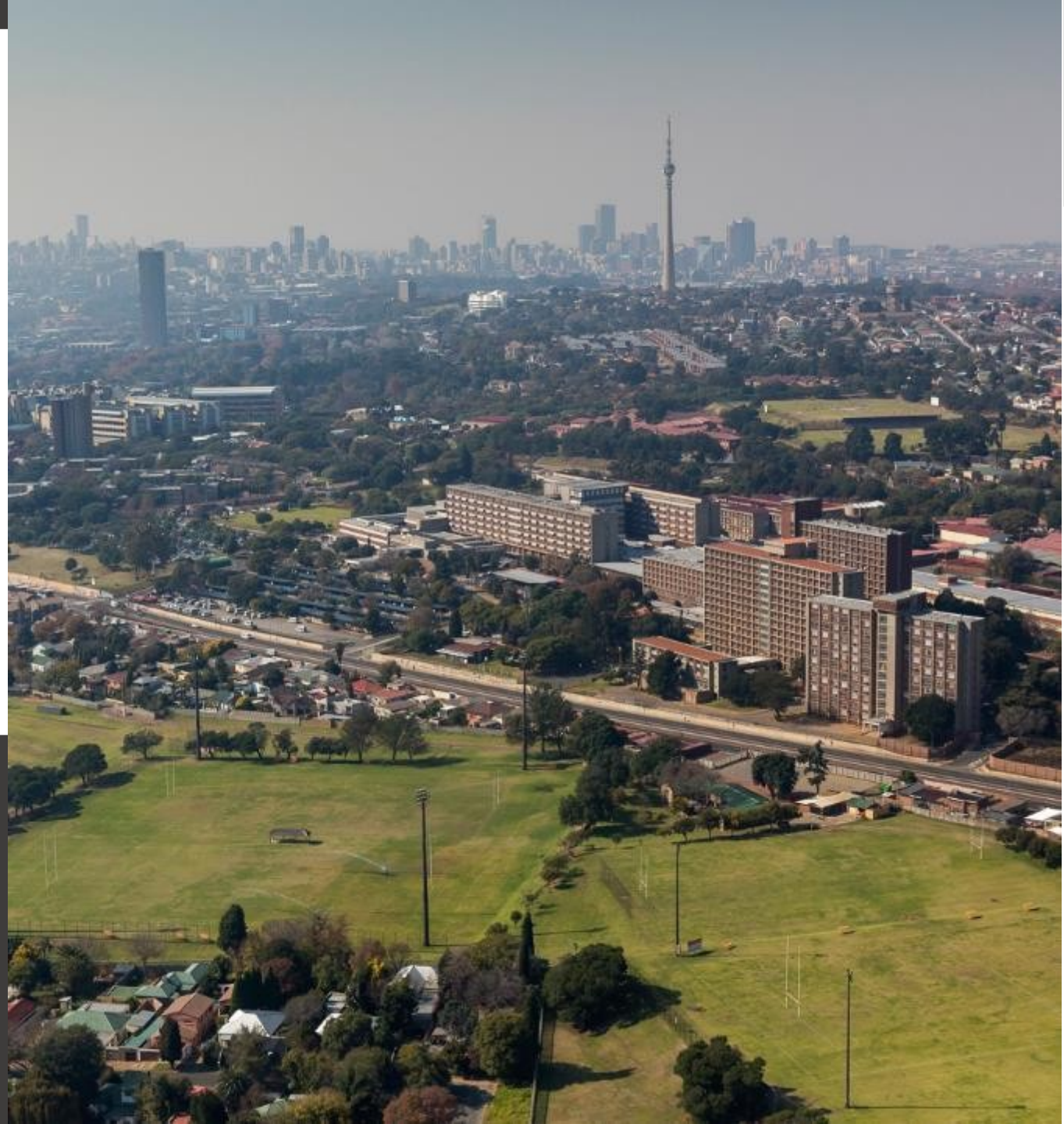




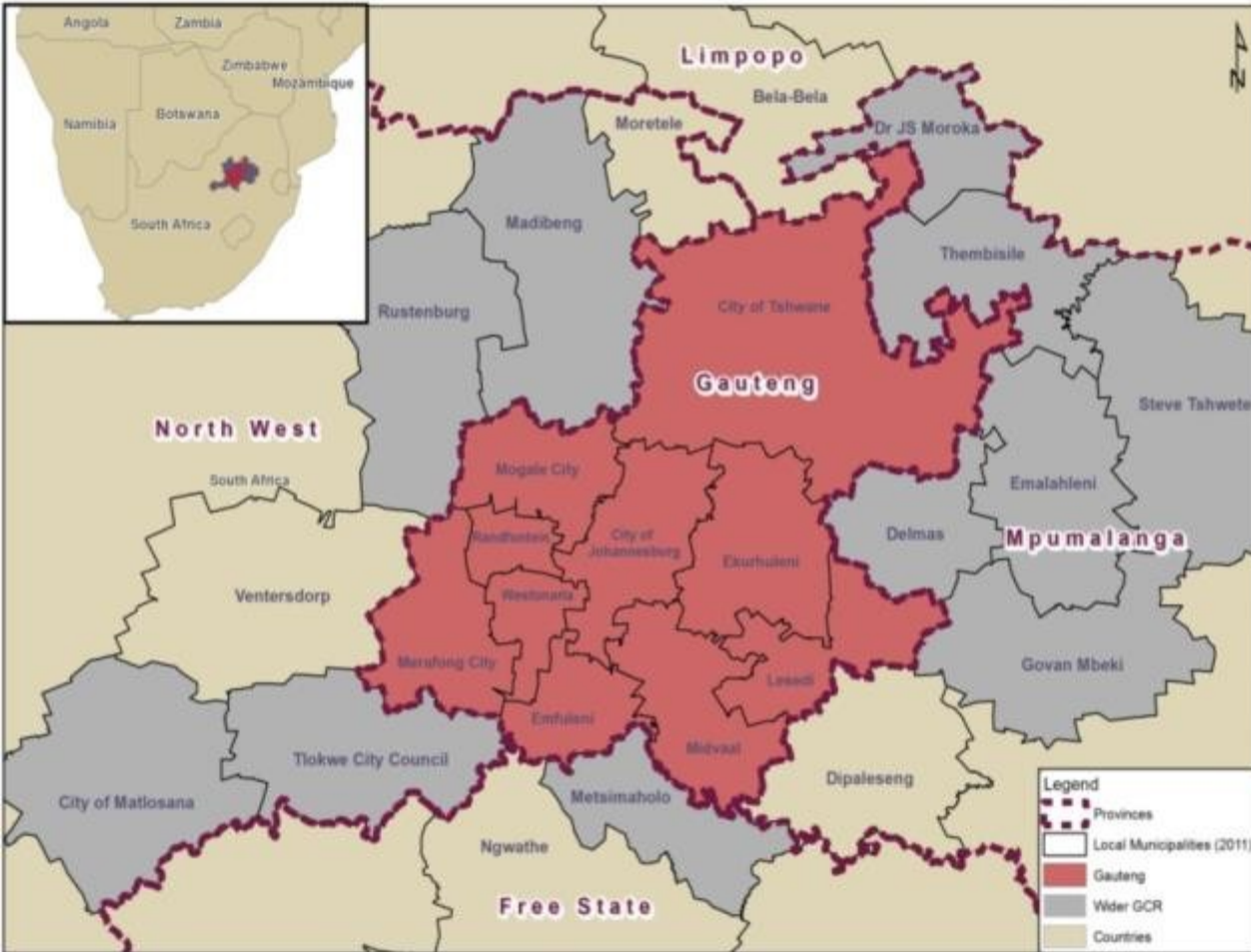
Christina Culwick, Gauteng City-Region Observatory

Urban metabolism in policy & practice: A global Discussion
9 May 2019



The Gauteng City-Region (GCR)

Context



A an actually existing urban reality, with dynamics (spatial, economic, social, environmental, etc. that need to be understood)

