Fiscal and economic analysis of spatial growth in South African cities

Nick Graham 08 May 2018

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Why is fiscal and economic impact assessment of growth important?

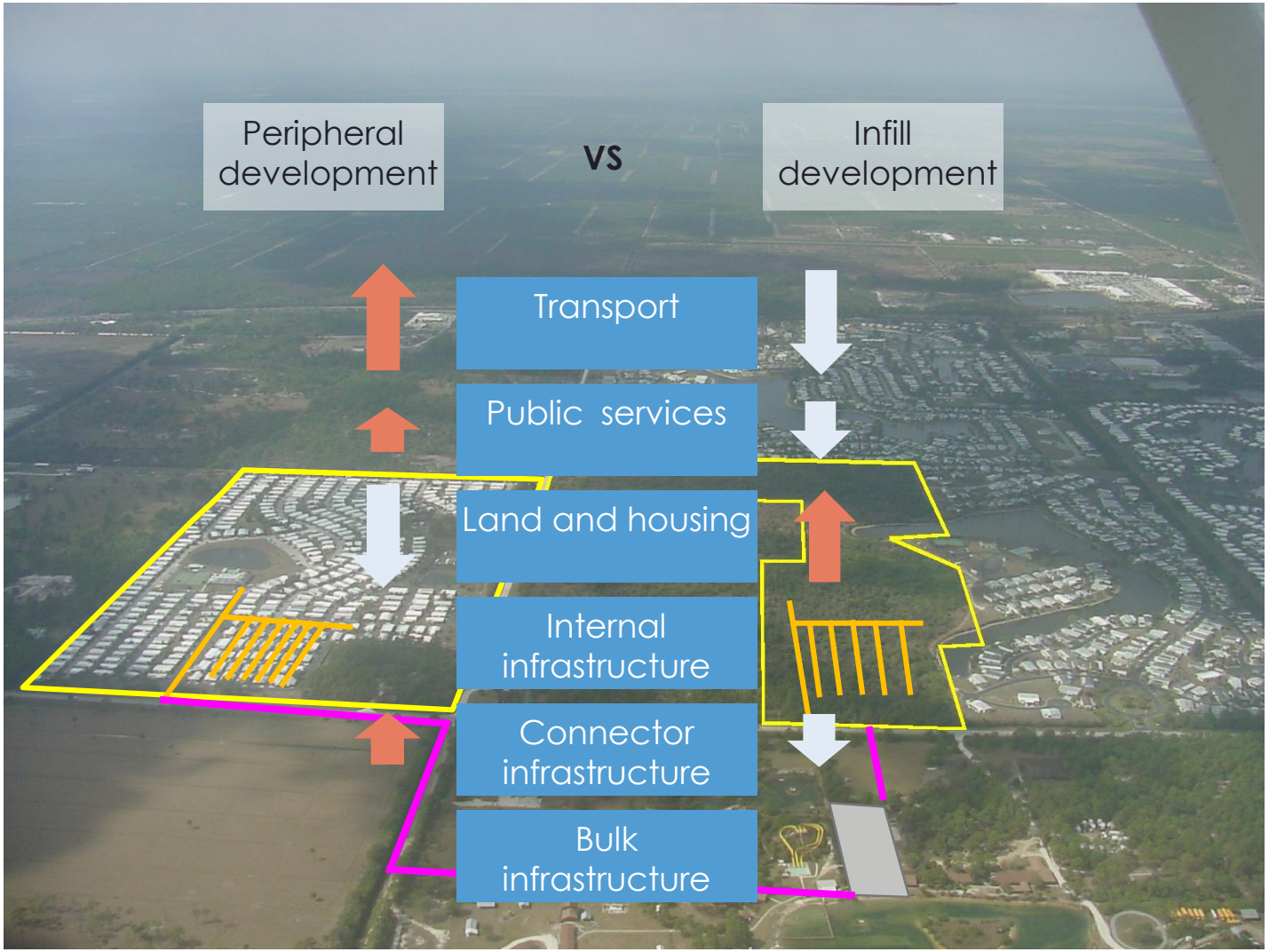
To provide evidence to support conscious spatial decisions that have a long-term impact on multiple actors

Bertaud, 2008

How does space impact cost?

- Land value
- Connector infrastructure length
- Travel distance, modes and time
- Existing infrastructure capacity

How do costs vary in space?



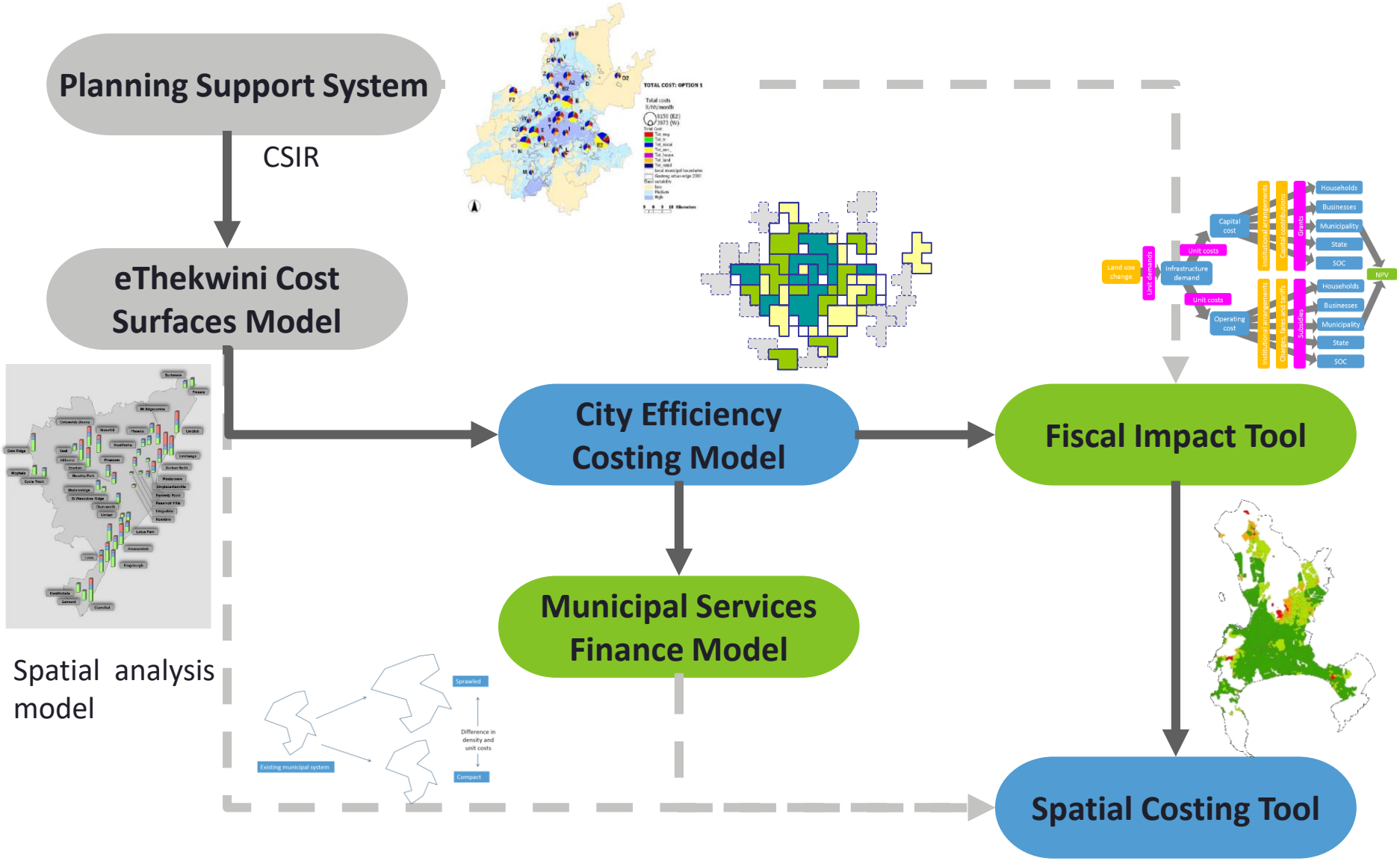
What is the impact of spatial decisions?

