Impact of Urban Form on the Green Economy

DBSA Knowledge Week

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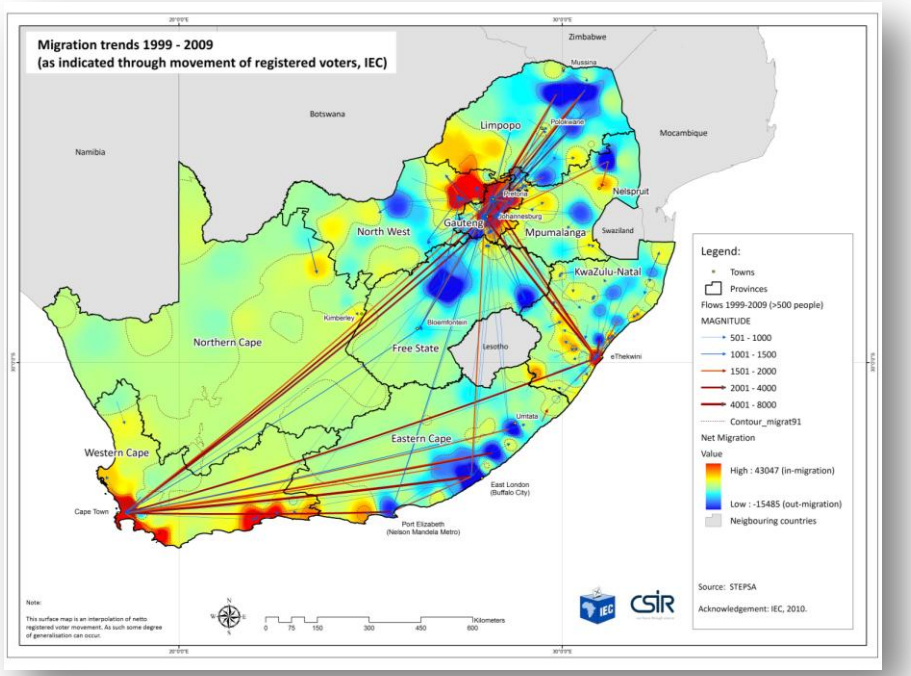
Introduction

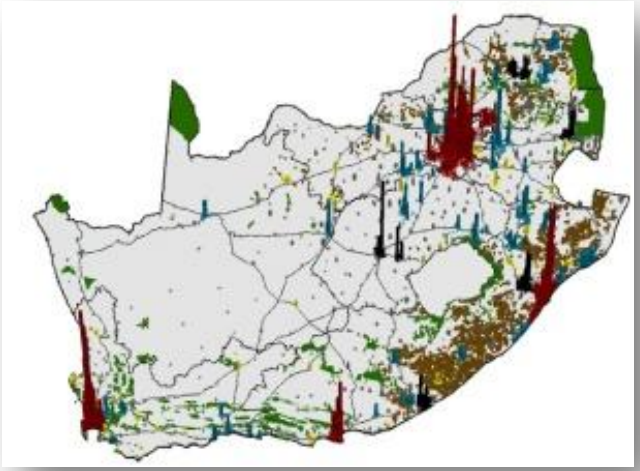
- Many South Africans are moving from rural areas to cities in search of a better life.
- In line with global urbanisation trends, this population transition is likely to continue for some time.



During 2005, **59,3%** of the South African population lived in urban areas compared to the global average of **48,7%.**

It is expected that **71,3%**.of the South African population will be urbanised by 2030.

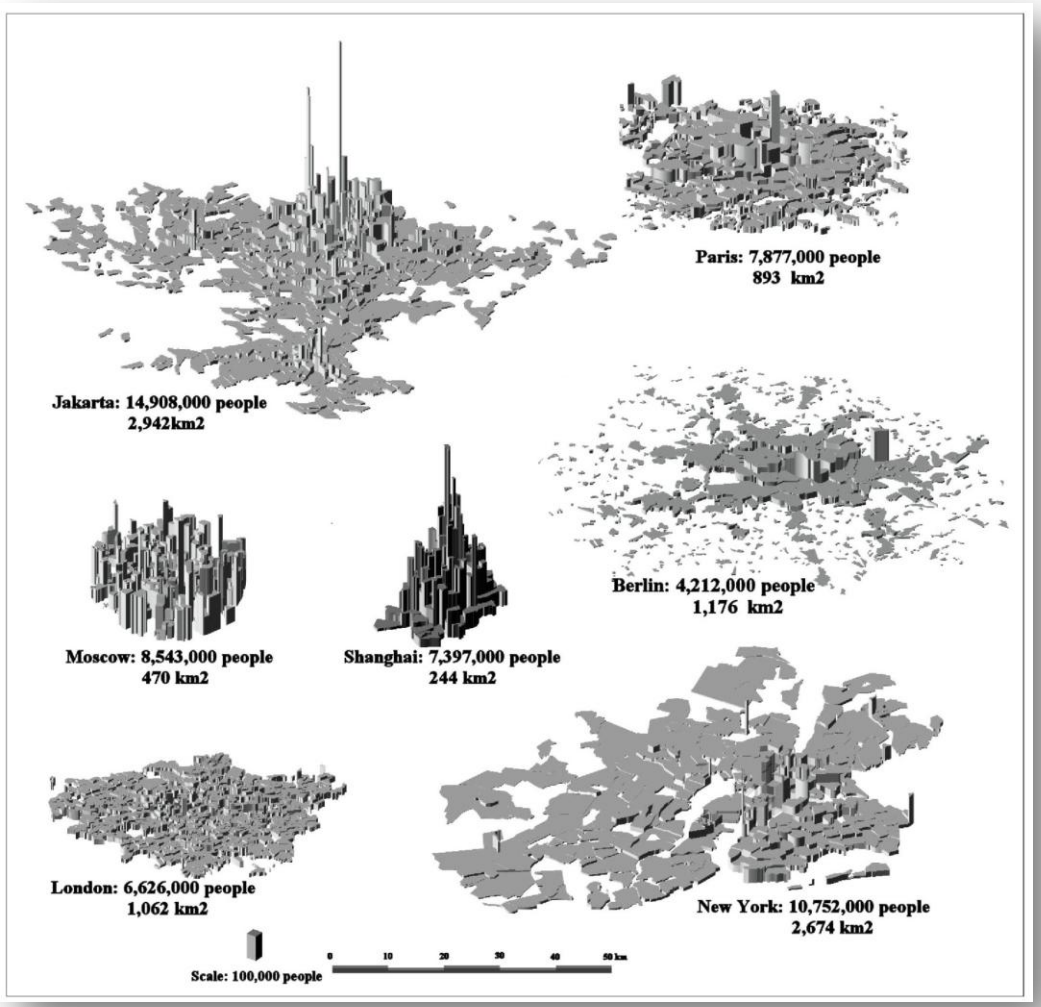
Introduction



SA Settlement types	% of National Population	% of Nat Econ Act	% of Nat Land Area
City region	33.7	56.5	1.9
Cities	5.8	6.0	0.5
TOT: CITY REGIONS & CITIES	39.5	62.4	2.4
Regional Service Centres	14.8	13.9	1.7
Service Town	4.2	3.3	0.7
Local niche towns	9.7	6.2	1.9
TOWNS	28.7	23.4	4.4
TOT: URBAN	68.1	85.8	6.8
Dense rural settlement	25.2	5.9	8.4
Other sparsely populated areas	6.7	8.3	84.8
TOTAL National	100.0	100.0	100.0

Background

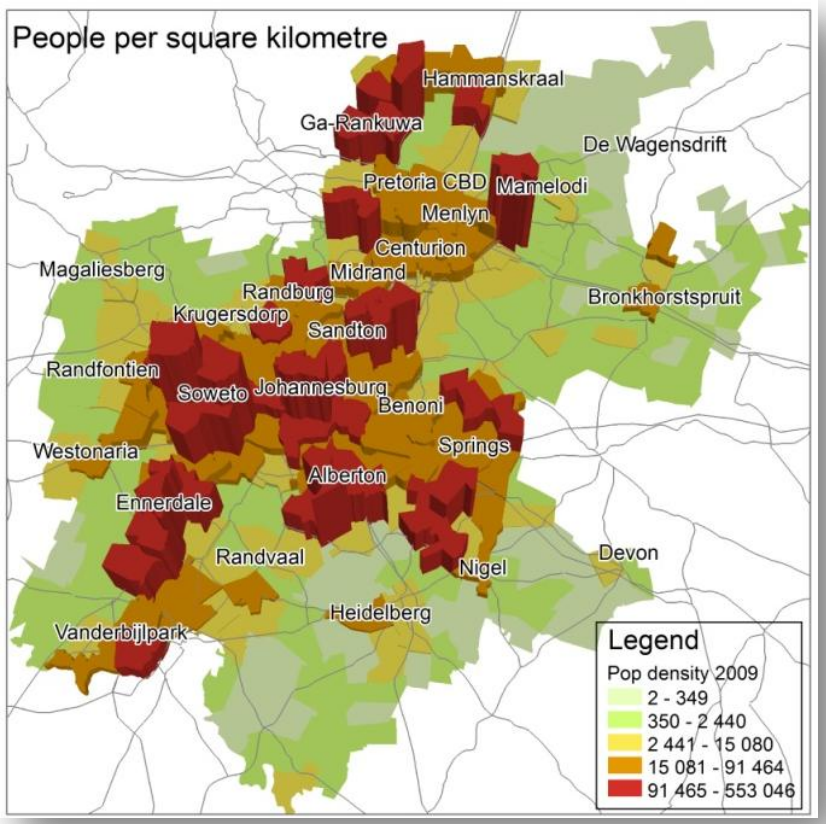
- How does a city or city region's physical form and infrastructure affect its sustainability?
- What spatial policies and instruments can assist us to develop cities that are more sustainable over the long term?