- Cluster of cities, towns and urban nodes – including cities of Johannesburg and Pretoria – make up the economic heartland of South Africa.
- Holds roughly a quarter of the South African population and a third of the national economy

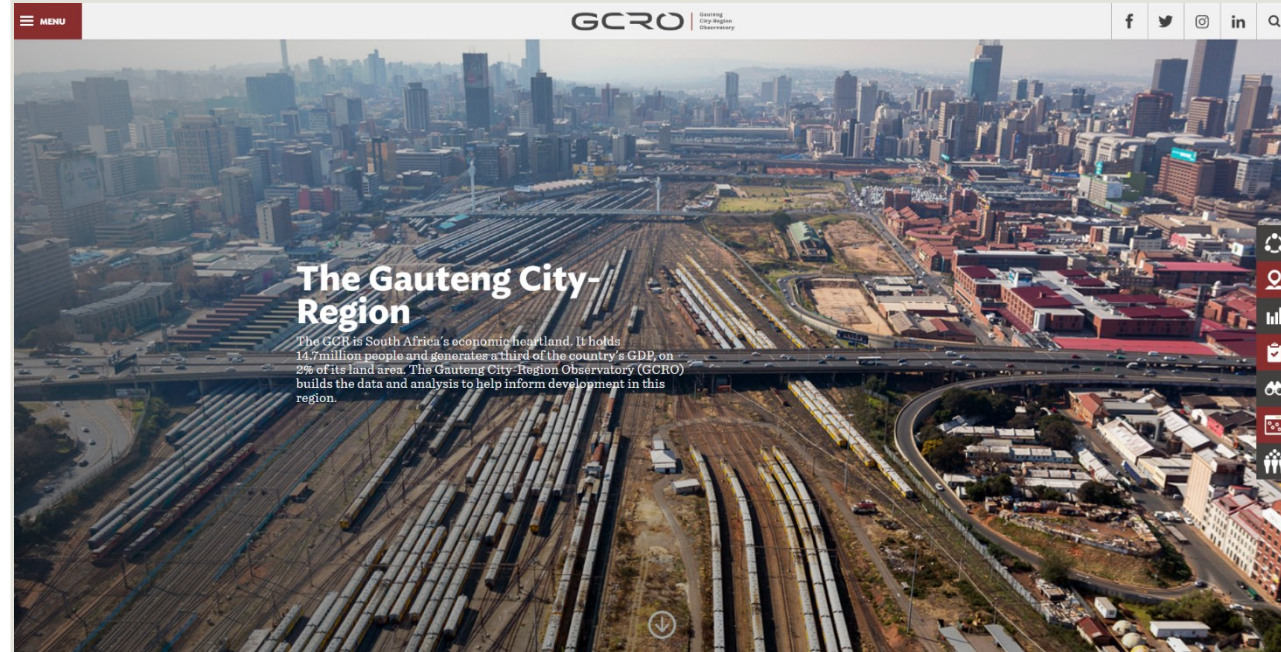
A ‘political project’ to govern the GCR better through improved intergovernmental co-ordination