Fiscal	net cost to government	**Fiscal Impact Analysis**
Economic	net benefit to the economy	**Input/Output models** **Social Accounting Matrices**
Social	net impact on society	**Social Impact Assessment**
Environmental	net impact on the environment	**Environmental Impact Assessment**

Fiscal impact analysis is common in North America, but relatively new to South Africa

- International examples:
  - Smart Growth America (www.smartgrowthamerica.org)
  - Victoria Transport Policy Institute (www.vtpi.org)
- South African experience:

Evolution of spatial cost modelling

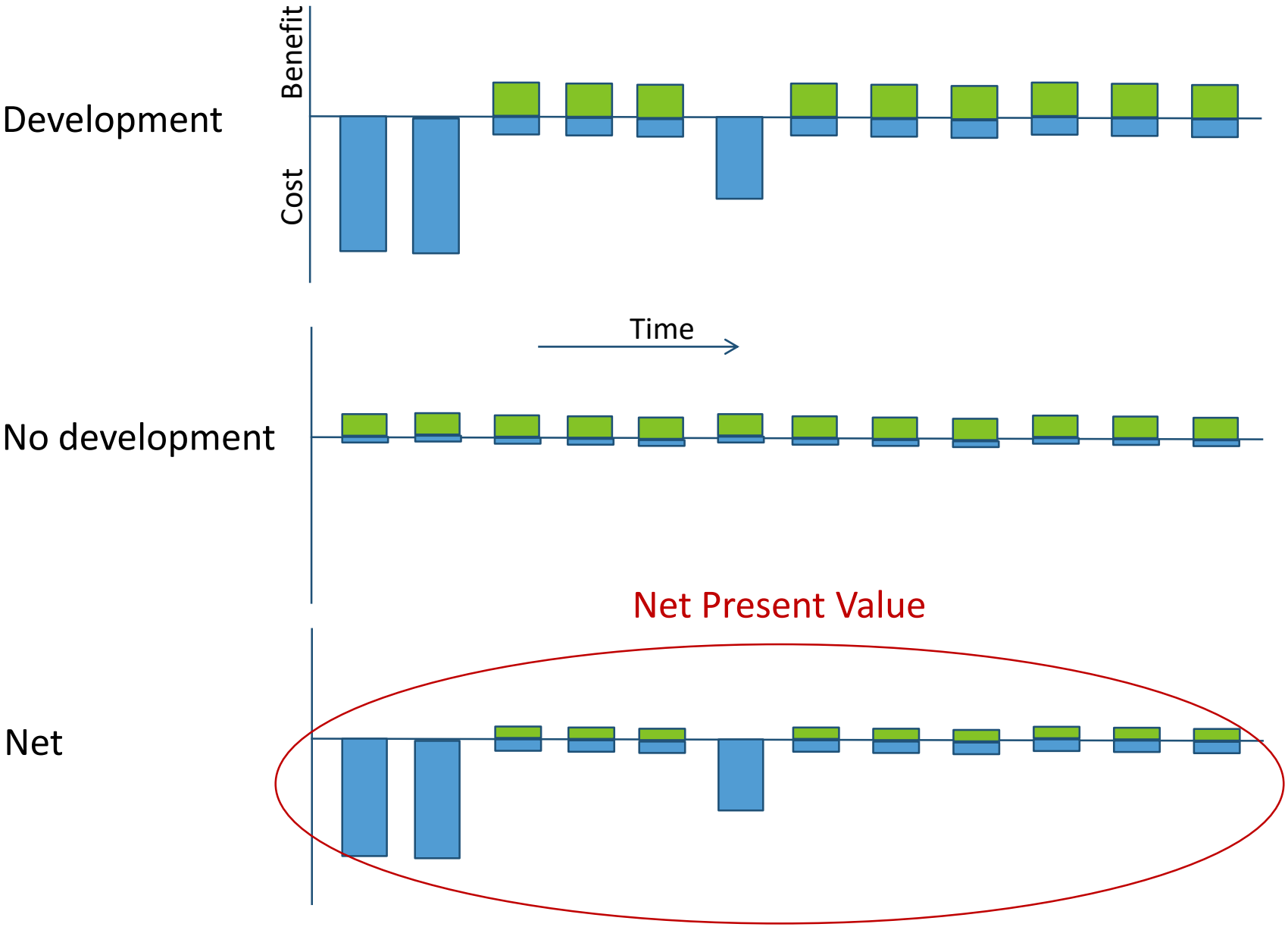


Cape Town Medium Term Infrastructure Investment Framework (MTIIF)

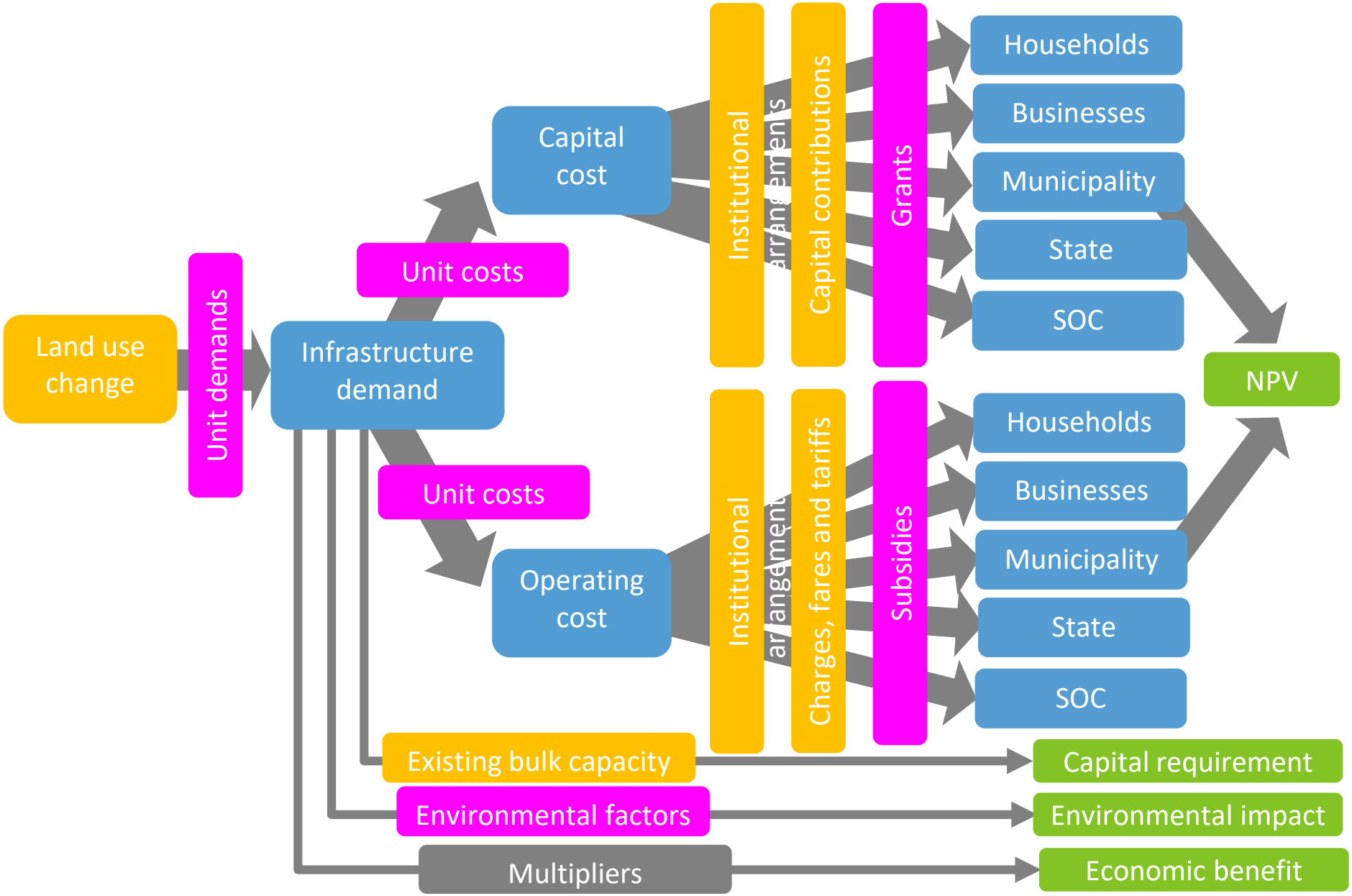
What question are we trying to answer?

- Development approval? Yes/No?
- Best location for a project?
- Best land use for a given site?

