0
0
0
0
total
1659707
6077000
198610110
206346816
Suburb Sales
Typology
Sales Value
Sales Count
Suburb Name
Individual house
495000
91
CROYDON
Townhouse
399000
10
CROYDON
Walkup
390000
35
CROYDON
Apartment
390000
35
CROYDON


Welcome
MCE1
MCE2
Market/Redevelopment
Feasibility
Map
Welcome r.trubka@gmail.com
Logout
Envision Tool
Detailed Context
Regional Context/Demographic Context
Precinct Identification
Viability
Welcome sglackin@swin.edu.au
Layers
Detailed Context
Regional Context
Precinct Identification
Residential
Commercial
Basemap
OSM
Google Maps
Google Satellite
Google Terrain
Google Hybrid
Stamen Toner
Stamen Watercolor
Detailed Context_Score:
0.00-0.25
0.25-0.50
0.50-0.75
0.75-1.00
Regional Context_Score:
0.00-0.25
0.25-0.50
0.50-0.75
0.75-1.00
Number of classes for Detailed Context_Score
Detailed Context_Score Colors
YlGn
Change Choropleth
Number of classes for Regional Context_Score
Regional Context_Score Colors
YlOrRd
Change Choropleth
Mooroolbark
Croydon
Kilsyth
Montrose
Canterbury Road
Kilsyth South
Bayswater North
Ringwood North
Ringwood
Eastfield Park
Cheong Park
Eastfield Road
Bayswater Road
Tintern Girls Grammar School
Croydon South

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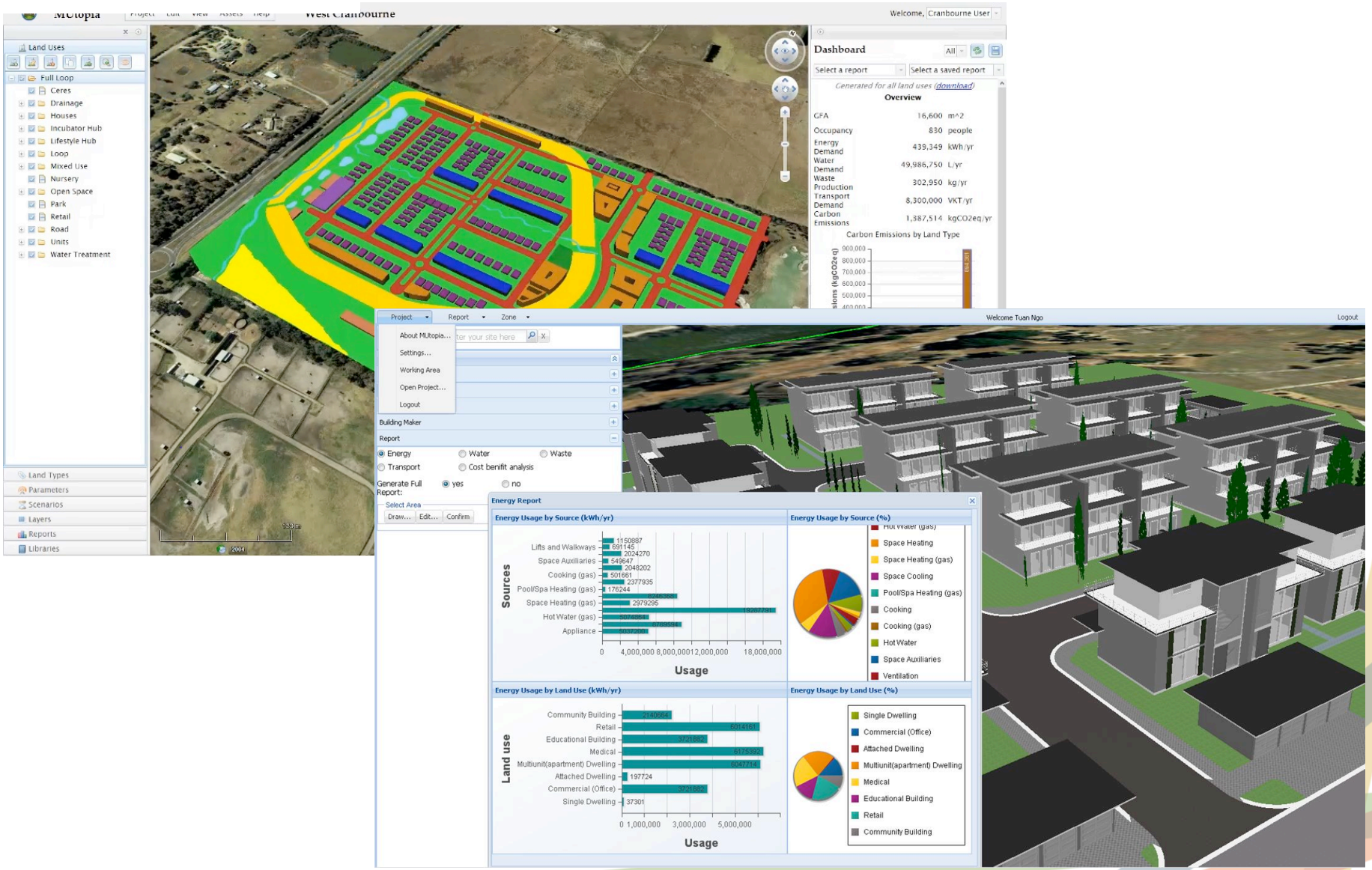
ESP Precinct Planning tool