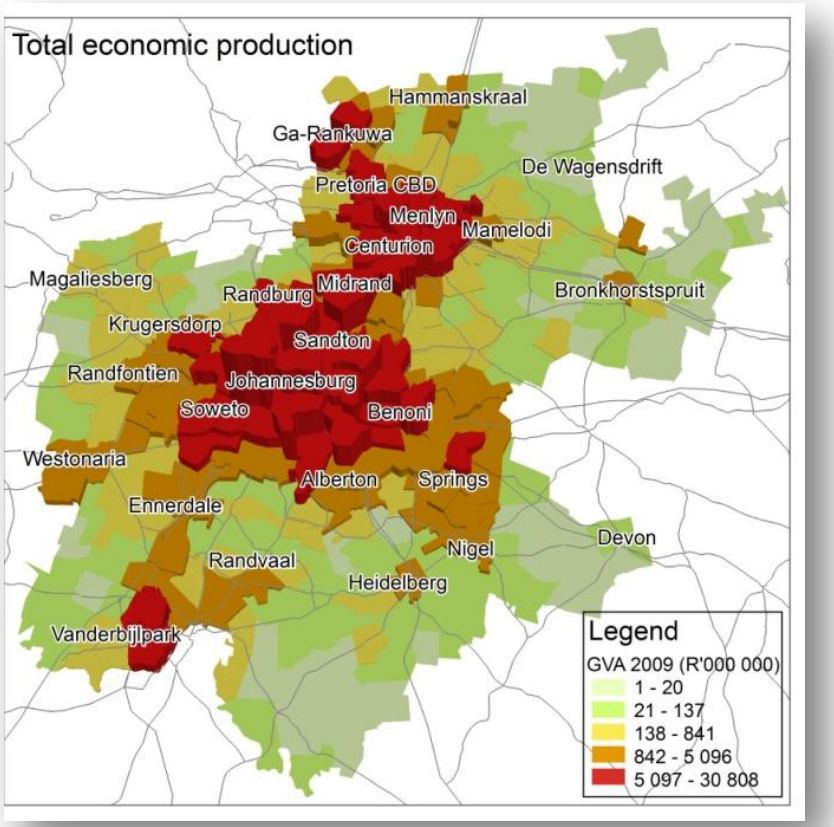


Bertaud, 2010

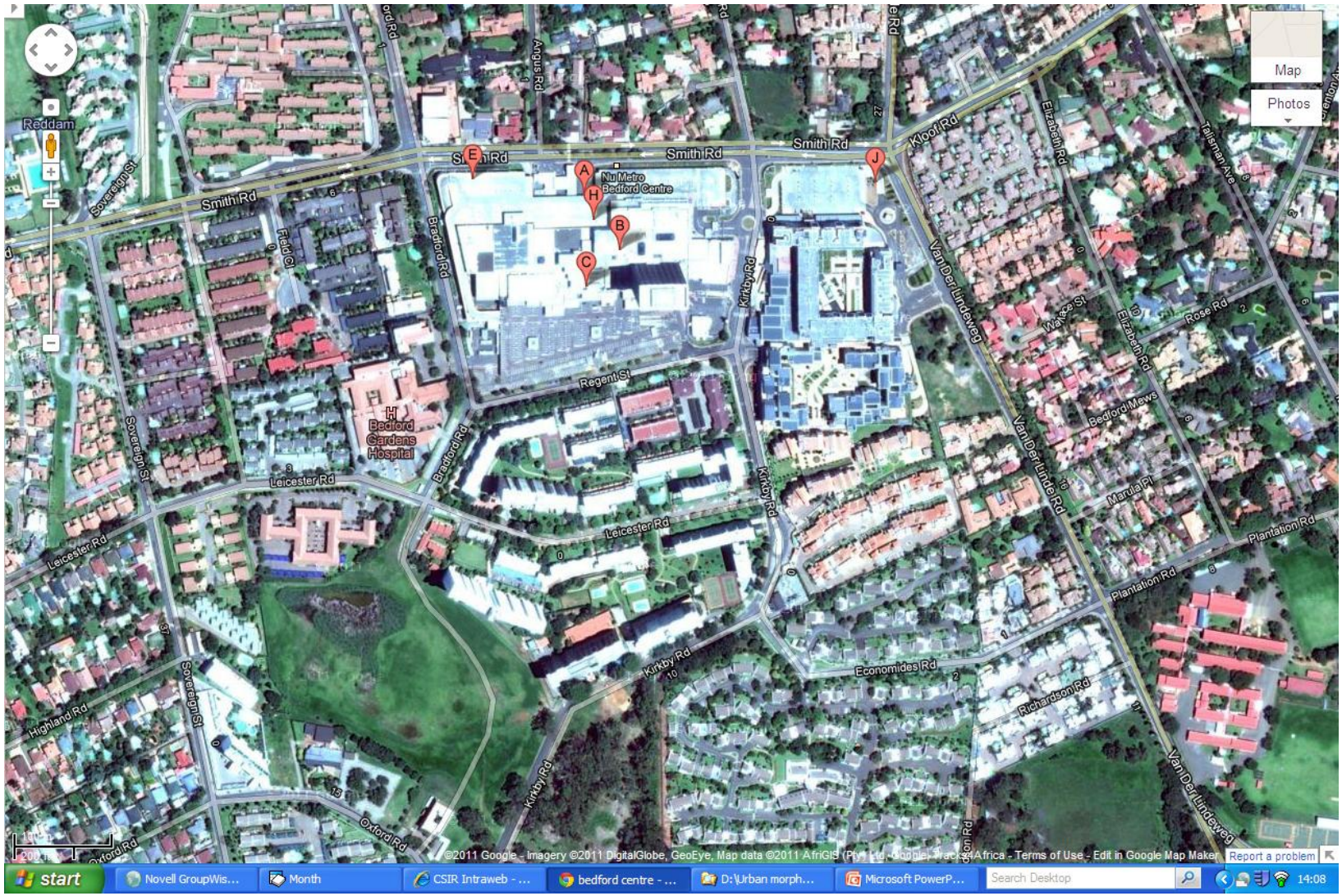
Background

- South African cities are generally dispersed in comparison to urban forms in most developed and developing countries.
- But just how efficient or inefficient are our cities? It is not good enough to look at the spatial footprint of the city.



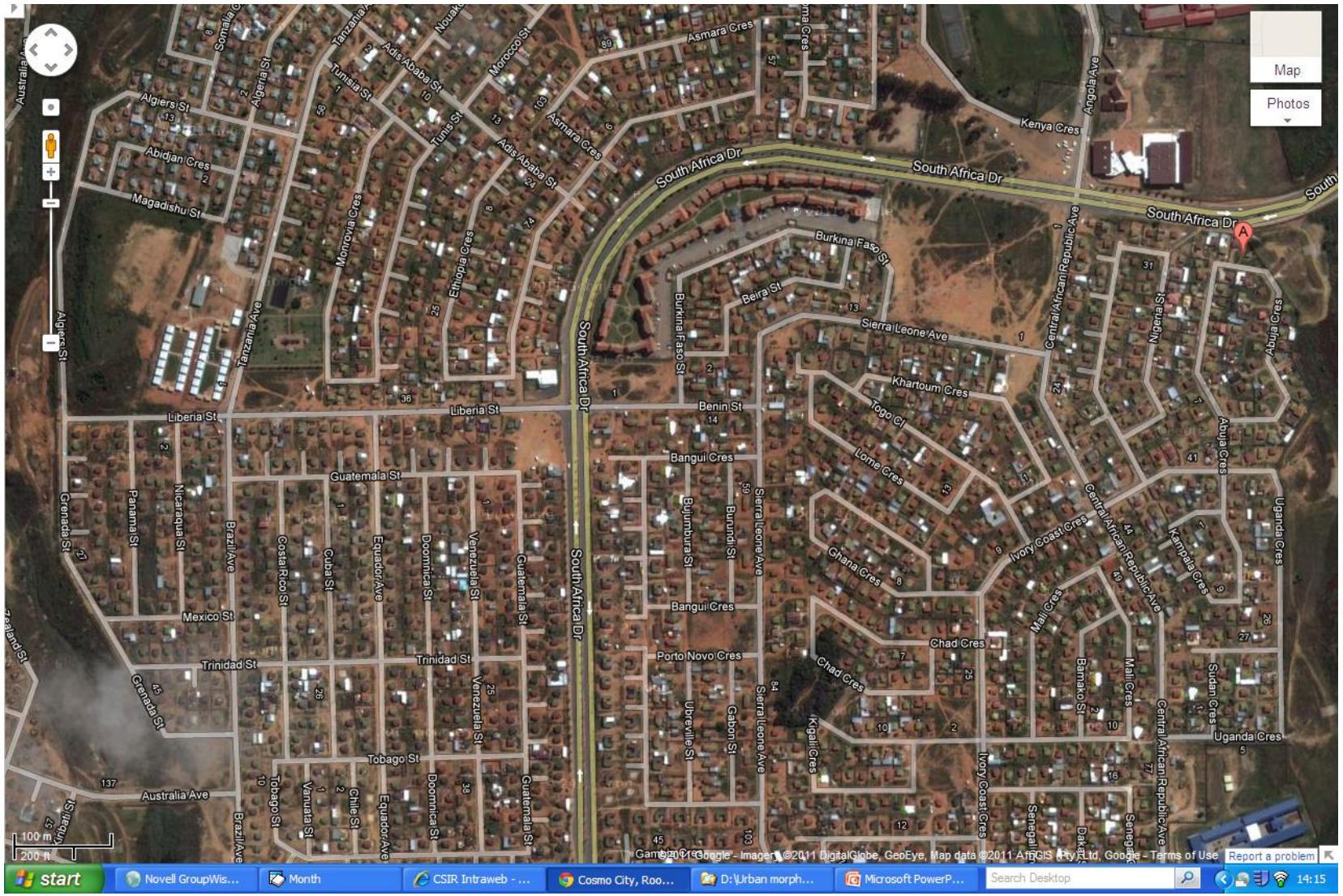


High Income (New Type)