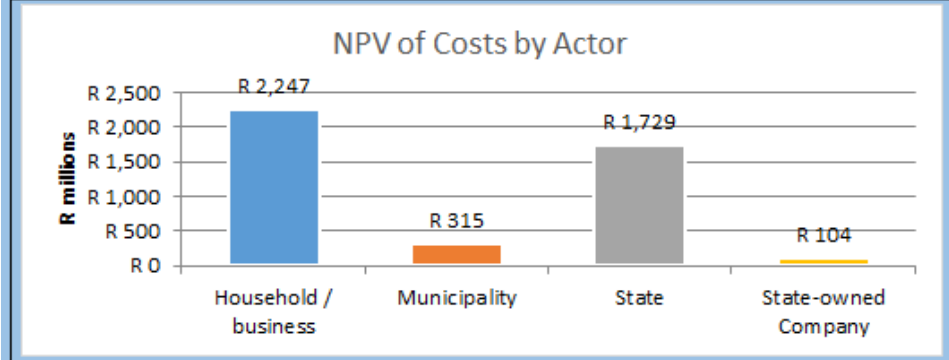
Project level tool: Fiscal Impact Tool

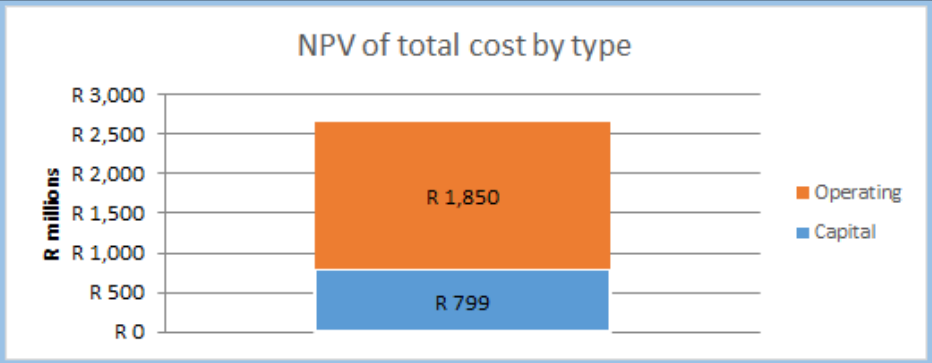


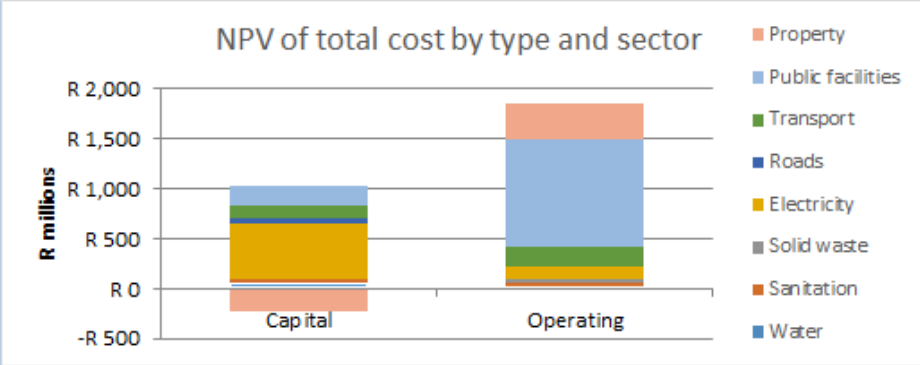
Process to calculate impact



Project level tool: Fiscal Impact Tool







Capital requirement

Initial capital requirement (water, sanitation, solid waste and electric	R	226	million
Total capital requirement (water, sanitation, solid waste and electric	R	715	million

Environmental impacts	**Per capita (res)**	**Per m^2 (non-res)**
Additional tons CO2 (from transport)	2733	237
Additional electricity demand (KWh pa in year 20)	551	34
Additional volume of water required (Kl pa in year 20)	36	1

Economic impacts

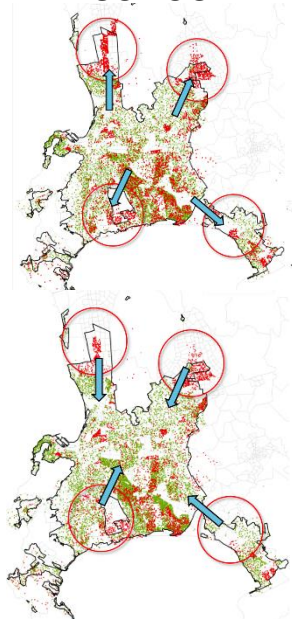
GVA from construction, operations and maintenance	R	4,044	million
Employment from construction, operations and maintenance		22,977	person years

Transport impacts

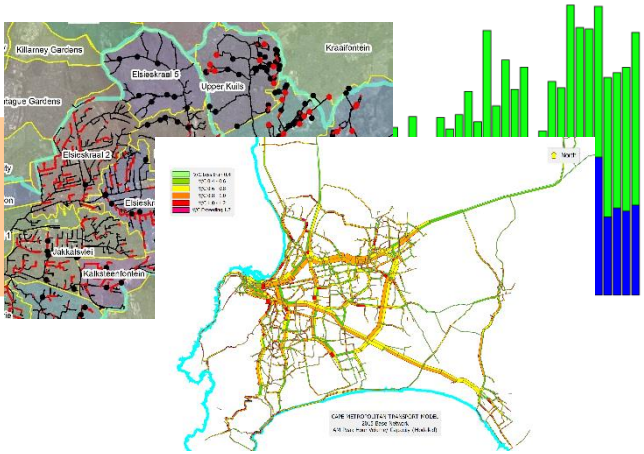
Average increase/decrease in travel time over 20 years (mins/day)		7	minutes per day
Economic cost of total travelling time (R million)	R	1,265	million
Maximum % of household income spent on transport in year 20		9%	

City level tool: Spatial costing tool

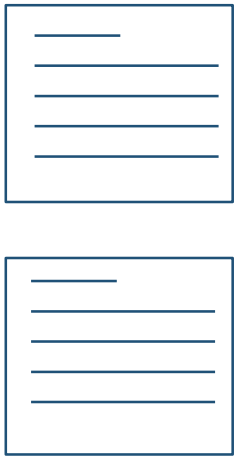
2 LAND USE SCENARIOS



MODELLING, DESIGN & COSTING



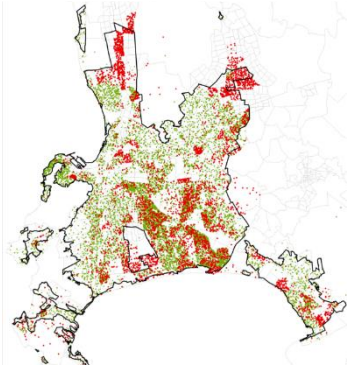
RESULTS



Unit demands and costs

Calibration

ALTERNATIVE LAND USE SCENARIO



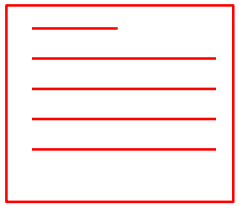
SPATIAL COSTING TOOL

City-wide) data

+

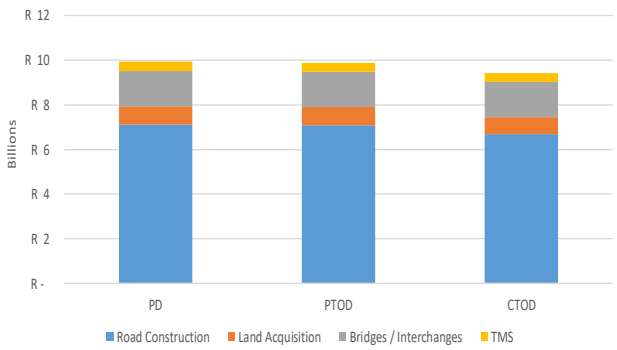
GIS surfaces from previous modelling by transport zone