AURIN WORKBENCH **Envision Scenario Planner**

USER MANUAL WALKTHROUGH ADMIN

Objects

Filter

Name
589853
589854
589856
592190
592191
592192
592193
592194
592195
592196

Show 10 rows per page Page 1 of 6 >

Typologies

high

Name
High Rise - 20 Storey 1 and 2 Bed - Basic - 120Dw
High Rise - 5 Storey 1 and 2 Bed - Basic - 20Dw
High Rise - 5 Storey 1 and 2 Bed - Basic - 30Dw
High Rise - 5 Storey 1 and 2 Bed - Basic - 40Dw
High Rise - 8 Storey 1 and 2 Bed - Basic - 32Dw
High Rise - 8 Storey 1 and 2 Bed - Basic - 48Dw

Reports

Residential Report

Assessing 51 entities

Space

Lot Size (m^2)	61,698.87
Extra Land - Lawn (m^2)	6,910.14
Extra Land - Annual Plants (m^2)	4,606.76
Extra Land - Hardy Plants (m^2)	16,123.67
Extra Land - Impermeable (m^2)	18,427.05
Extra Land (m^2)	46,067.62
Footprint Area (m^2)	15,631.26
Gross Floor Area (m^2)	30,625.00
Plot Ratio	0.45
Dwelling - Density (Dwellings/ha)	42.03
Dwellings - Total (Dwellings)	316
No. Occupants (Persons)	976

Energy Demand

Heating (MJ/year)	934,526.88
Cooling (MJ/year)	542,421.72
Lighting (kWh/year)	294,550.32
Hot Water (GJ/year)	4,272.72
Cooktop and Oven (MJ/year)	618,096.00
Appliances (MJ/year)	3,080,684.00
PV Energy Generation (kWh)	0.00
Total Operating (MJ/year)	10,508,829.75

Embodied Carbon

AURIN WORKBENCH **Envision Scenario Planner**

USER MANUAL WALKTHROUGH ADMIN

Objects

Filter

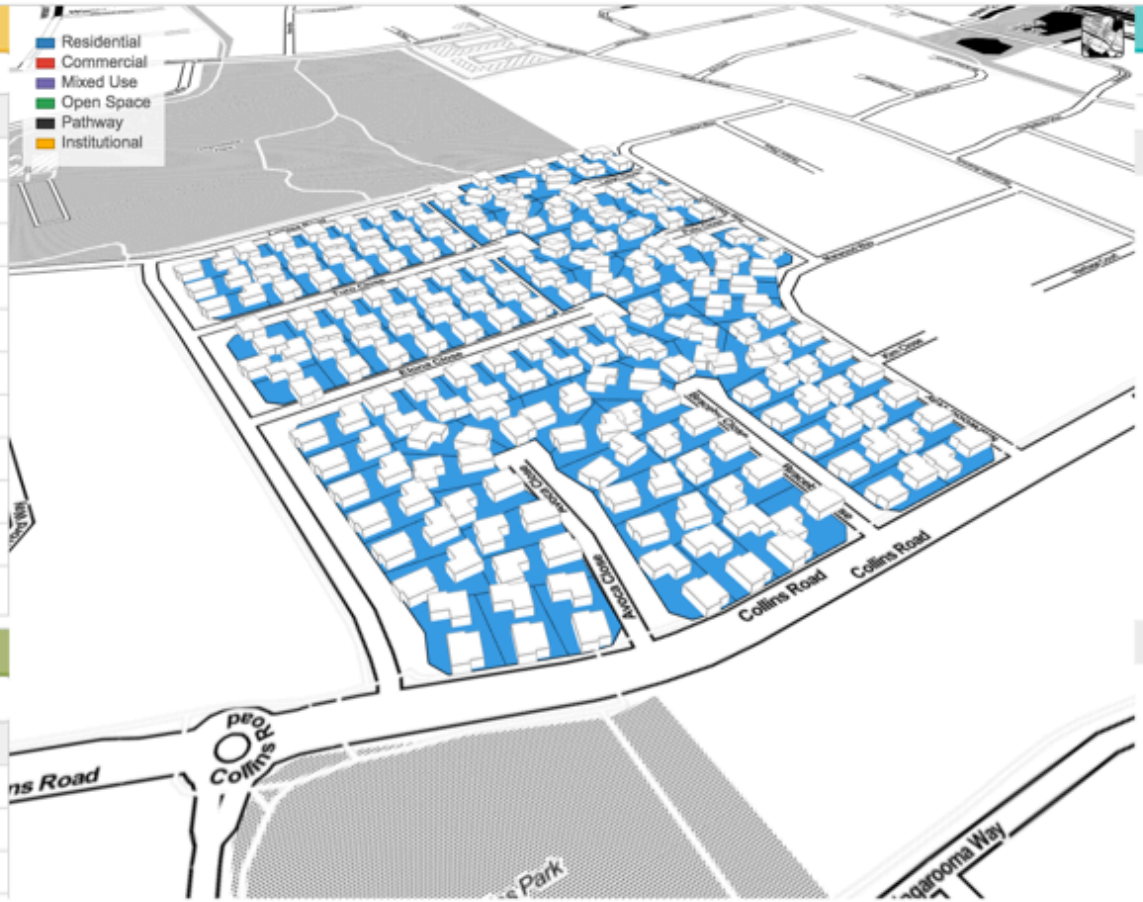
Name
1152253
1152510
589853
589854
589855
589856
589857
589858
592190
592191