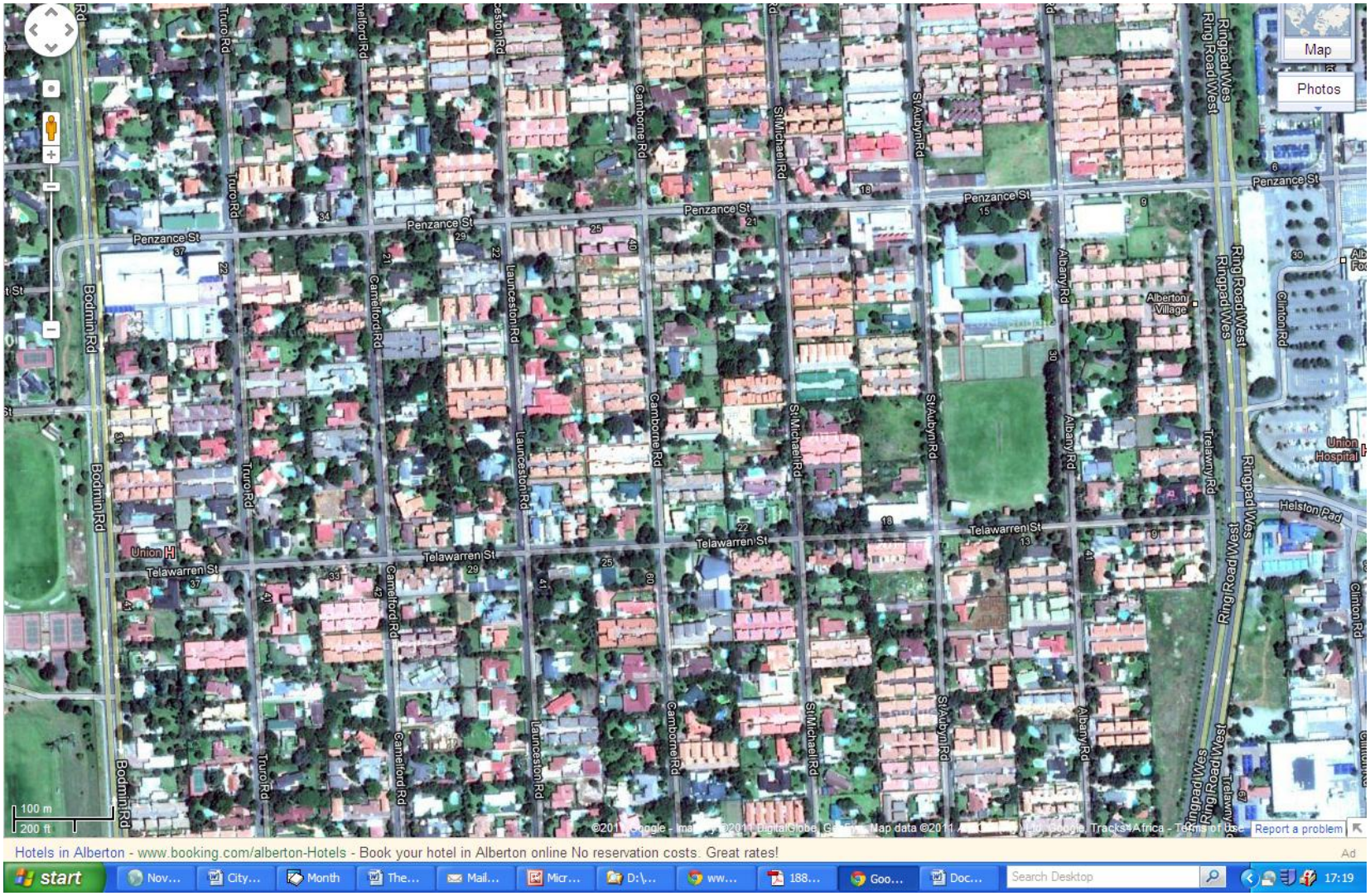


Mixed High and Middle High Income

Mixed Income

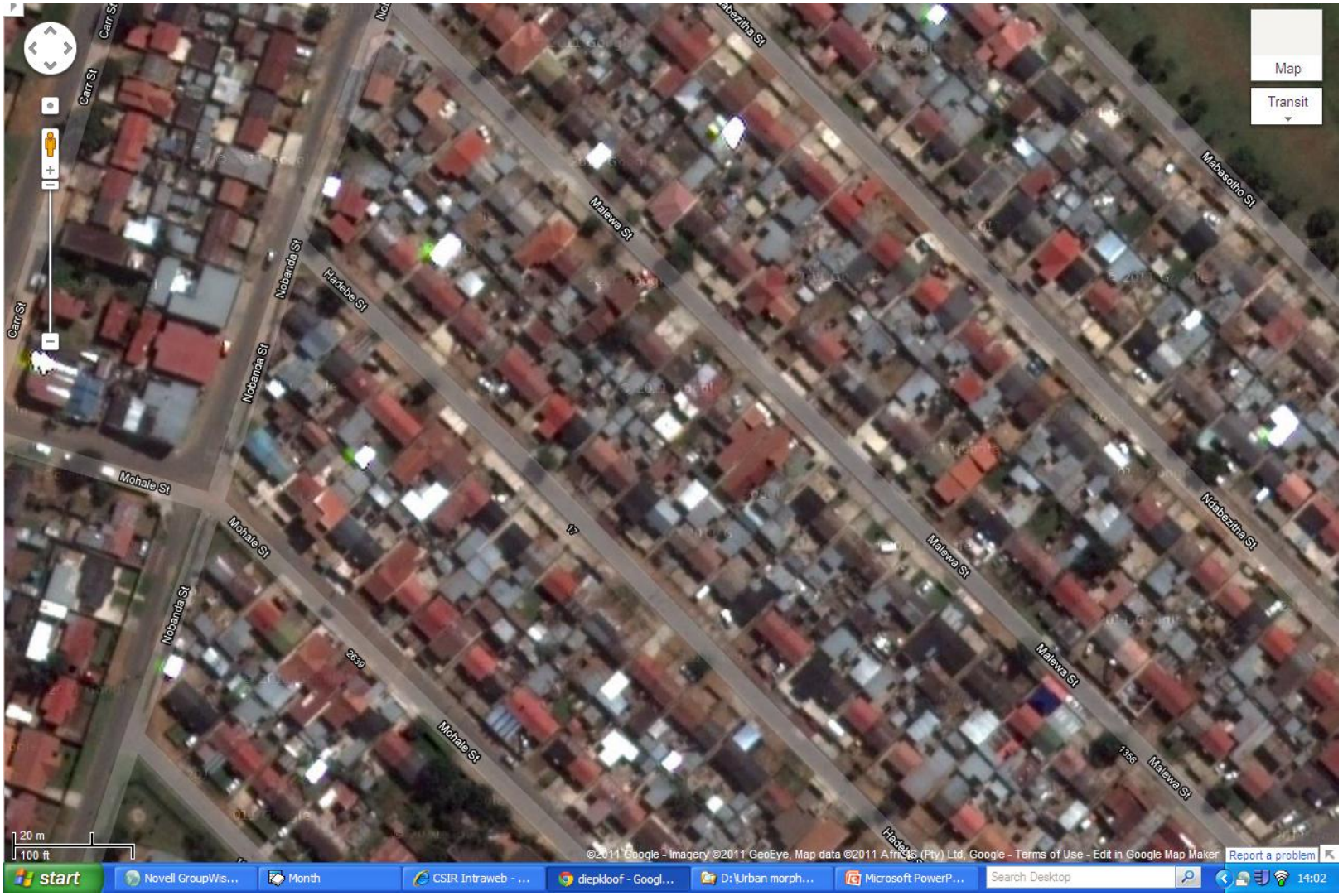


Middle-High Income Densification



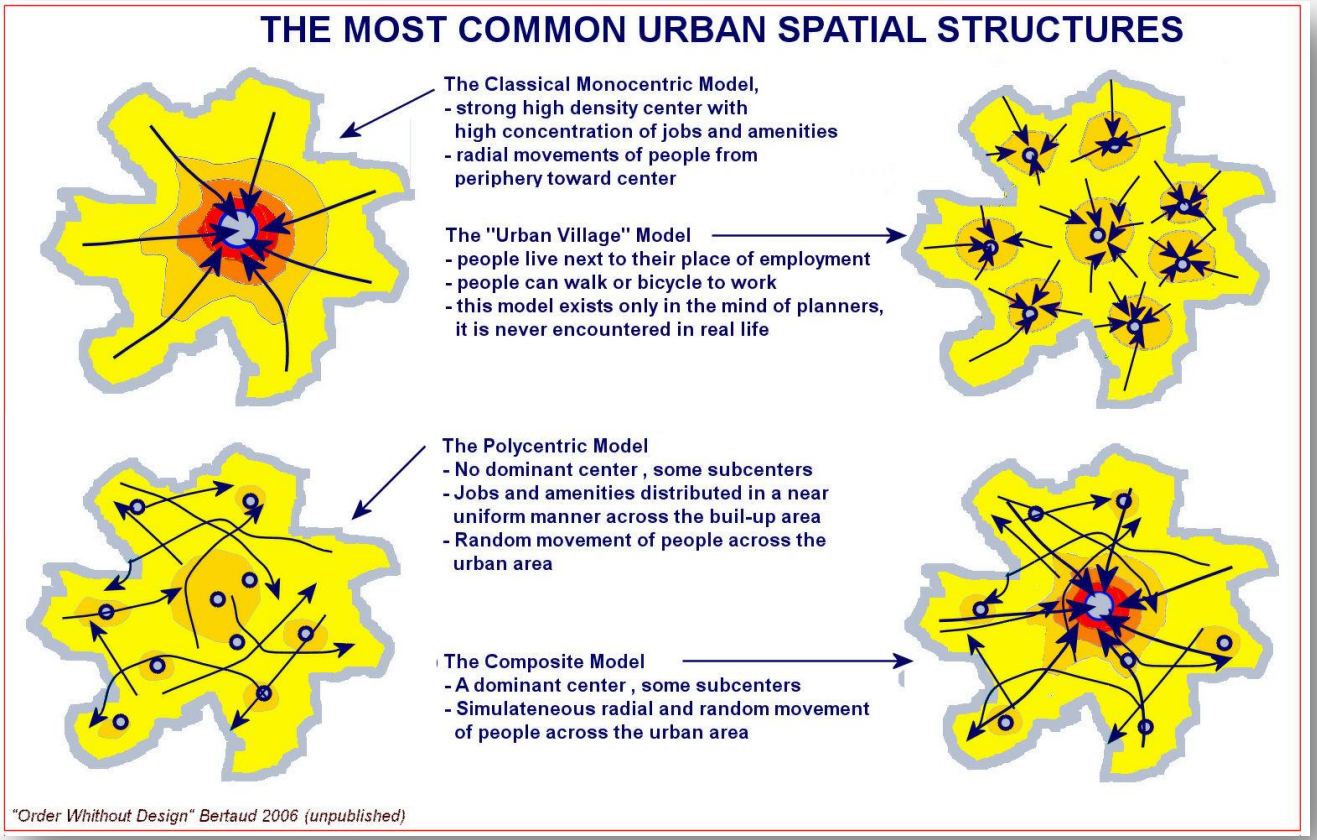
Low Middle Income

Low Income



Background

- Transport makes op **35%** of the energy demand of the Gauteng province.
- We need to understand how the cities function and how interactions play out in our cities.
- Only then can we understand what can we do to improve the sustainability and resilience of our cities.

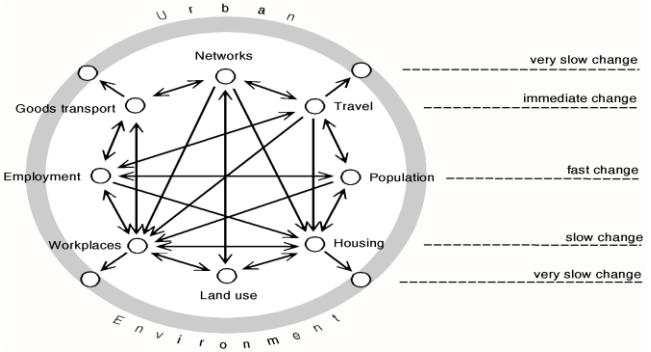


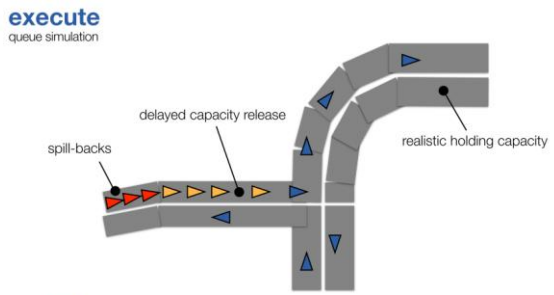
Outline

- Background to the work
- Overview of the Urban Simulation Platform
  - What
  - Why
  - How
  - Outputs/Deliverables
- Next Steps
  - Projections and Spatial Scenarios
- Illustrative Results

What tools do we have available to do this?

- Started with Urban Dynamics Laboratory in 2007
  - Literature review indicated rapid acceptance of micro-simulation techniques
  - UrbanSim (Open Source)
    - Discrete choice (Random Utility Maximization Theory) forms the basis of adaptation to developing world
  - MATSim (Open Source)
    - Autonomous agents executing and optimising trip plans based on queue theories





Charypar, D. (2008). *Efficient algorithms for the microsimulation of travel behavior in very large scenarios. Dissertation, Institute for Transport Planning and Systems*. Swiss Federal Institute of Technology (ETH Zürich).

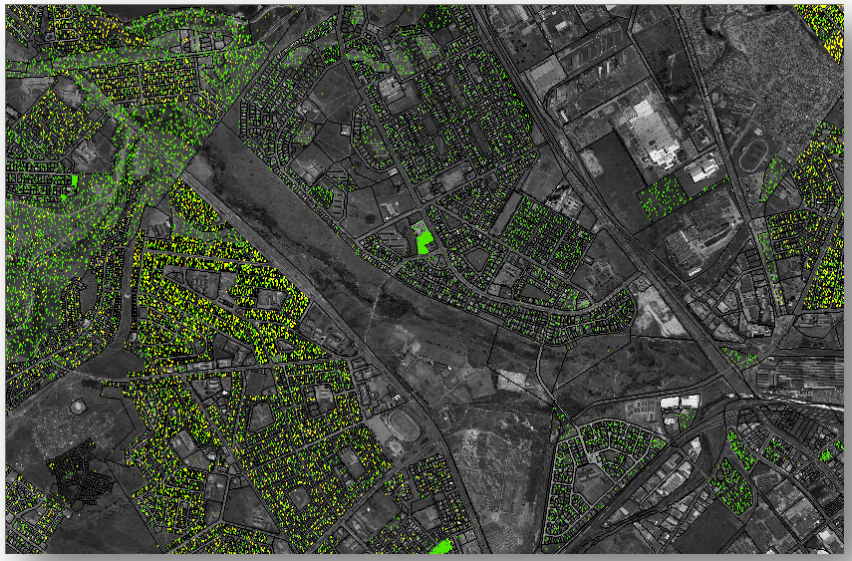
Background

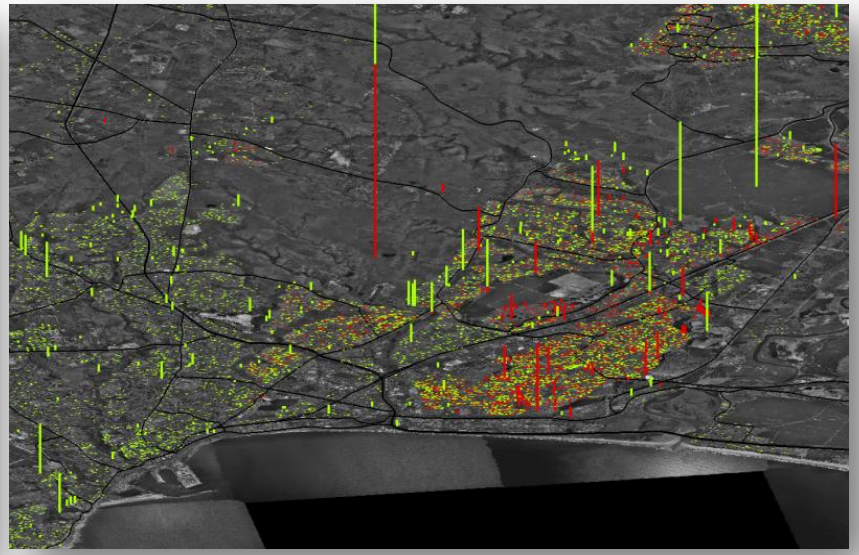
- Integrated Planning and Development Modelling (IPDM) project
  - Funded by DST since 2009 (see www.stepsa.org)
  - Achieved integrated land use and transportation modelling capability
    - Through loose coupling (data exchange) between UrbanSim and MATSim
    - Enerkey Collaboration in Gauteng
- Correct choice ?
  - Yes. Both platforms growing by leaps and bounds. EU FP7 Sustain City.