INDICATIVE RESULTS

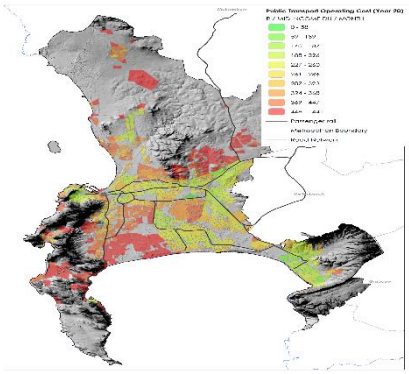


Costing methodology - life-cycle costs

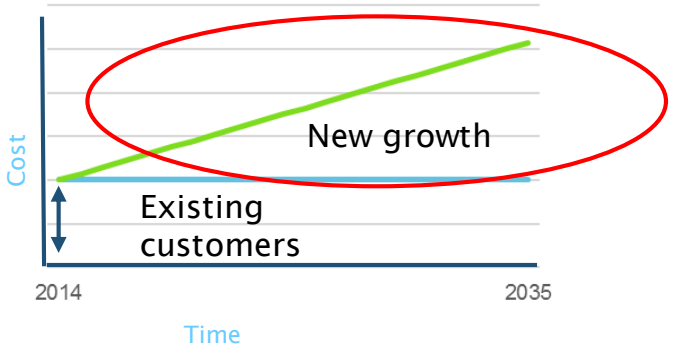
Capital costs



Operating costs



20 Years

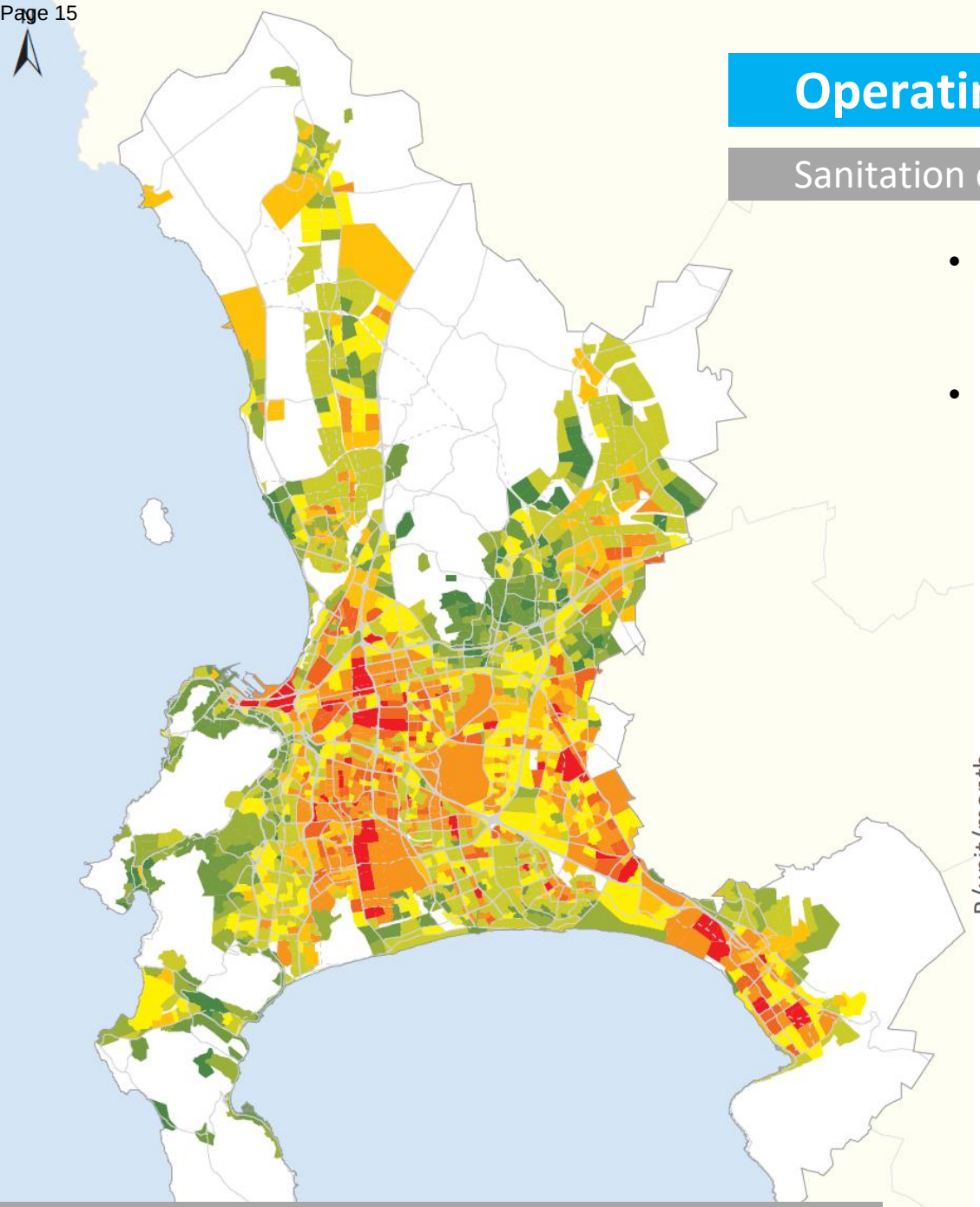


Net Present Value (NPV)

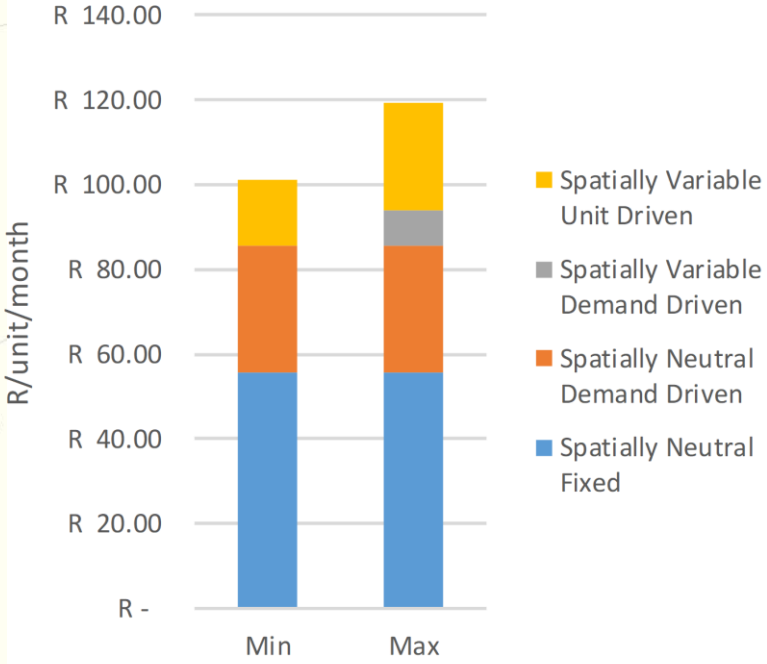
of life-cycle cost to the infrastructure <u>provider</u>

Operating cost surface example

Sanitation cost variation



- Strongly affected by the mean slope (blockages and pumping)
- Moderately impacted by density, distance to depot and age of infrastructure)



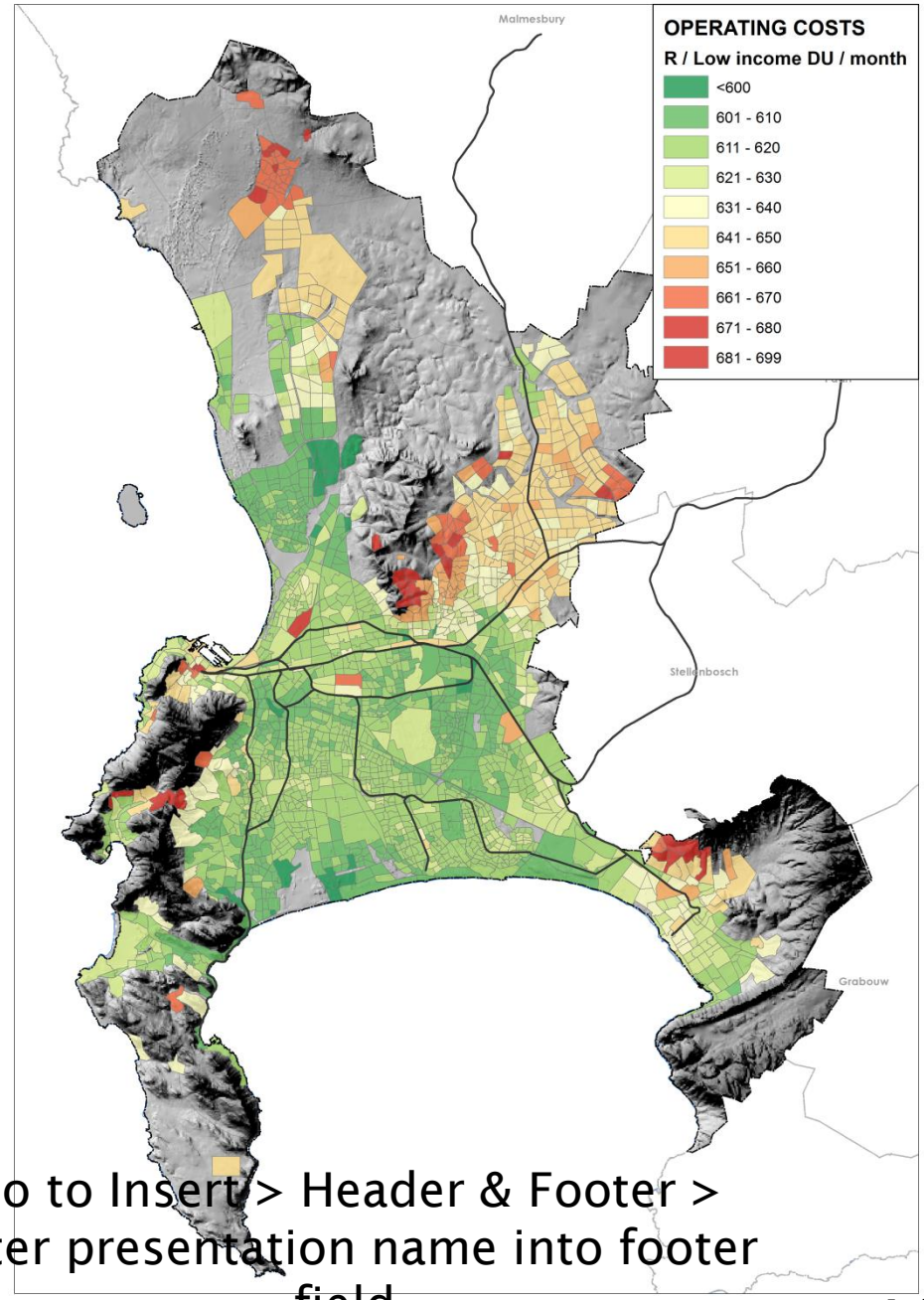
INCOME GROUP 1 DU

BULK OPERATING COSTS

OPERATING COSTS

R / Low income DU / month

- <600
- 601 - 610
- 611 - 620
- 621 - 630
- 631 - 640
- 641 - 650
- 651 - 660
- 661 - 670
- 671 - 680
- 681 - 699