Show 10 rows per page Page 1 of 12 >

Typologies

Filter

Name
Attached House - 1 Storey 1 Bed - Basic - 2Plex
Attached House - 1 Storey 1 Bed - Basic - 3Plex
Attached House - 1 Storey 1 Bed - Basic - 4Plex



Reports

Residential Report

Assessing 114 entities

Space	
Lot Size (m^2)	82,103.17
Extra Land - Lawn (m^2)	8,030.06
Extra Land - Annual Plants (m^2)	5,353.38
Extra Land - Hardy Plants (m^2)	18,736.81
Extra Land - Impermeable (m^2)	21,413.50
Extra Land (m^2)	53,533.76
Footprint Area (m^2)	28,569.41
Gross Floor Area (m^2)	25,114.20
Plot Ratio	0.31
Dwelling - Density (Dwellings/ha)	28.04
Dwellings - Total (Dwellings)	228
No. Occupants (Persons)	912

Energy Demand	
Heating (MJ/year)	461,403.97
Cooling (MJ/year)	190,312.62
Lighting (kWh/year)	147,132.96
Hot Water (GJ/year)	3,504.36
Cooktop and Oven (MJ/year)	445,968.00
Appliances (MJ/year)	2,222,772.00

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AURIN Lens10/01 An Integrated Design Infrastructure for Australia Cities

TONSLEY DEMO

Entities

Filter

Name
Area Name 1
Area Name 1
Area Name 2
Area Name 2
Area Name 3
Area Name 4
Area Name 5
C02
C03
C04

Show 10 rows per page Page 1 of 18 >

Types

Filter

Name
ADVANCED MANUFACTURING MAB
CAR PARK
CARPARK - LONG TERM
COMMERCIAL / LIGHT INDUSTRIAL
COMMERCIAL / LIGHT INDUSTRIAL MAB
EDUCATION / TRAINING
GREEN SPACE
RESIDENTIAL
RETAIL
RETAIL MAB

Show 10 rows per page Page 1 of 2 >

Reports

Precinct Report

Assessing 172 entities

Precinct Information

GFA (m^2)	571,980.96

Model Outputs

Costs

Construction Costs ($)	306,184.00
Energy Cost ($/yr)	3,440.00

Carbon

Embodied Carbon (tCO_2-e)	547,254.75
Carbon Emission (tCO_2-e/yr)	31,219.99
Life Cycle Carbon (tCO_2-e)	578,474.75

Water

Water Usage (kL/yr)	218,519.04
Water Imported (kL/yr)	27,614.22
Runoff (kL/yr)	72,786.81