What and Why?

Develop a spatially explicit urban modelling and simulation platform;

- to assist cities and metropolitan regions;
- to better understand, plan, and manage urban growth and expansion
- over a 30 year period.



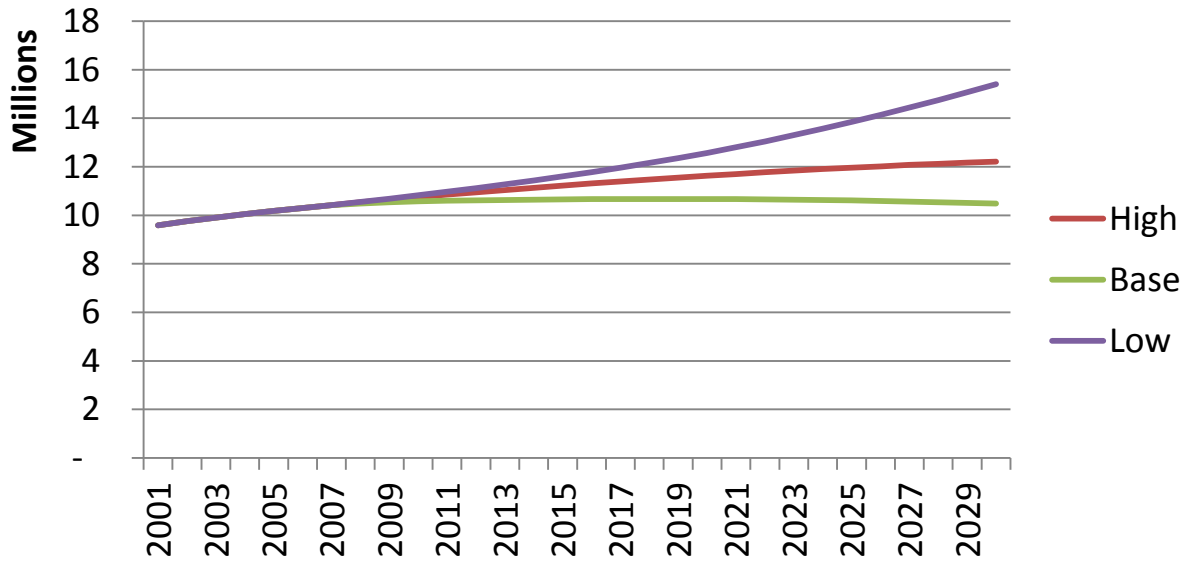


Household Growth: NMB 2001-2009

What?

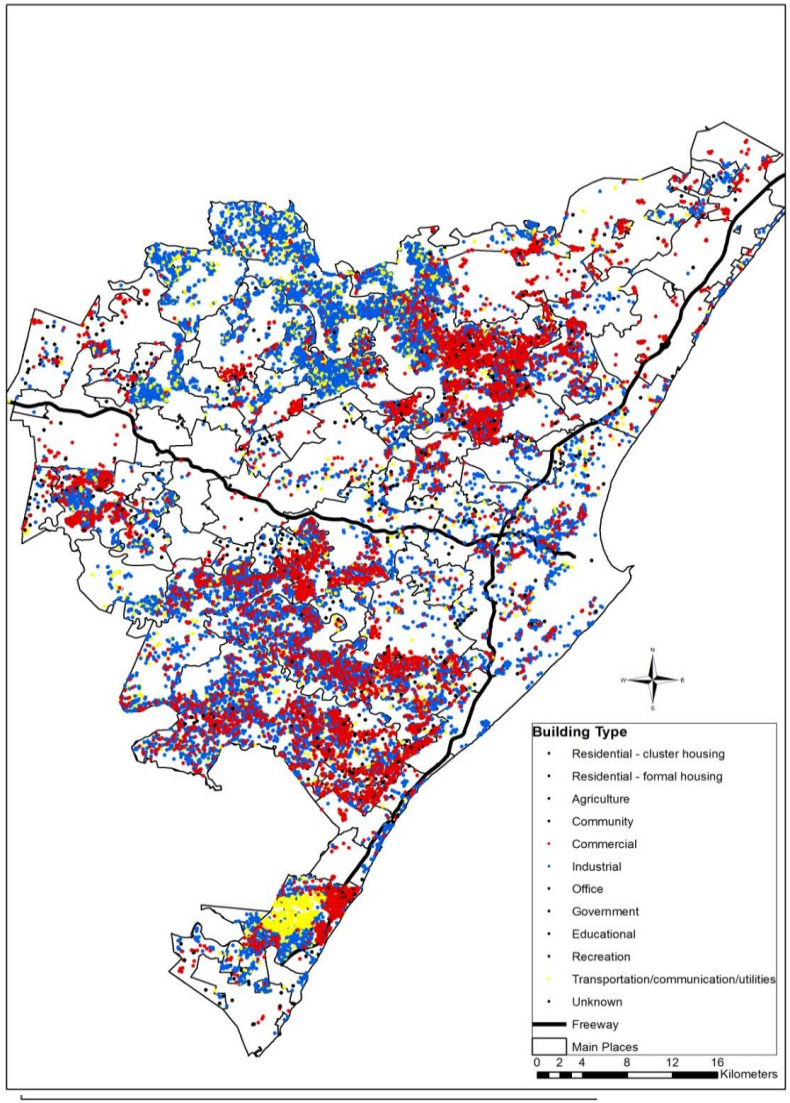
- Simulate probable/possible urban growth patterns over a 30 year period under a range of:
  - employment growth;
  - population growth; and
  - spatial planning scenarios

  up to 2030.

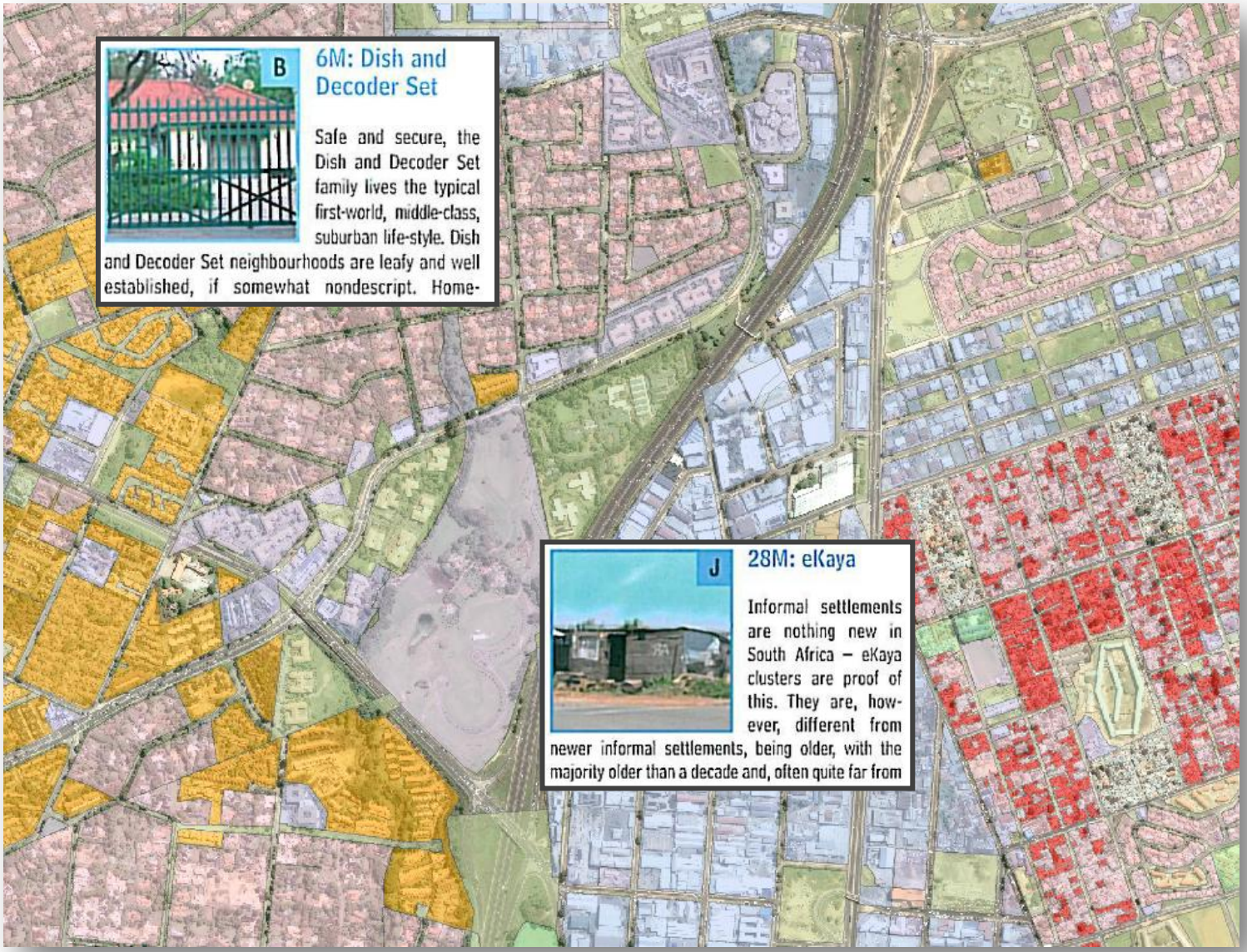


Why?

- The results of the simulation process will enable metros and city regions to plan more proactively for the long term by better understanding:
  - Future patterns of **demand for infrastructure, facilities and services** such as water, electricity, sanitation, schools, clinics and hospitals.
  - The **investments that will be required to sustain the economy** including public and private transport.
  - How future urban form may **impact on the sustainability our cities** by using indicators such as travel time and cost, access to social and economic opportunities and **energy and carbon efficiency.**



How?


B
6M: Dish and Decoder Set
Safe and secure, the Dish and Decoder Set family lives the typical first-world, middle-class, suburban life-style. Dish and Decoder Set neighbourhoods are leafy and well established, if somewhat nondescript. Home-
J
28M: eKaya
Informal settlements are nothing new in South Africa – eKaya clusters are proof of this. They are, however, different from newer informal settlements, being older, with the majority older than a decade and, often quite far from

How?

- Uses a collaborative or living laboratory process comprising interactive work sessions with **end users** in **real life contexts** to ensure:
  - the participation and collaboration of relevant municipal officials; in the
  - process of developing, testing and applying the urban simulation platform.

- The **Living Lab Process** includes the implementation of living laboratory processes in three metropolitan areas as well as the Gauteng Province.