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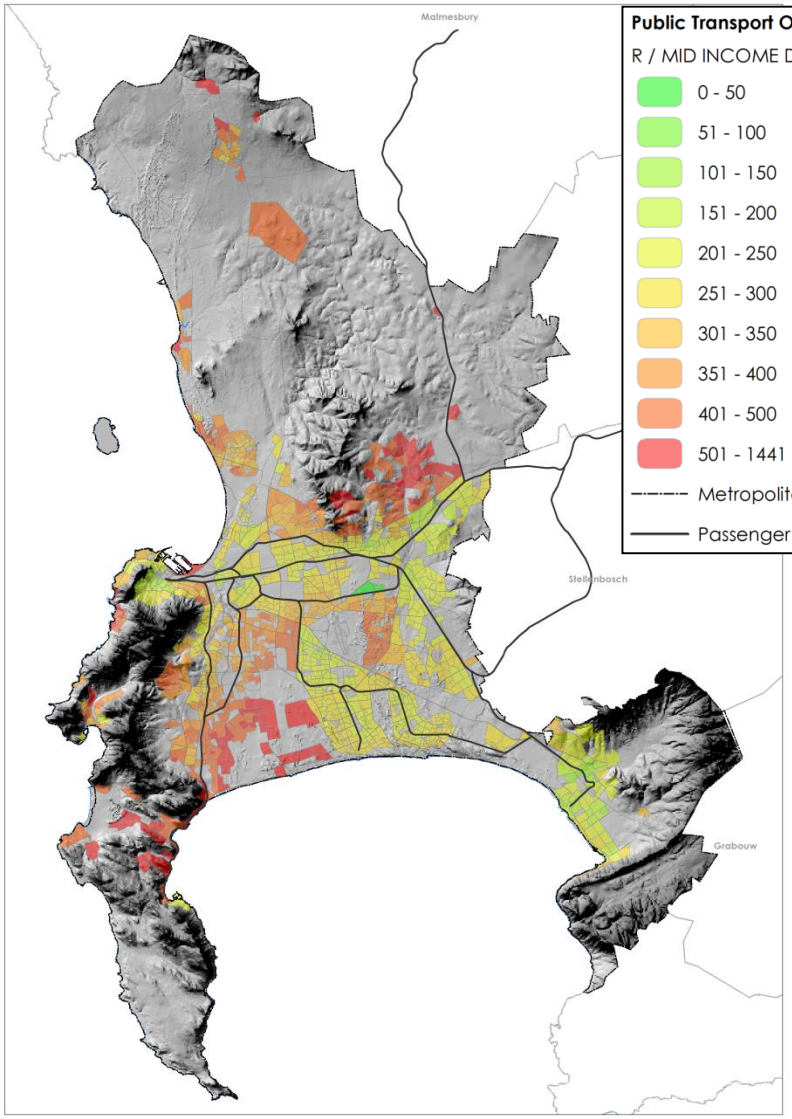
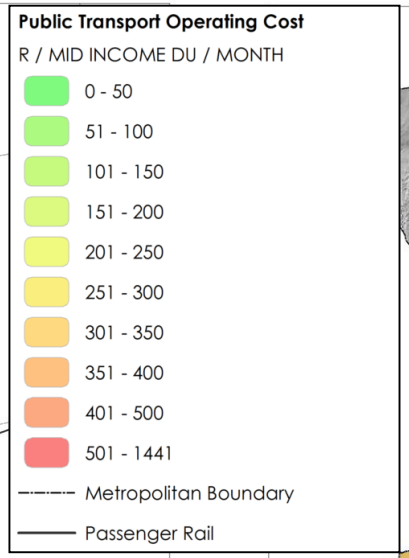
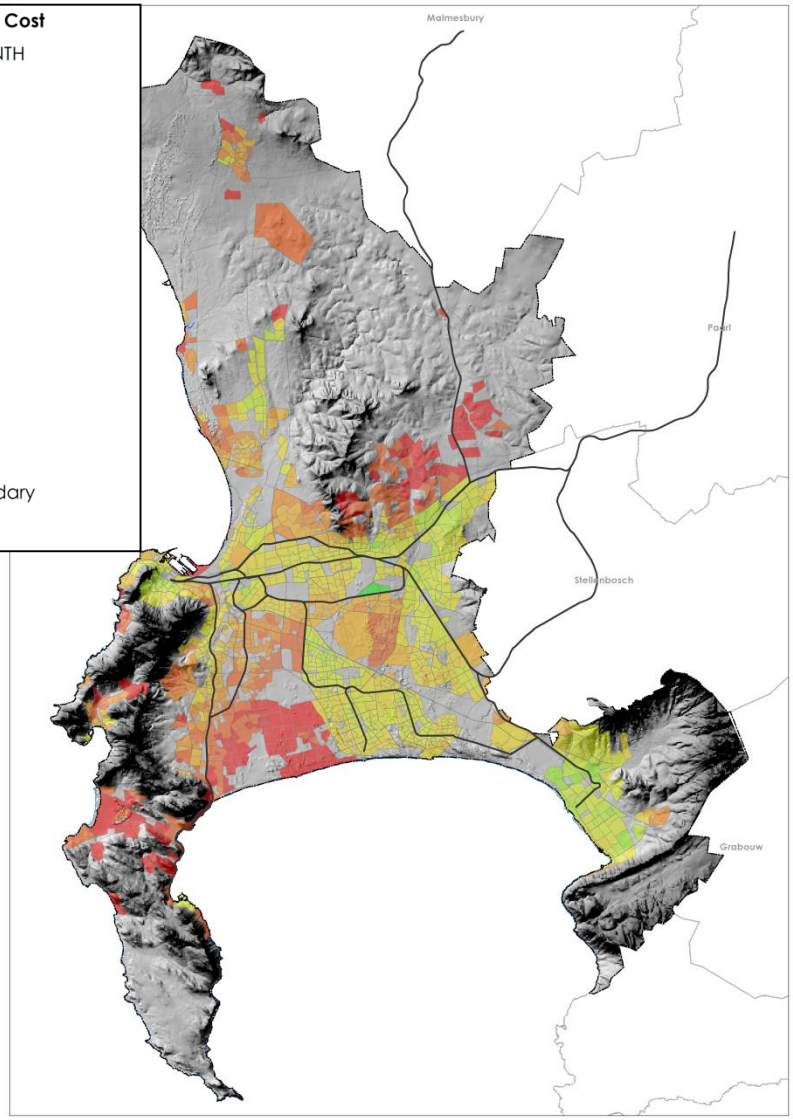
PUBLIC TRANSPORT OP. COST SURFACE