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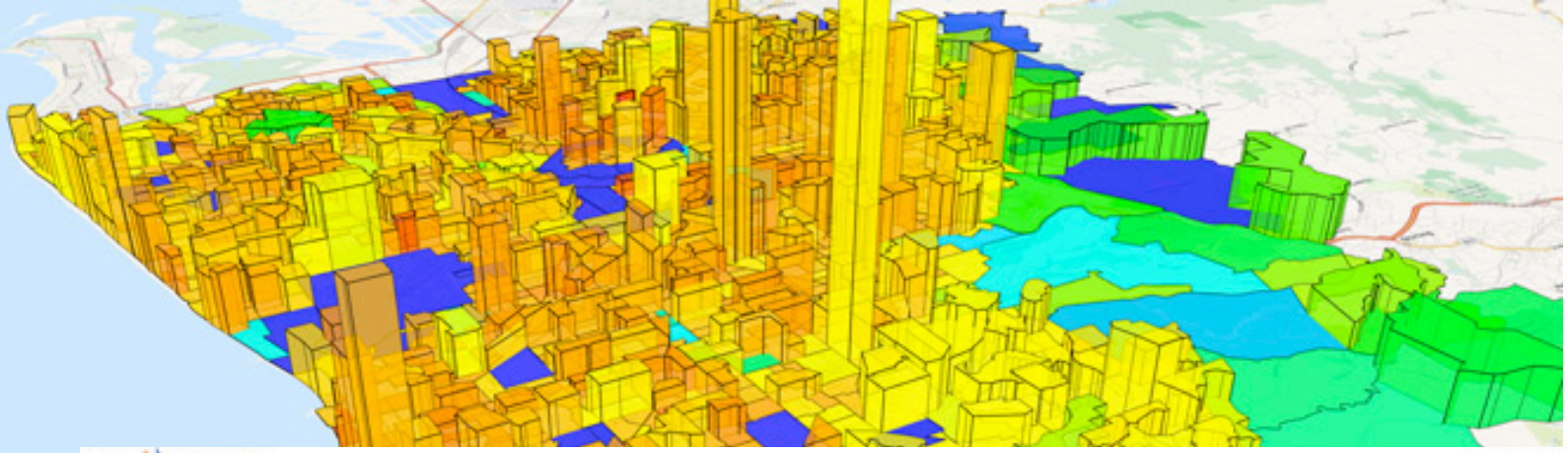