ETHEKWINI MUNICIPALITY

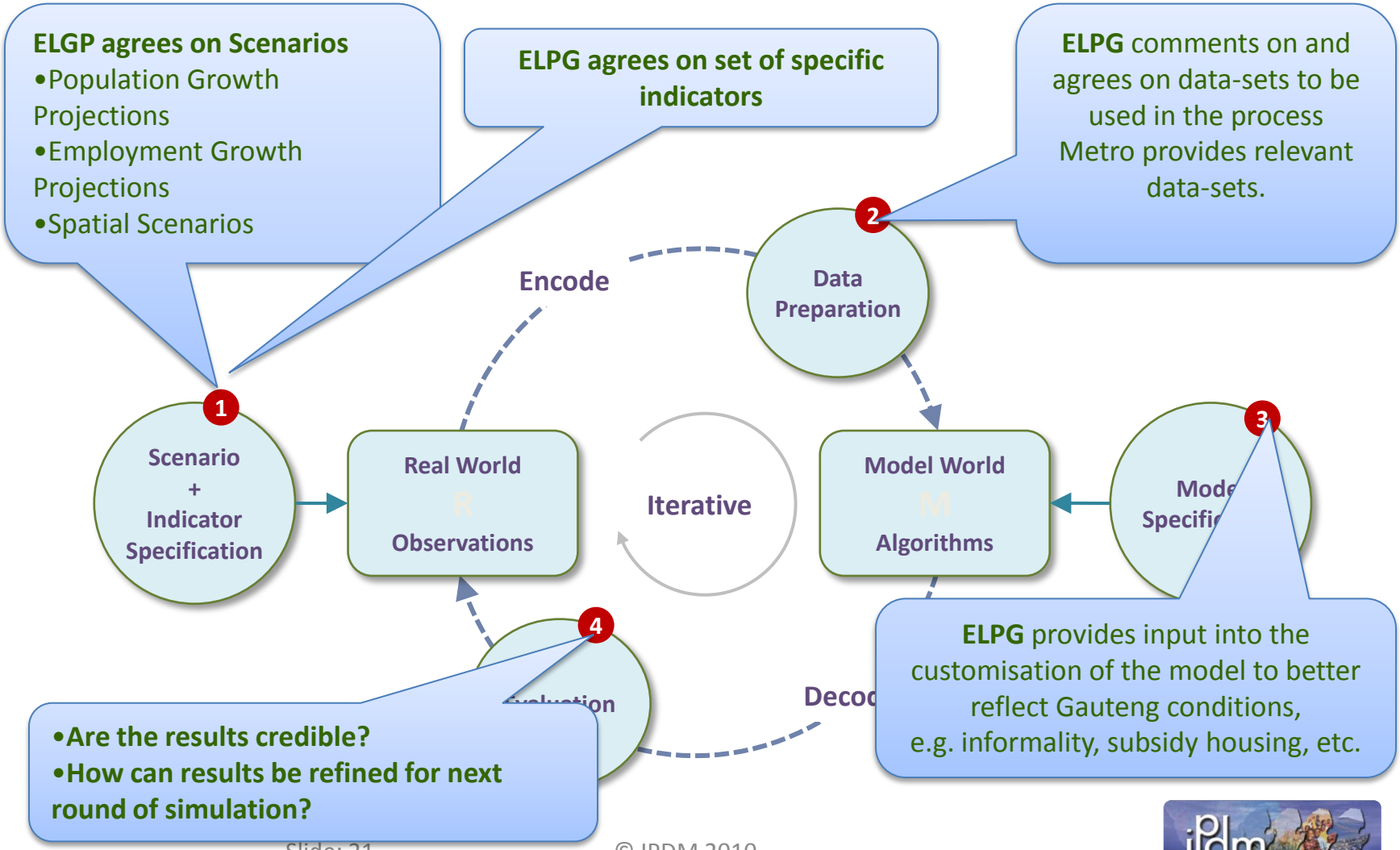
nelson mandela bay

Joburg
a world class African city

GAUTENG
it starts here

iPdm

How? The Role the Cities



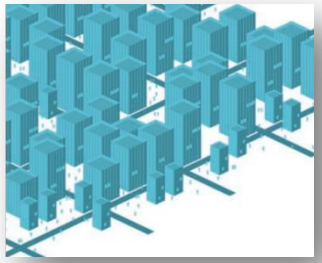
Approaches to Spatial Policy and Planning

- Metros use common instruments and measures, but differences in emphasis and approach, instruments used in different combinations and is highly dependent on contextual conditions.
- Examples of instruments:
- High Priority Public Transport Corridors, Increased Densities, Mixed Uses, Various Types of Urban Edges and Development Lines, Hierachies of Nodes, Accessibility, Incentives, Special Investment Projects.

1: Trans-politan

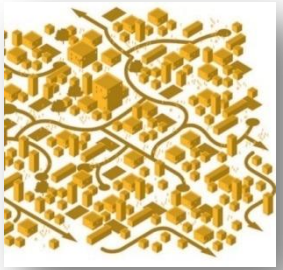
Transit orientated

2: Manag-opolis



Urban management approach

3: Community-city



Sustainable community unit approach

Metro Scenarios

Nelson Mandela Bay

- **'Trend'** Scenario
- **'Sustainable City'** Scenario

eThekwini Metro

- **'Business as Usual'** Scenario
- **'Public Transport Led'** Scenario

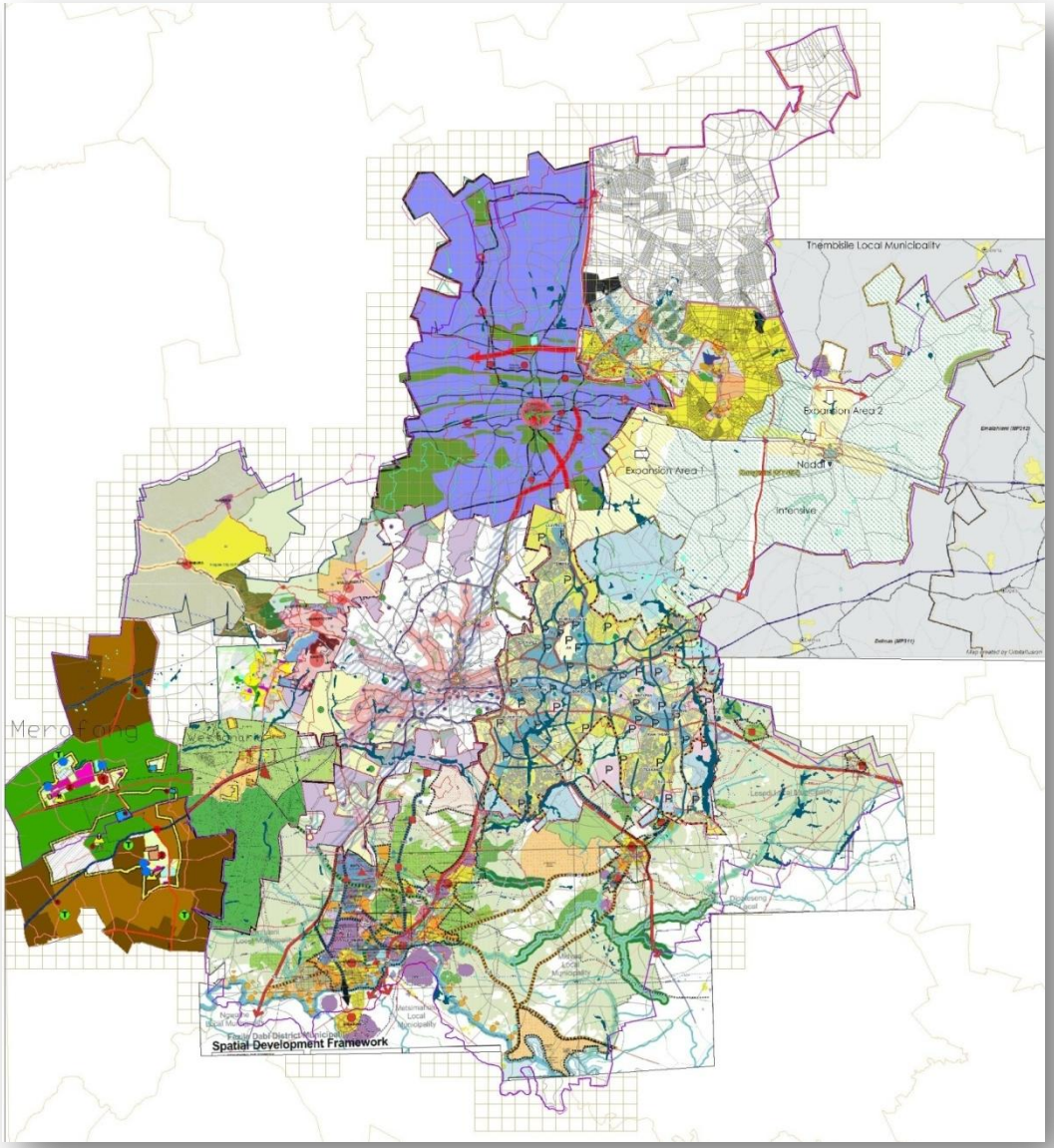
City of Jo'burg

- **'Unmanaged Demand Driven Growth'** Scenario
- '**Managed Growth**' Scenario

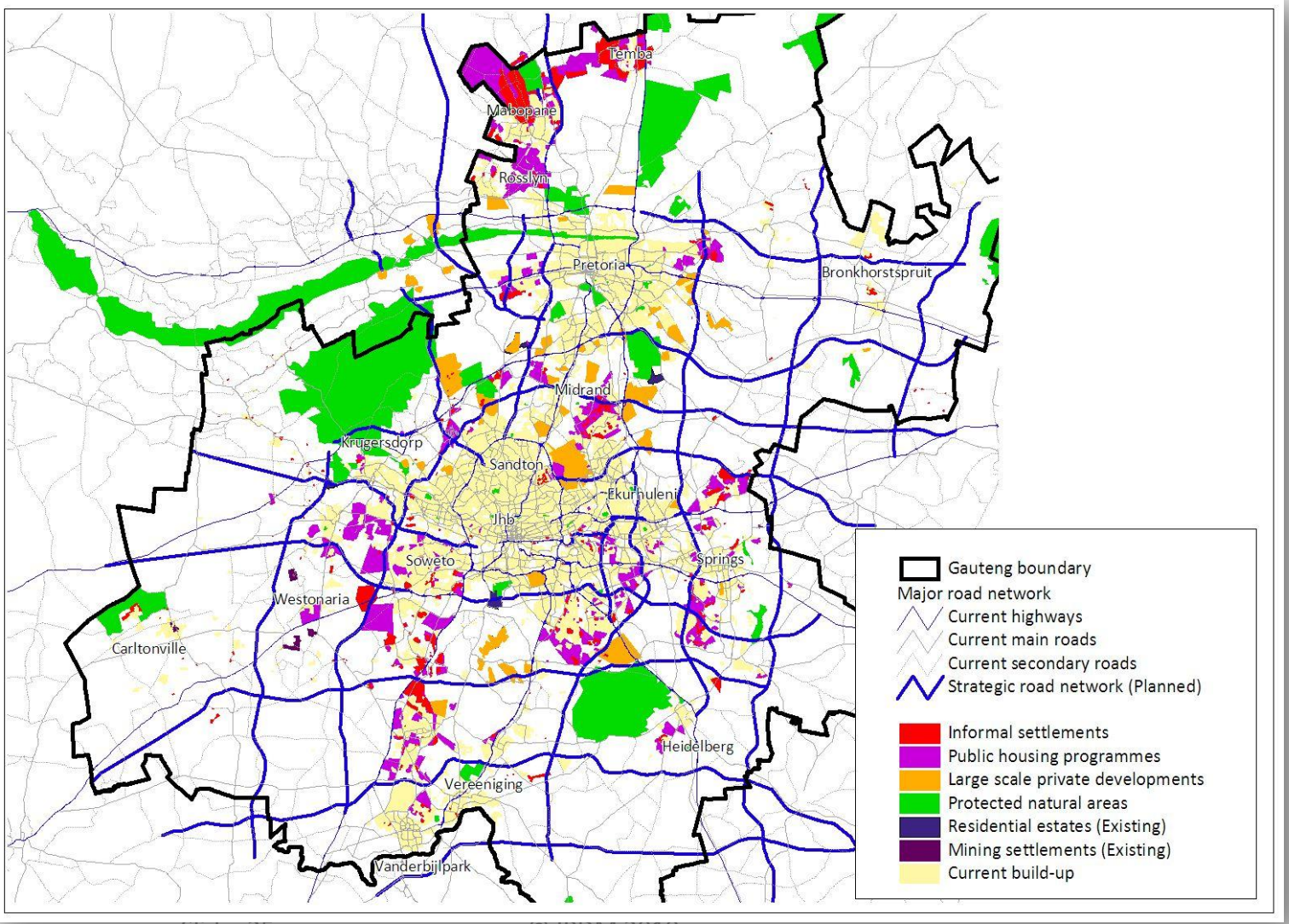
Gauteng

- **Fragmentation**
- **Consolidation**
- Assess the **energy and carbon emission implications of two spatial scenarios (**at city region scale with Enerkey Collaboration