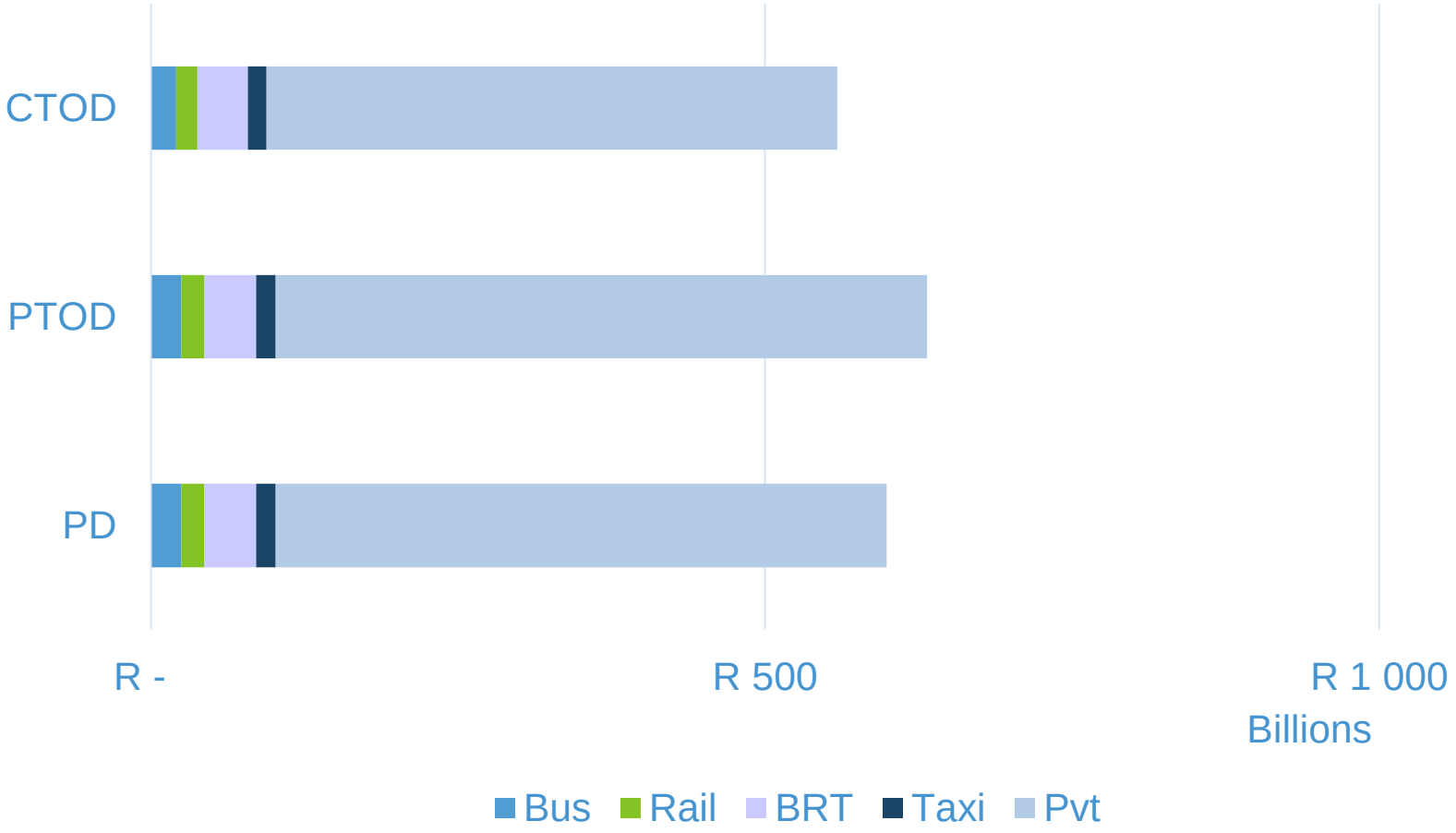




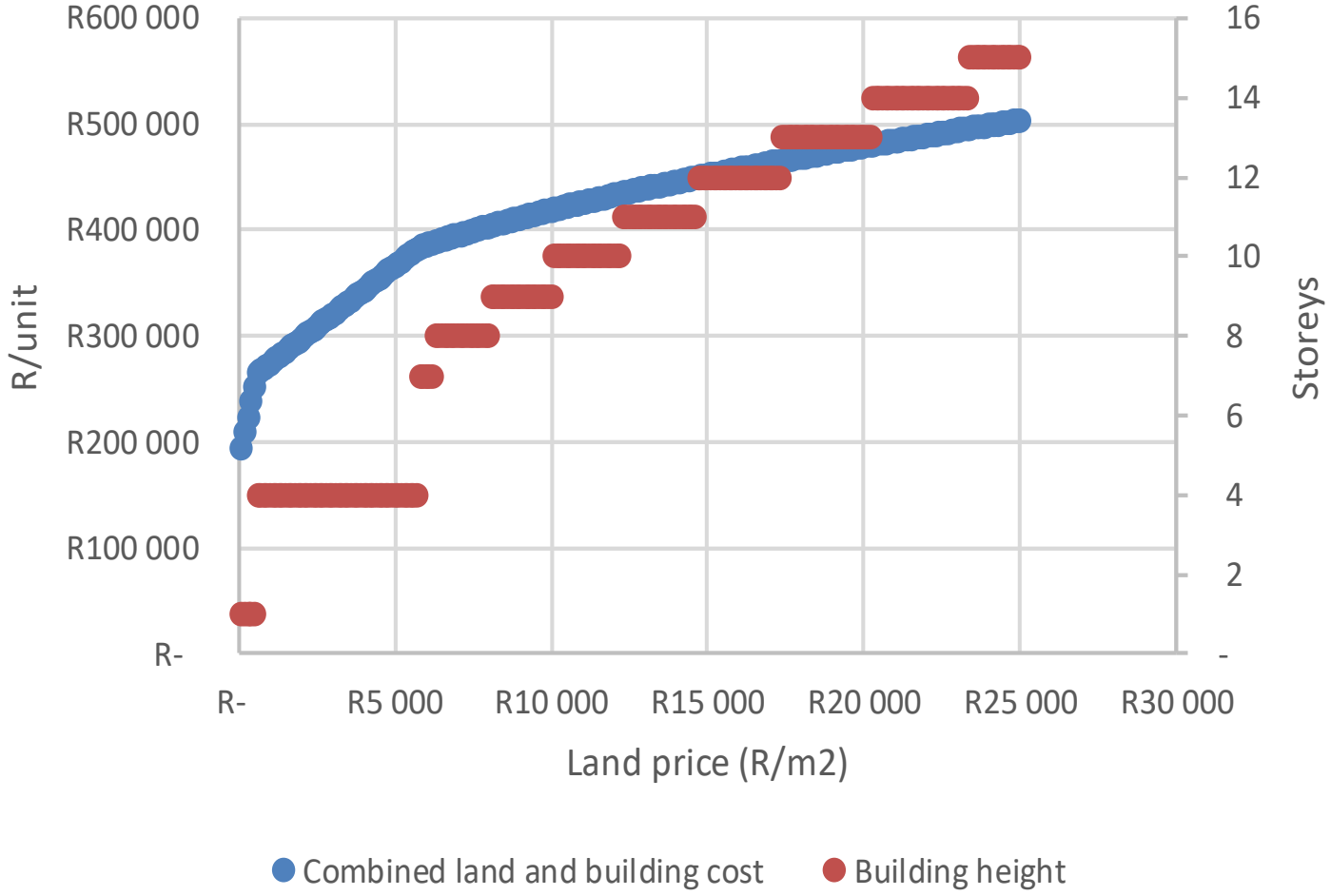
YEAR 1

YEAR 20

NPV of transport operating costs to all actors

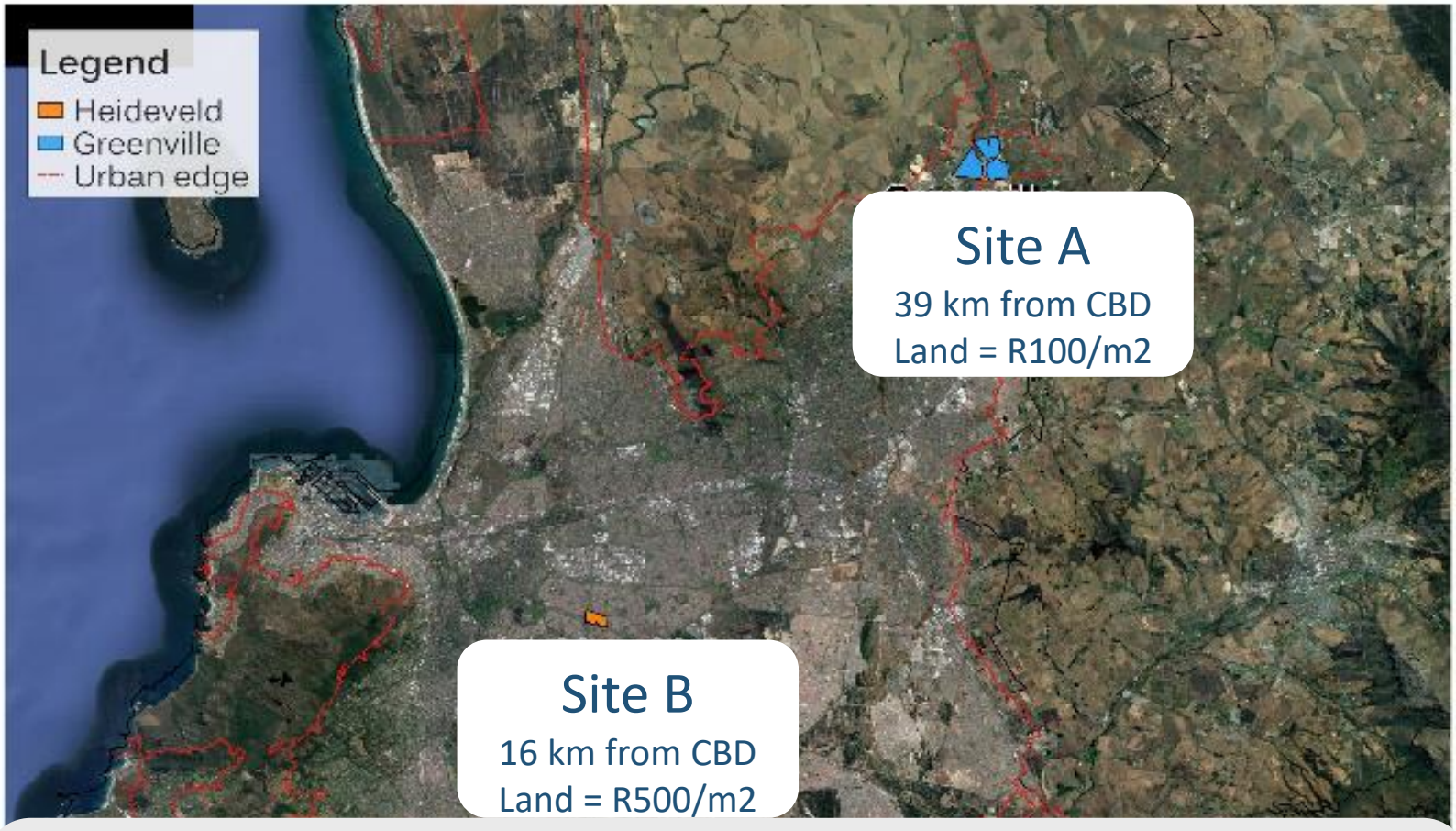


Capital expenditure: land and buildings



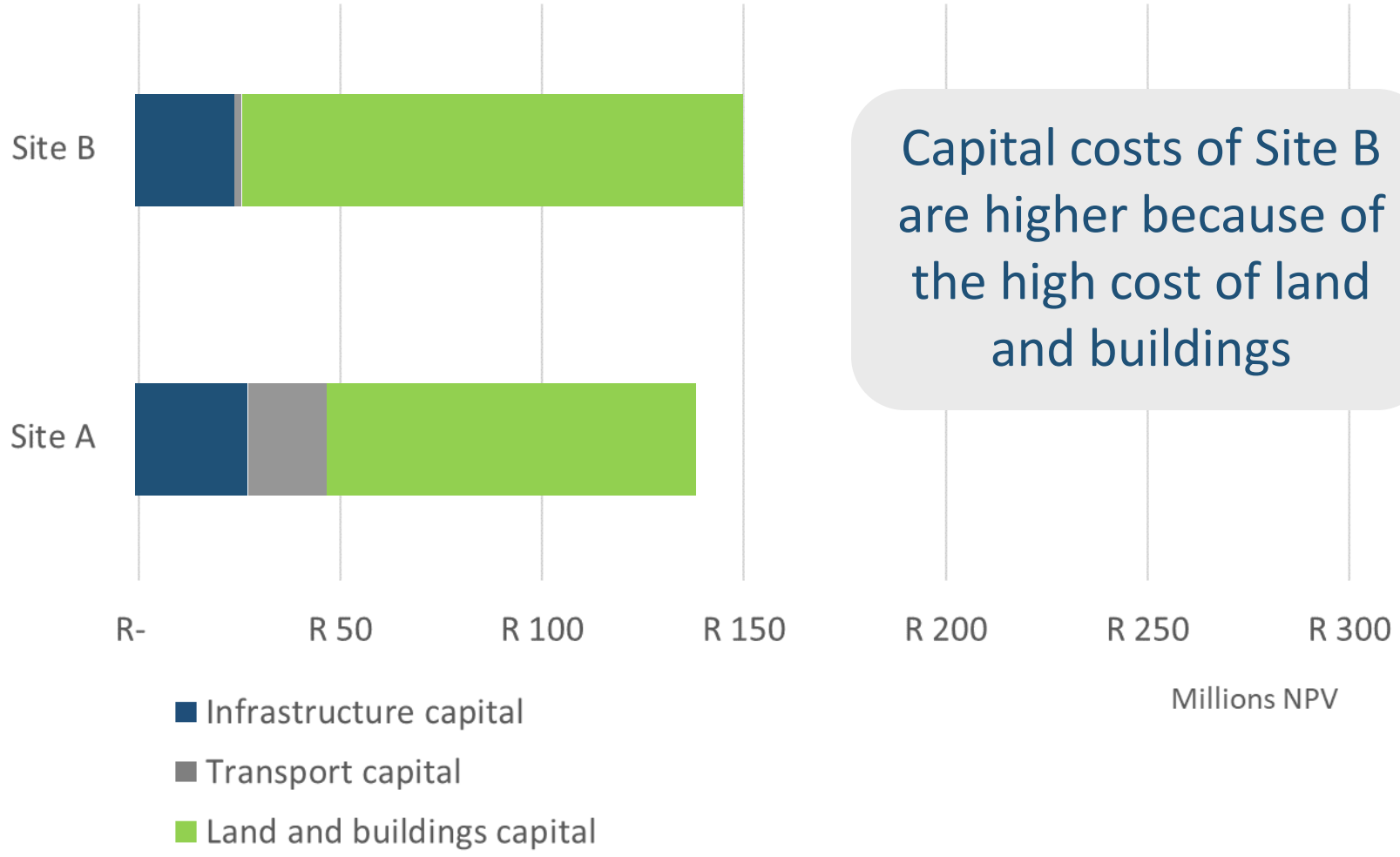