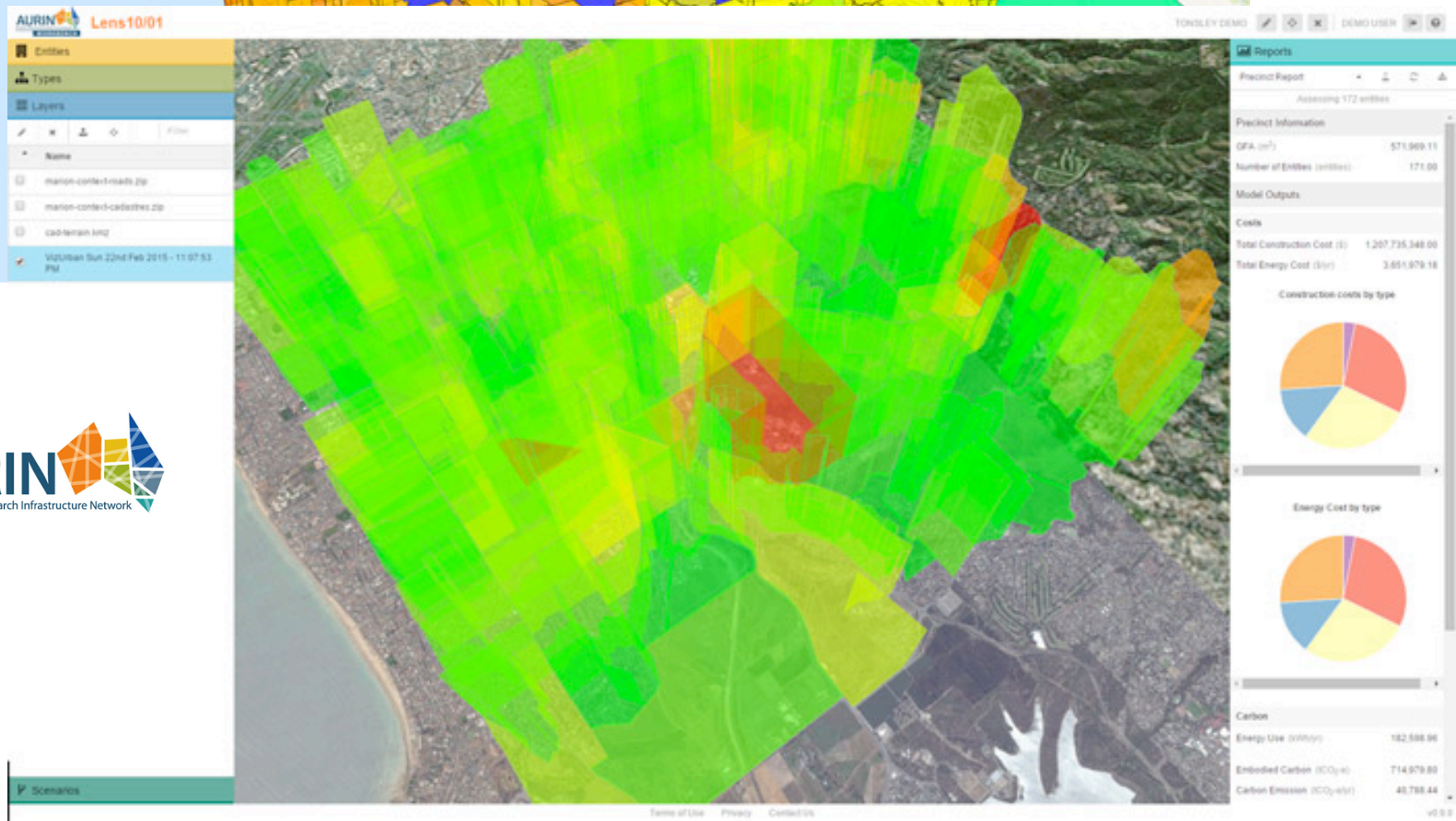

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Interactive MapTable

MapTables to support group decision-making

Can big data fix Australia's traffic clogged cities?

PUBLISHED: 24 JAN 2015 04:49:23 - *Australian Financial Review*

Benefits for AURIN to end-users

- **Savings** in **time** and **money** by **removing barriers to data access**.

- Access via AURIN Portal to:
  - wide **range of data types**
  - at **various levels of spatial scale**
  - from **multiple data providers.**

- Connections and exposure to relevant but previously 'locked-up' datasets.

- Support to help utilise open-source **e-research research tools** to **interrogate**, **visualise** and **analyse** data.

- Ability to **download data** where permitted by the data custodian.

Future work

- Move beyond a data portal – the semantic web.
- Develop and urban data dictionary - driven by urban data ontologies.
- Increase focus on data standards (ISO37120) harmonisation of data sets across jurisdictions.
- Implementation of 3D data structure and querying ability.

Conclusions (1)

- **Bettencour**t (2013):
  - *"... The rise of information and communication technologies (ICT) and the spread of urbanization arguable the two most important global trends at play across the world today.*
  - *Both are unprecedented in their scope and magnitude in history, and both will likely change the way we live irreversibly.*
  - *If current trends continue, we may reasonably expect that the vast majority of people everywhere in the world will live in urban environments within just a few decades and that information technologies will be part of their daily lives, embedded in their dwellings, communications, transportation and other urban services." (p. 2)*

Conclusions (2)

- **Anderson** (2013) argues that with new modelling approaches taking advantage of the *"miracle of big data"* to understand and predict system response using modern electronics we can *"bypass complexities in systems at longer temporal at larger spatial scales"* to solve difficult and important problems withoutrecourse to theory.

Conclusions (3)

- In his book providing an overview of the historical forces that have shaped the planning and design of cities and information technologies since the industrial revolution to the current ICT age and the spread of ubiquitous computing, **Townsend** (2013) says that:

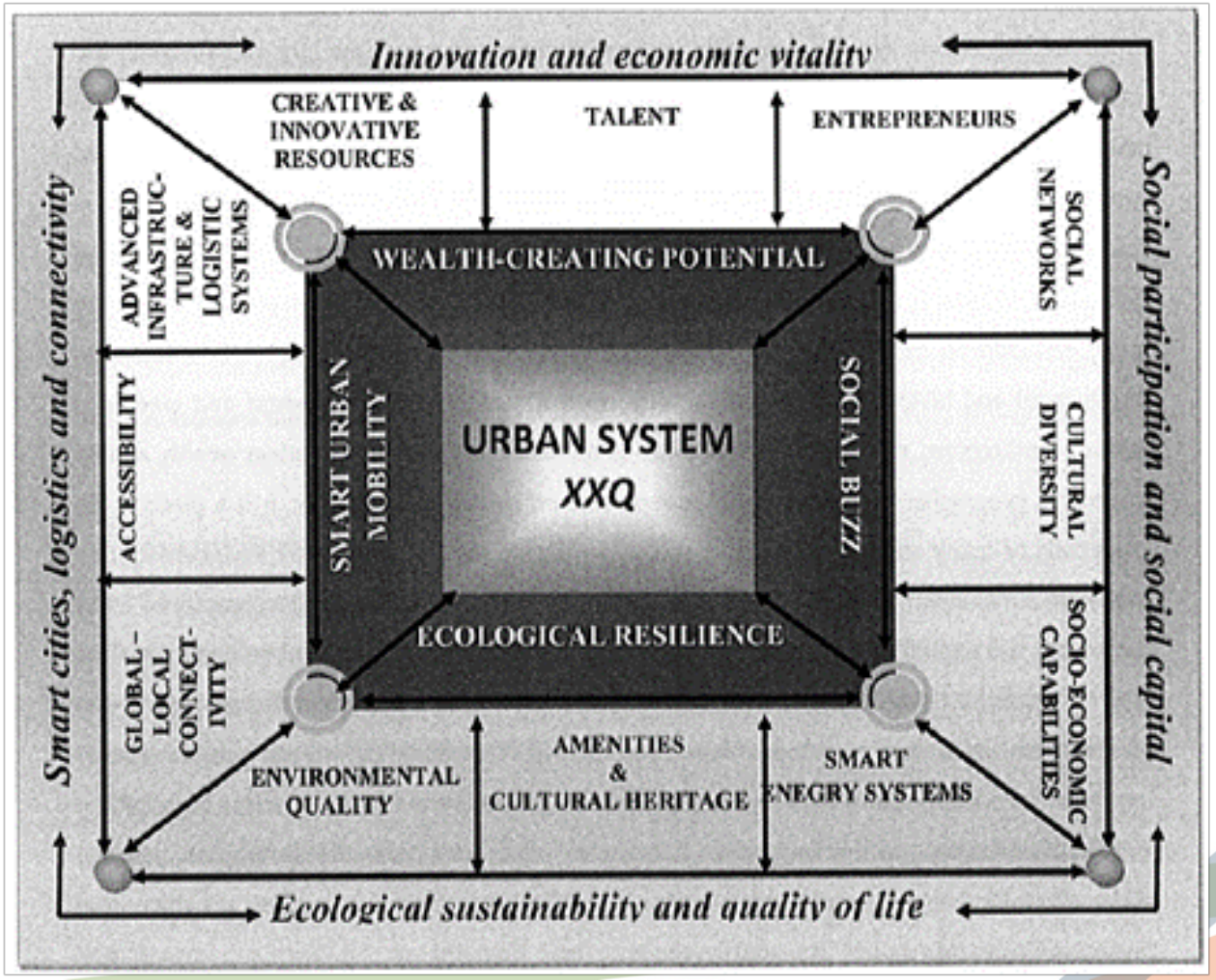
  - *"... never before has humanity faced such enormous global challenges ... nor has it amassed such a massive technological and organizational toolkit to tackle them."*

Conclusions (4)

- With **'Big Data'**, **'Open Data'**, and **'Big Data Analysis'** we are now starting to have the where-with-all to make substantial progress in operationalising the '*New Urban World - Urban Piazza*' framework proposed by **Kourtit, et al**. (2013) and to undertake the **integrative urban research** that is essential for not only generating *"accurate and consistent definitions and terminology"* but also for producing *"quantitative benchmarks"* (p. 117).

The New Urban World – Urban Piazza framework

(Source: Kourtit, et al. (2014: p. 105).