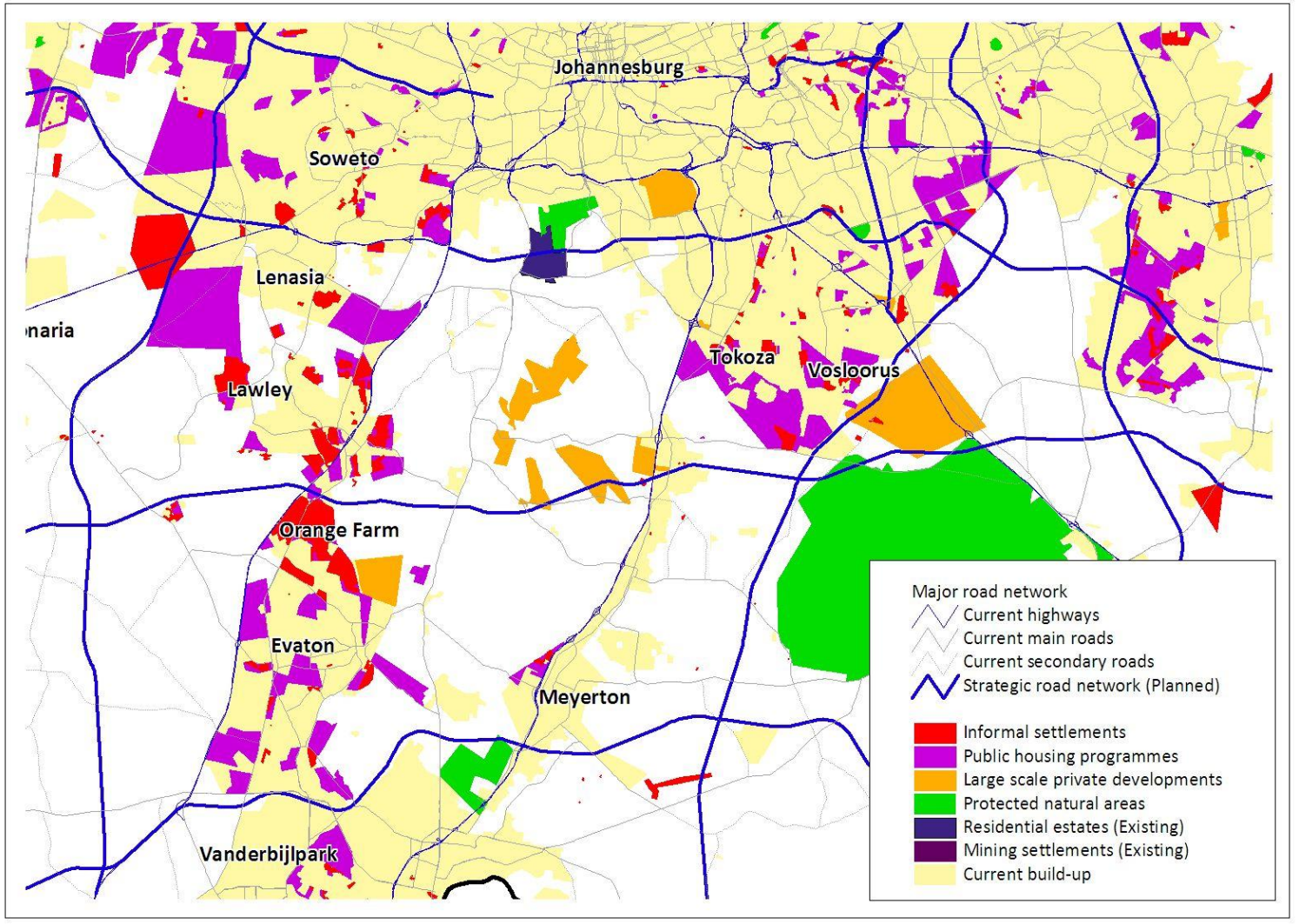
Composite Metro and Districts SDFs



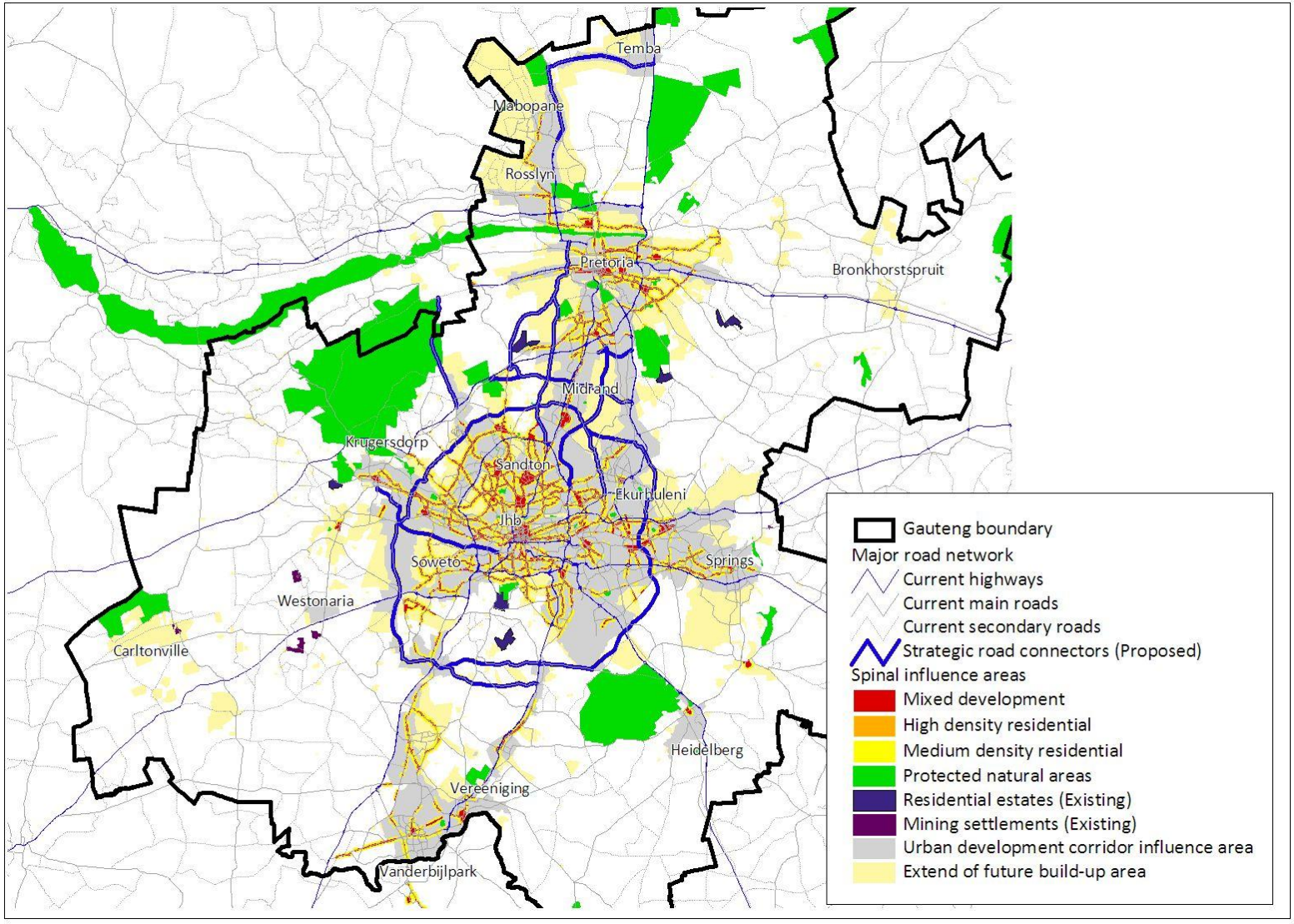
Fragmentation Scenario



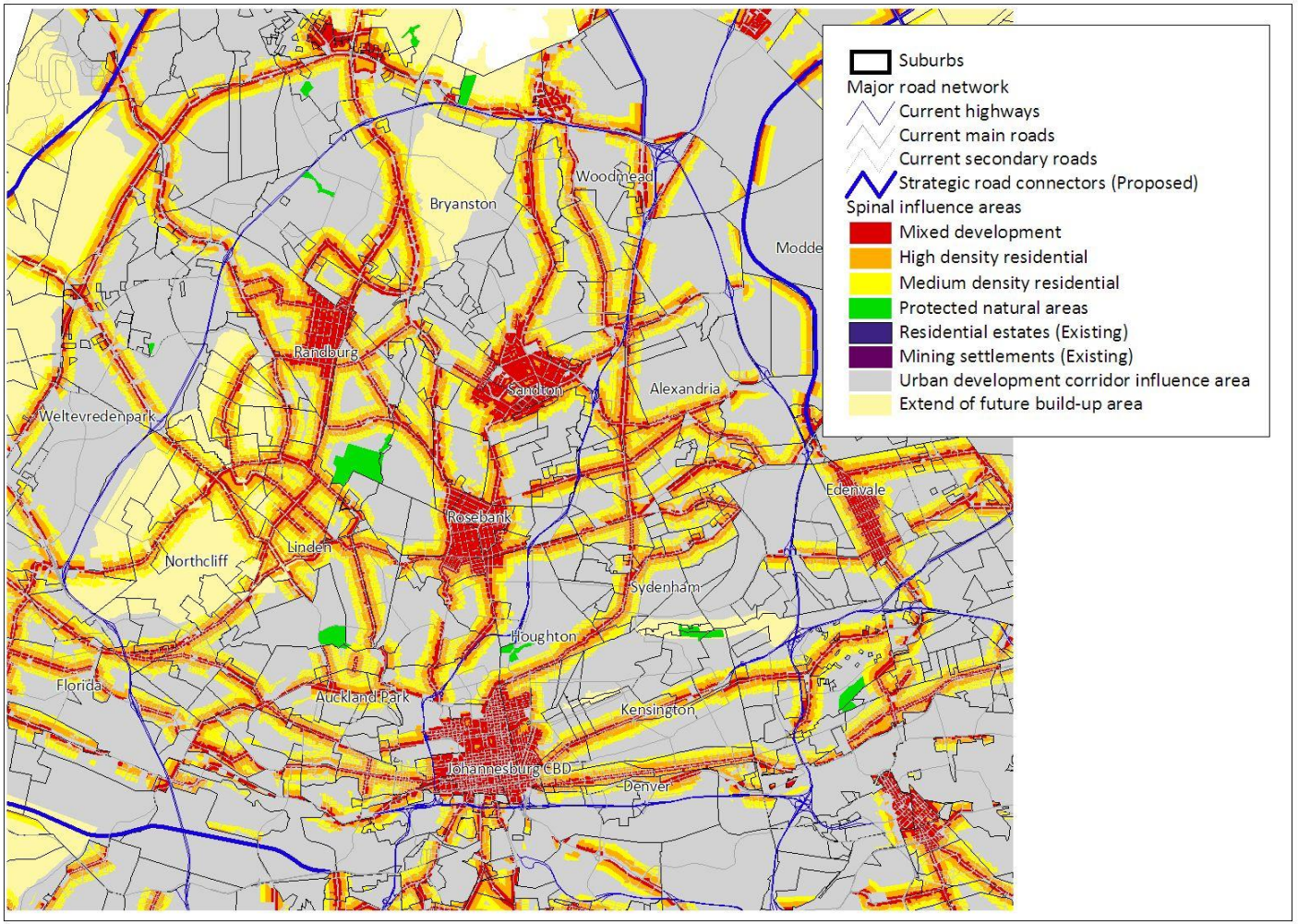
Fragmentation Scenario (Zoomed in)



Consolidation Scenario



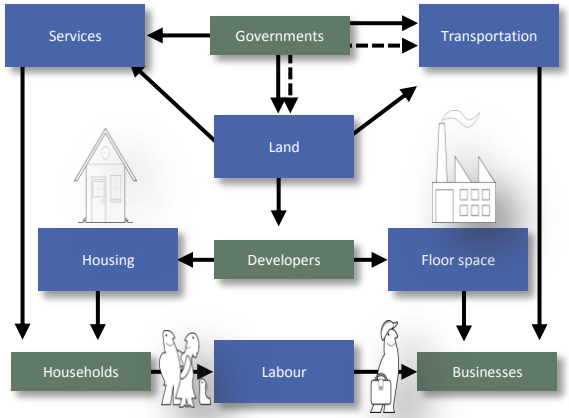
Consolidation Scenario (Zoomed in)



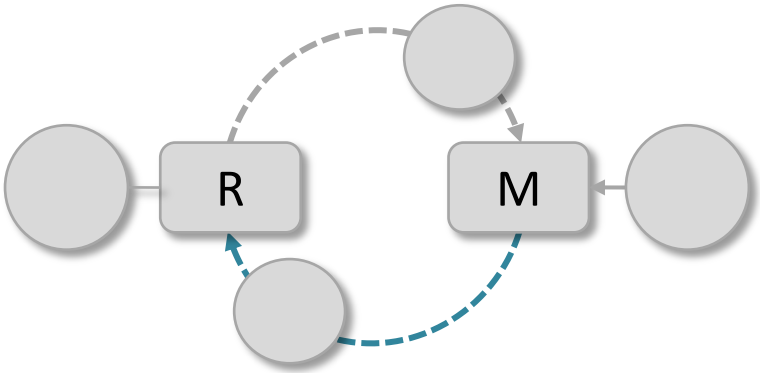
The Outputs/Deliverables

Outputs

- An urban simulation platform customised for South African conditions comprising:
  - Customised open source UrbanSim and MatSim soft ware for each metro.
  - A set of high, medium and low population projections in the form of annual control totals for each metro/city region for 2001 – 2030. (Excel spreadsheets)
  - Fully prepared relational data-set for each Metro.
  - Simulation results for agreed upon policy scenarios.
  - Capacity building and training for nominated officials on the use of the platform.