Single storey dwellings on cheap land will always be the lowest cost solution to housing of a fixed standard

Location of two case studies: land vs transport costs



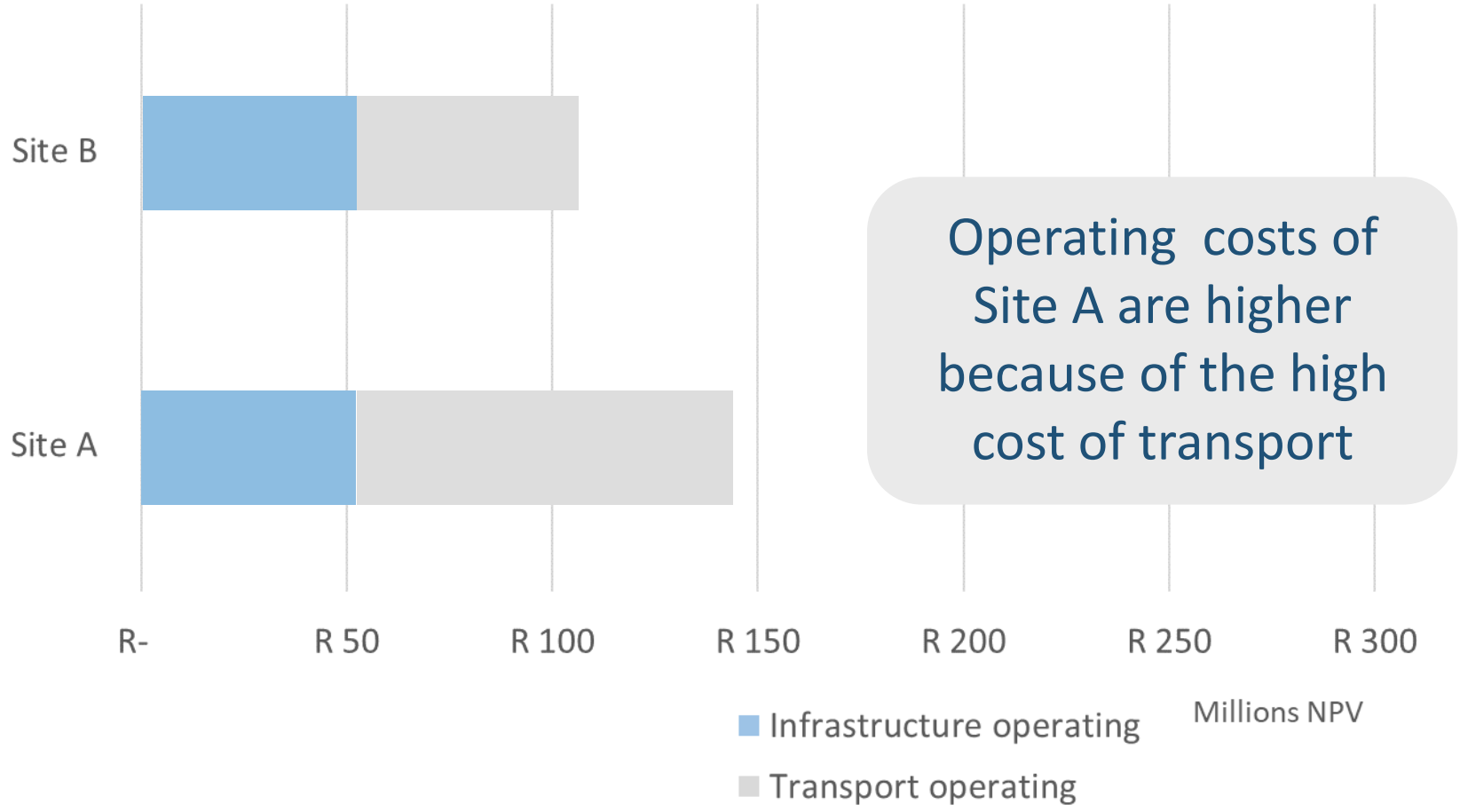
Development of 527 low cost housing units
Transport characteristics based on modal availability
Net Present Value of costs over 20 years