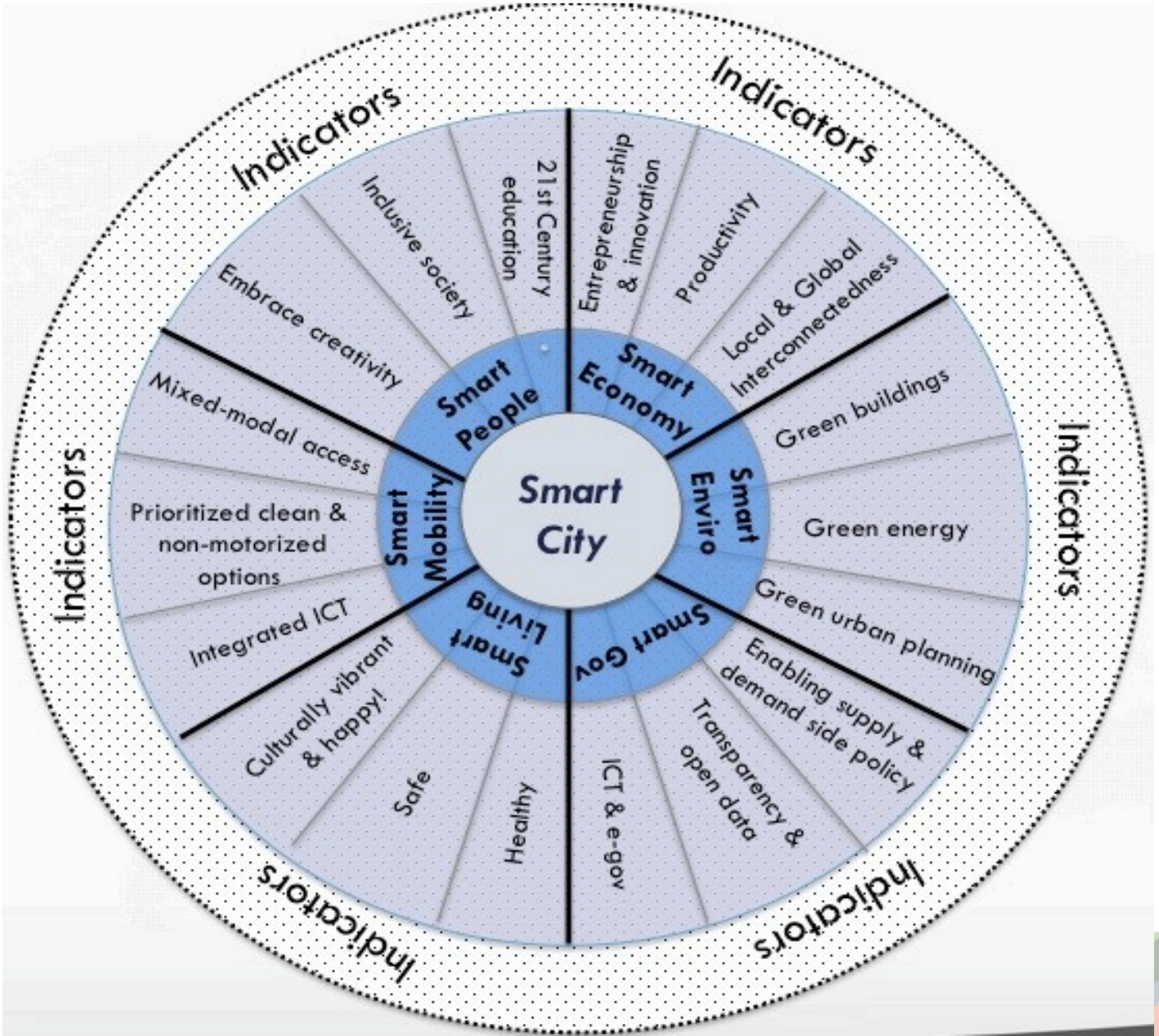
❑We can now develop the:

- *"... **benchmarks**, **scorecards,** or **report cards** that capture the imagined elements of the urban piazza on a regular basis and allow for comparisons across time periods and areas. This urban monitoring, like testing out our statistical definitions, is both basic and fundanmental .... [and] ... until initial benchmarks have been calculated, it is difficult to know where we stand on many issues." (p. 117)*

❑This potentially enables a:

- "*... systems approcah in urban research"* (p. 117), to "*connect modern technology with life styles and urban architecture"* (p. 117) with an emphasis on the *"human factor"* (p. 117) through an activity-oriented approach.

Smart City Indicators



Conclusions (5)

- Research infrastructure facilities that are starting to be developed around the world through projects such as **AURIN** in Australia and **UBDC in the UK** are important initiatives.

- They are:
  - harnessing **'Big Data'**
  - providing e-research technologies as **'Big Data Analysis'**.

- They have the potential to **enable an integrated approach to urban research** to materialise in the context of a constantly changing, increasingly uncertain and complex 'New Urban World'.

Conclusions (6)

- However, despite the initiatives that are occurring in 'Big Data' and research infrastructure initiatives such as AURIN, progress towards implementing government **'Open Data' policies remains less fast than desirable**.

- This is demonstrated in the **study of 23 countries** by **Capgemini Consulting** (2013) referred to earlier which divided countries into three categories in opening their data –
  - beginners
  - followers
  - trend setters.