Illustrative Results



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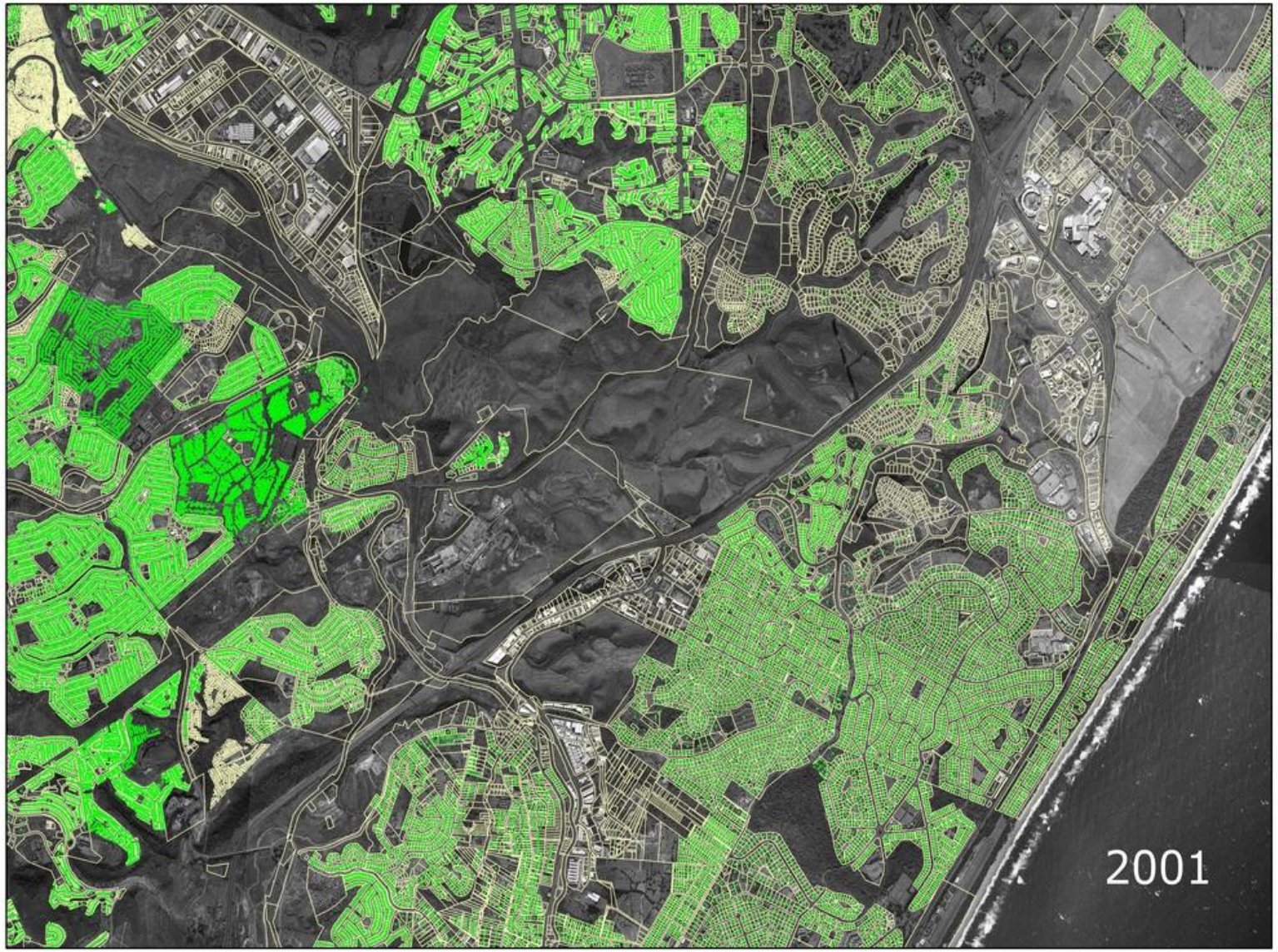
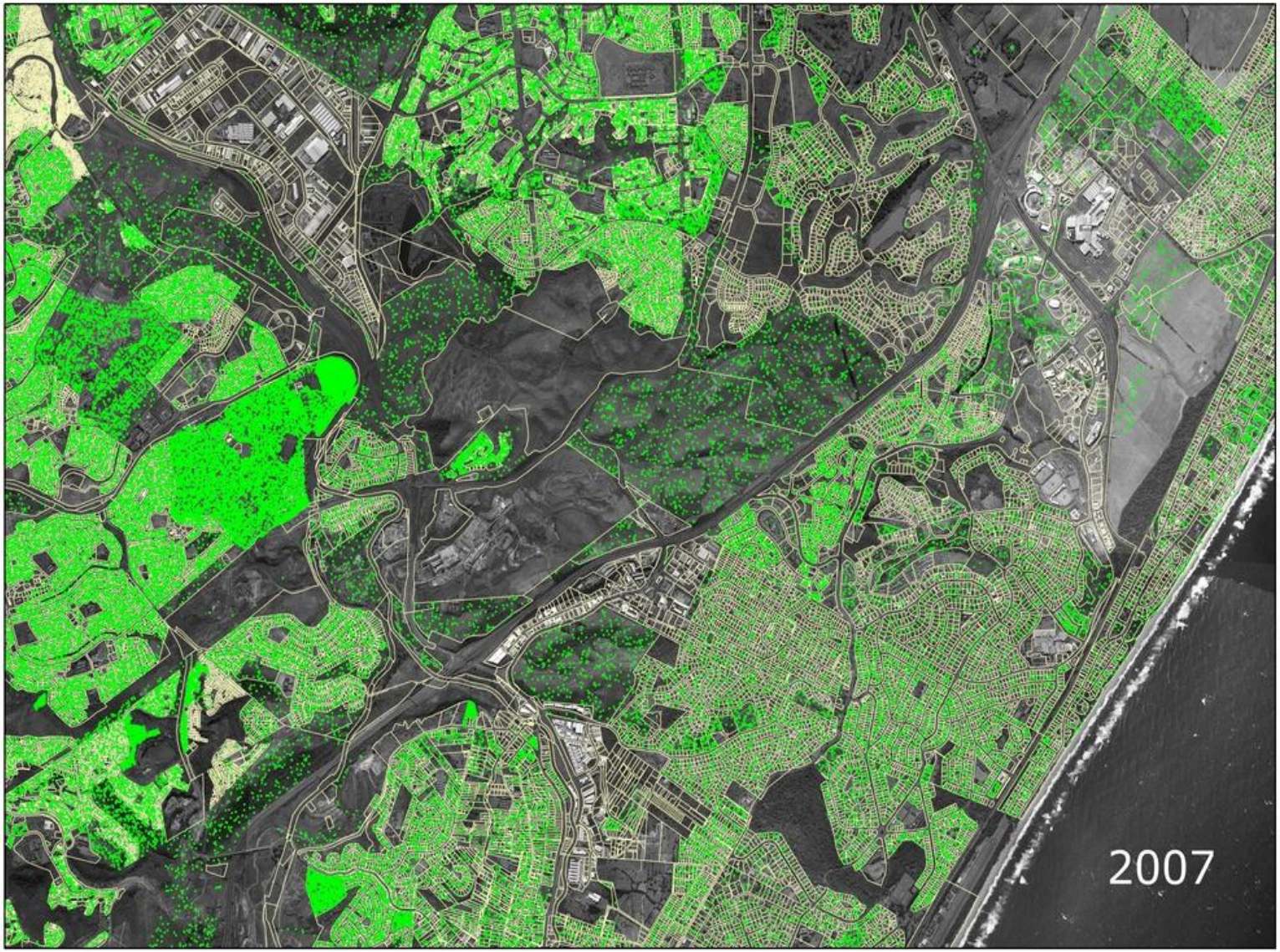
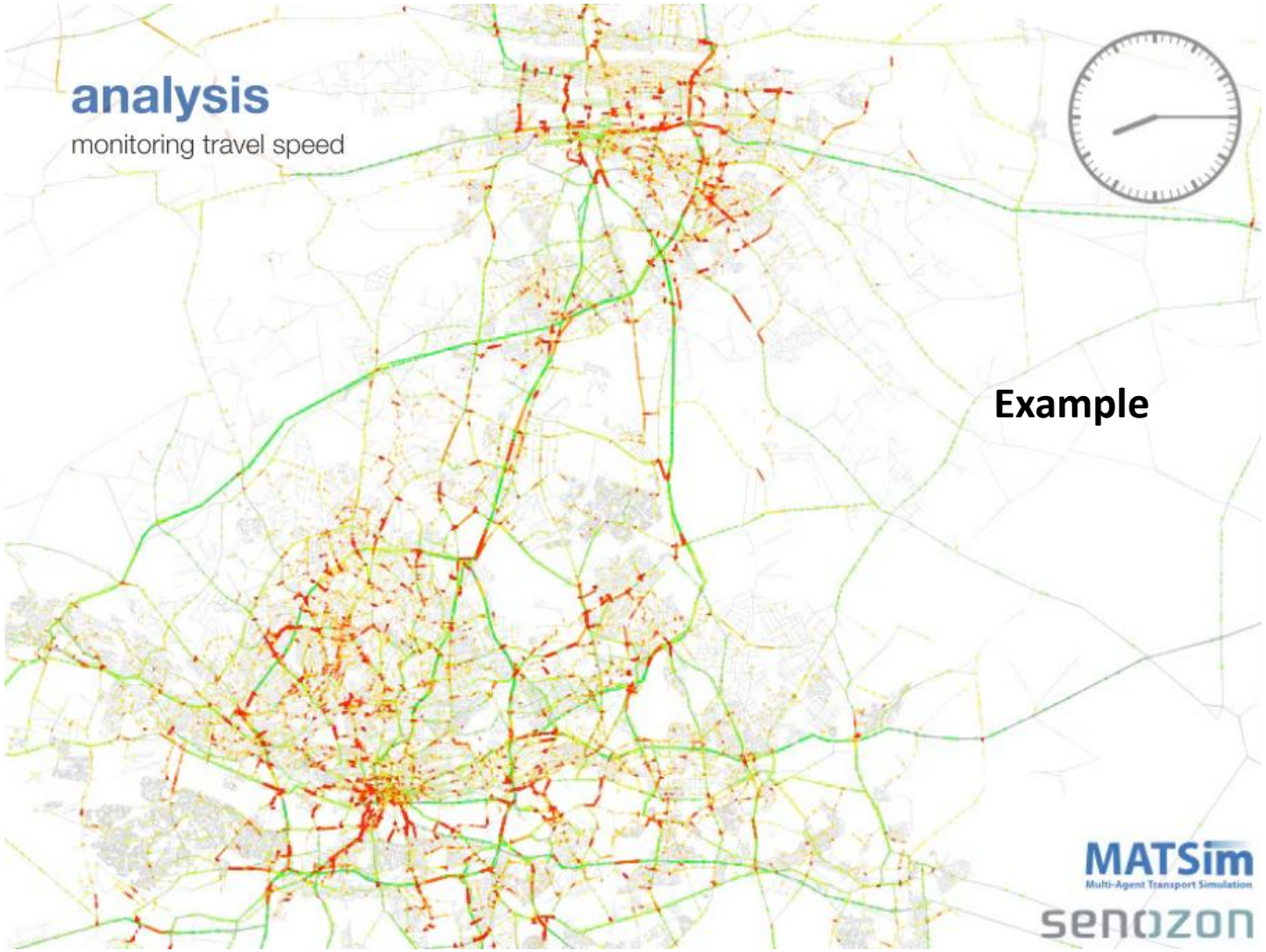
eThekwini Land Use 2001