Case study: combining cost elements



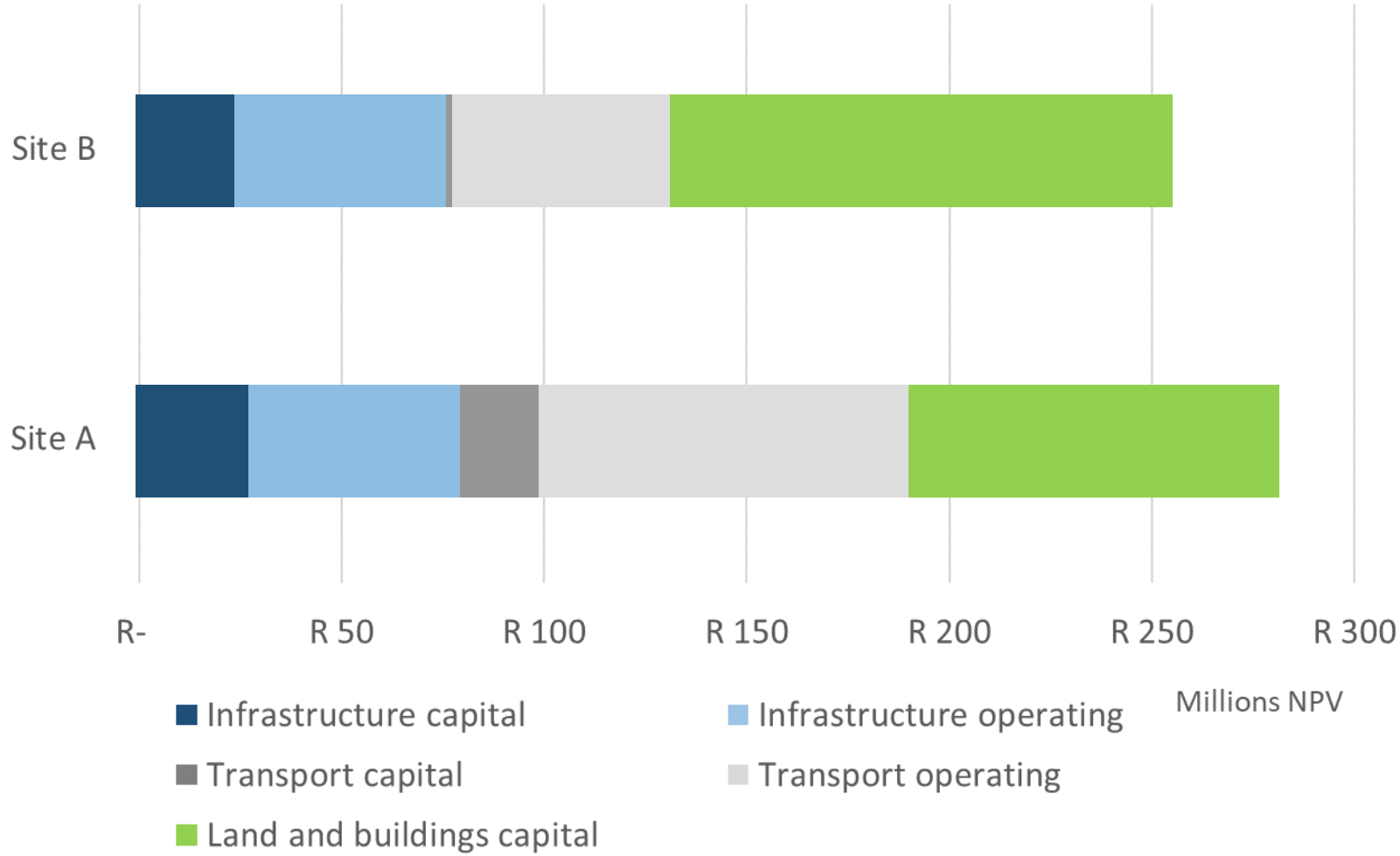
Capital costs of Site B are higher because of the high cost of land and buildings

Case study: combining cost elements



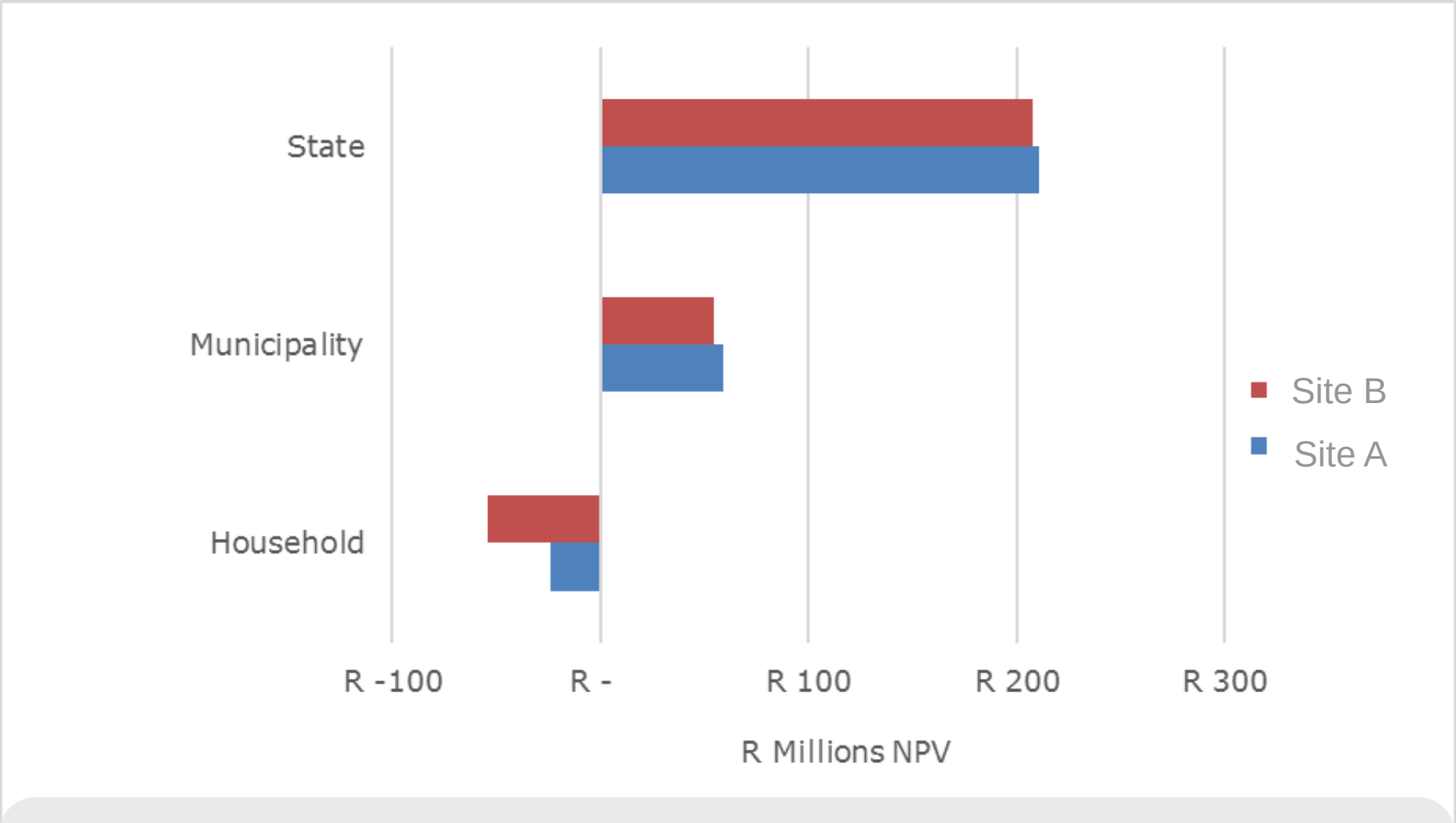
Operating costs of Site A are higher because of the high cost of transport

Case study: combining cost elements



Site A is cheaper overall because the long-term savings in transport outweigh the higher land and building costs

Cost per actor



While the longer term costs and benefits of the two locations are marginal for the **State** and the **municipality**, the net benefit to **household**s living in Site B is significantly greater

Applications of the tool:

Testing of alternate growth projections

- Any new 20 year city-wide land use model, provided
  - EMME model is re-run; and
  - capital costs are selectively applied and adapted

Assessment of the impact of large-scale development proposals or alternative sites for a particular project

- e.g. Wescape; Paardevlei

Planning tool for development discussions (e.g. land use mix and highest and best use)

- E.g. Athlone Power Station

Development Charges calculations

- Verification and potential revision of DC unit costs geographically

Constraints to spatial cost modelling

- Lack of municipal data
- Format of municipal accounting
- Poor spatial referencing of costs
- Inter-departmental communication
- Inter-disciplinary modelling skills

Conclusions

- Spatial decisions should be made based on a robust analysis of the long term impacts
- Costing data in cities needs to improve dramatically to undertake fiscal impact analysis
- The key trade-off is the capital cost of land and buildings versus the long-term operating costs of transport (especially private transport)
- There is significant room for improvement in land and transport costing methodologies

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