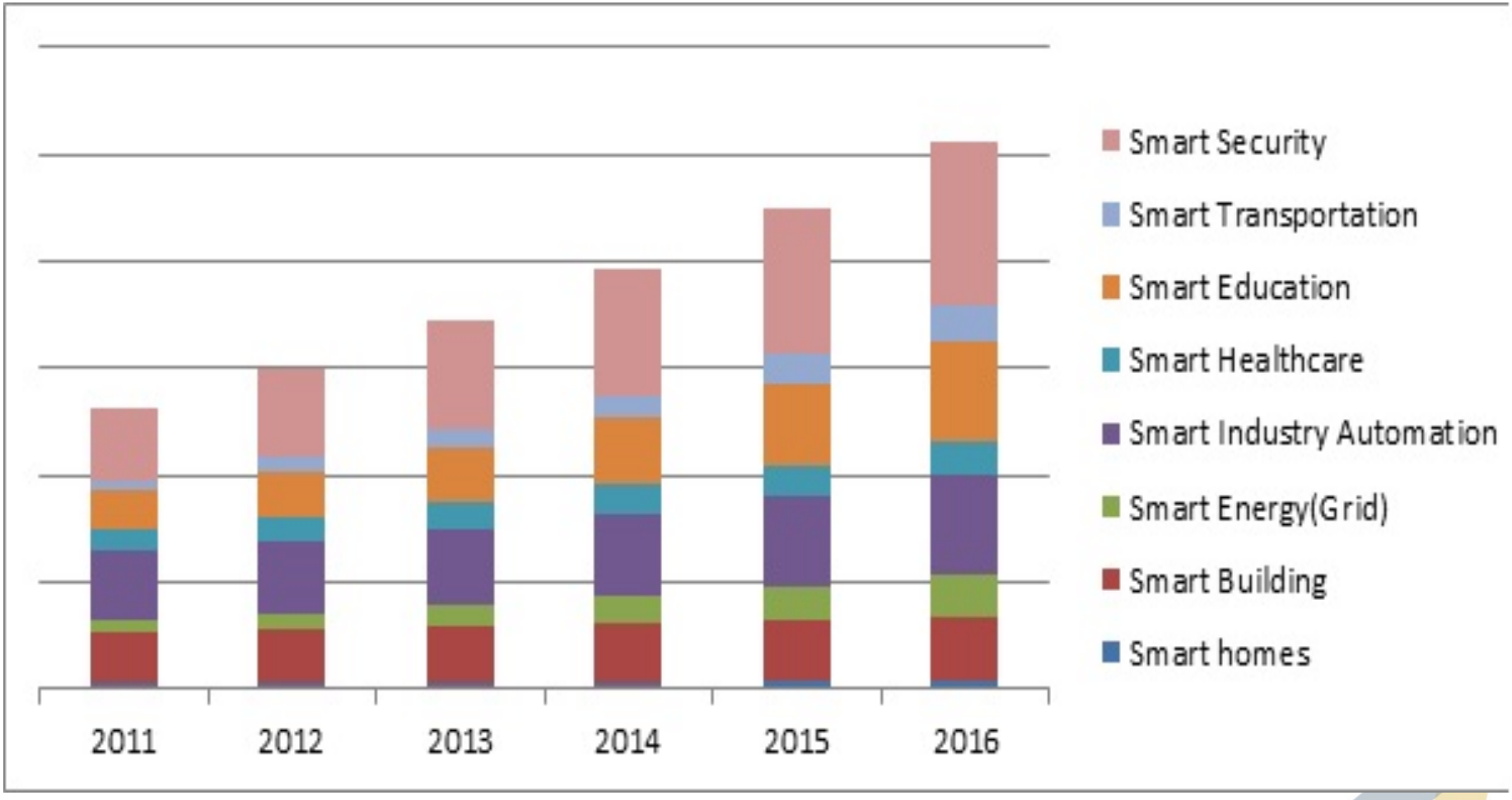
- It was found that only just over one-fifth shared data that had significant breadth and was granular at the same time.

- Over 60% of the countries analyzed lacked enhanced search capabilities.

Conclusions (7)

- Acording to **Gilbert** (2014), governments will:
  - *"… need to aggressively embrace open data standards, cloud computing platforms and big data analysis techniques for the management of geospatial data."*
- Perhaps the **'Open Data' trend** will be supurred on by the new business opportunities that have been developing out of governments publicising their open data, as seen in *"the rise of data marketplaces or data supermarkets." (***Rijmenan** 2014)

Growth in Smart City Dimensions



Conclusions (8)

- There are some **significant issues** regarding aspects of **'Big Data'** and **'Smart Cities'** concerning:
  - data representativeness and inclusion;
  - trust and privacy;
  - State and corporate control and manipulation; and
  - the blind trust in imperfect algorithms.

- **Serras, et al.** (2014) warn that :
  - *"... While the potential of the [big] data is huge, it also comes with many hurdles. We have more data, but often with lower explanatory power about the underlying decisions and behaviours of city users."*

- **Kitchen** (2013) argues for citizens' rights to privacy in the face of unrelenting data and image surveillance. **In the end it all depends on what Aikat (2013) refers to as:**
  - ***"... a commitment to ethical values and best practices sustains big data mining." (p. 107)***

Conclusions (9)

- **Aikat** (2013) says:
  - *"… From a socio-economic development perspective, people in all modern societies are surrounded by big data surveillance with meticulously-designed computer algorithms that sift through big data to reveal important insights about people, products and perspectives. Ethical big data mining has the unique potential to measure and monitor trends that are critical for socio-economic development."*
- But **Batty (2012) provides us with a timely caution saying:**
  - ***"…** Smart cities and big data may be the hot topics of today, but the implications of new theories and models relevant to our understanding, how we might use our strategic models and intelligence to plan the city, building on this new understanding these are all crucial questions to be explored."*

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