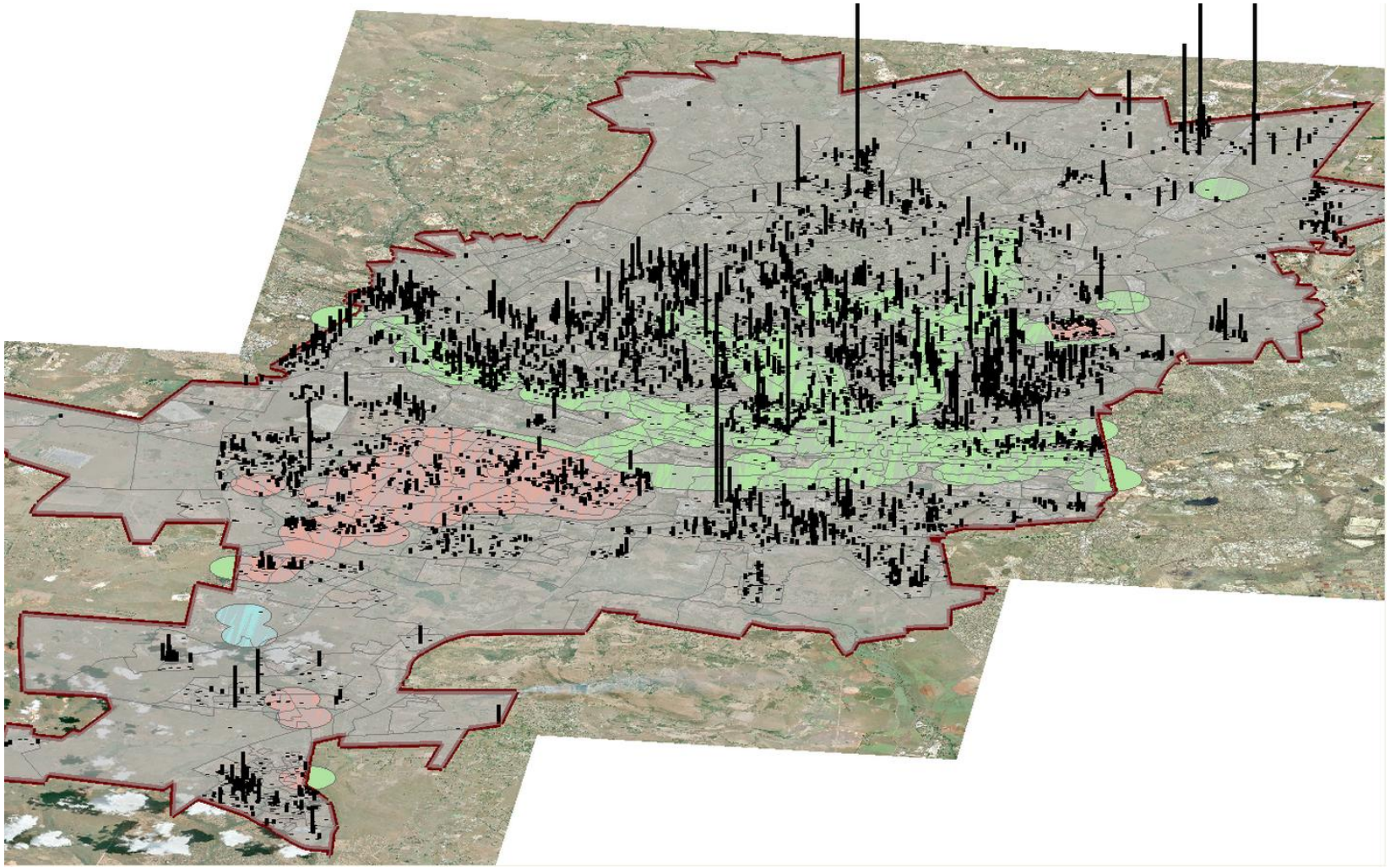
eThekwini Land Use 2007



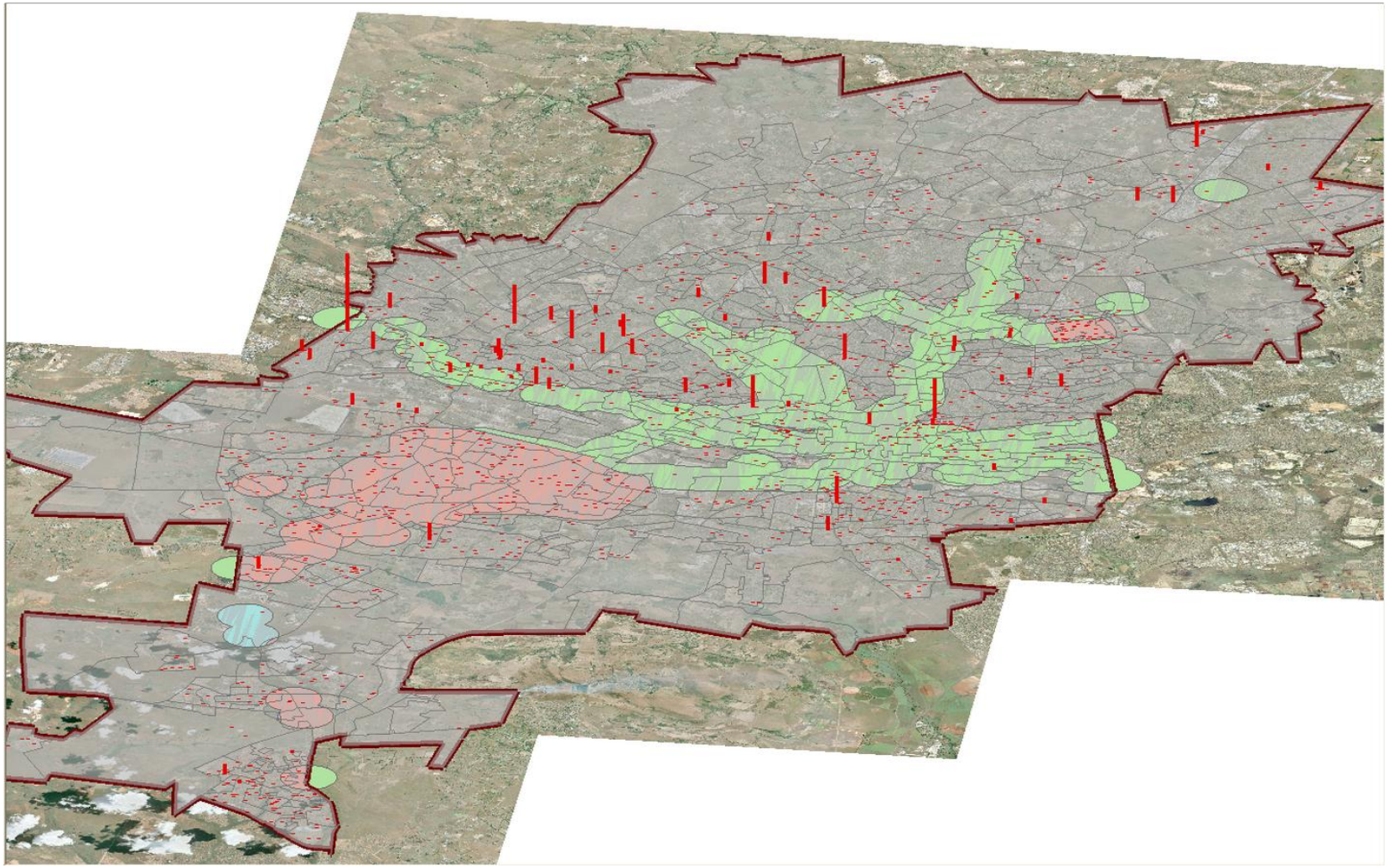
Gauteng Transport Simulation



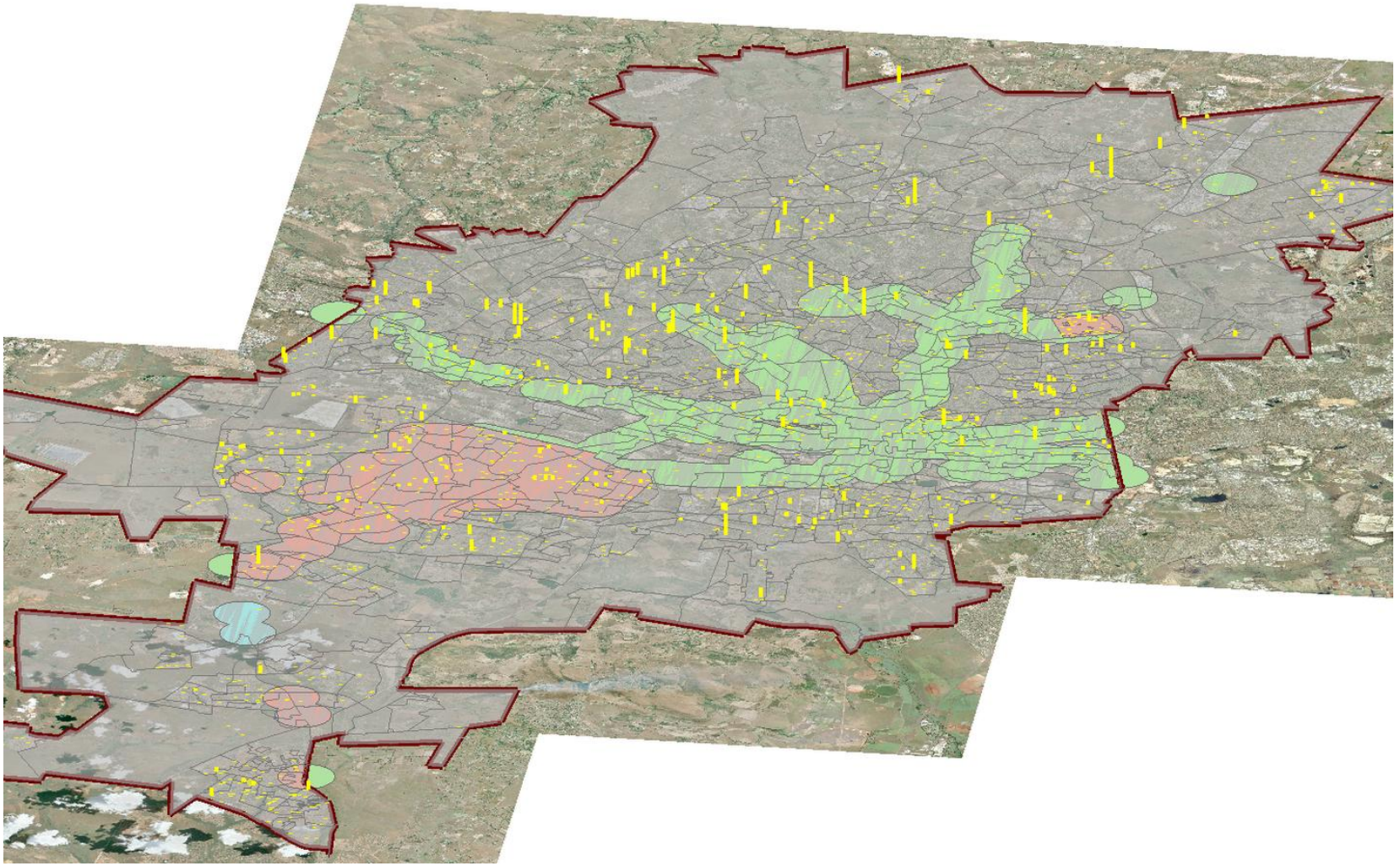
Jo’ burg Formal residential buildings 2001-2007



Jo'burg Informal residential buildings 2001-2007



Jo'burg backyard shacks 2001-2007



Thank you

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