- Find the right institutional expressions of the idea of a city-region
- Given the city-region’s challenges and opportunities, shape the right government agenda

Gauteng City-Region Observatory



GCRO helps to build the knowledge base that government, business, labour, civil society and residents all need to shape appropriate strategies that will advance a competitive, integrated, sustainable and inclusive Gauteng City-Region.



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Sustainability transitions



[← BACK TO RESEARCH THEMES](#)

Sustainability Transitions

The last few years have seen a significant uptick in research interest and policy concern over the sustainability of the development path we are on. For example there is a growing awareness of the probable development impacts of climate change and variability (Gauteng is likely to see increased disaster vulnerability and growing water scarcity in the years ahead).

GCRO has done considerable work in this area over the years. Important outputs include the *2011 Green Strategic Programme*; the *2013 State of Green Infrastructure Report*; a Green Infrastructure CityLab; and an occasional paper on the *Governance of Acid Mine Drainage*.

Much of this work stems from an early project in 2009 around how cities and regions in other parts of the world were responding to the global financial crisis, where it became clear that green jobs and green industry support were becoming a conscious economic development strategy for many regions. From that early thinking we have developed the line of argument that the GCR faces a future crisis (economic, social and otherwise) unless it can find ways to limit unsustainable use of resources, and depart from past paths of externalising costs to future generations. Routinely externalising environmental costs to other places and to future generations will rebound on our economy as suffocating constraints at unexpected moments (witness South Africa's now dramatically rising costs of electricity and water and the pressing matter of acid-mine drainage). By contrast a society that invests wisely in maintaining green assets and enhancing ecological systems services, and that proactively exploits opportunities in the production of green goods and services, may turn the sustainability challenge into a 'competitive advantage'. What the Gauteng City-Region needs is a full sustainability transition, led by government, across society and the economy. Our research in this area supports this set of propositions. It focuses on the difficult political economy choices entailed in a move to greater sustainability; prospects for infrastructure transitions; resource security challenges; green infrastructure; and the green economy.

Increasingly clear that cities cannot to continue to grow and develop in a way that assumes unlimited resources and that environmental costs can be externalised.

- Green Assets and Infrastructure
- Dimensions of a green economy
- Metabolic flows and infrastructure transitions
- Just sustainability transitions

These projects aim to build the arguments necessary for government to shift decision-making around urban development in the Gauteng City-Region

Metabolic flows and infrastructure transitions



[← BACK TO RESEARCH THEMES](#)

Metabolic flows and infrastructure transitions

Ongoing | Graeme Götz, Alexis Schäffler, Christina Culwick, Dr Josephine Musango

This project examines the prospects for reducing resource consumption and waste flows through the transformation of infrastructure networks in the Gauteng City-Region (GCR). The need for such an assessment arises from the realisation that city-regions can no longer continue to grow while assuming unlimited resources. The project focuses on tracking the throughput of water, energy, biomass (food and non-food), waste and if possible other materials in economic and human activities in the GCR, as well as on analysing the infrastructure that conducts flows of these inputs and waste outputs into, around and out of the city-region. While government has previously commissioned investigations into the state of environment or the state of energy in the province or its parts, this study looks to provide an overall picture of total resource

The project:

- examines the prospects for reducing resource consumption and waste flows through the transformation of infrastructure networks in GCR
- tracks water, energy, biomass, waste and where possible other material flows, together with the infrastructure that conducts these flows
- provide an overall picture of total resource consumption and waste outputs, in order to help clarify what would be entailed in an infrastructure transition to increase resource efficiency and sustainability in the GCR.

Metabolic flows and infrastructure transitions

Data collection for economy wide material flow analysis

The project set out to conduct an economy wide material flow analysis (EW-MFA) following the Eurostat (2001) guidelines.

Between 2011/12 and 2013/14 data was collected for the following flows:

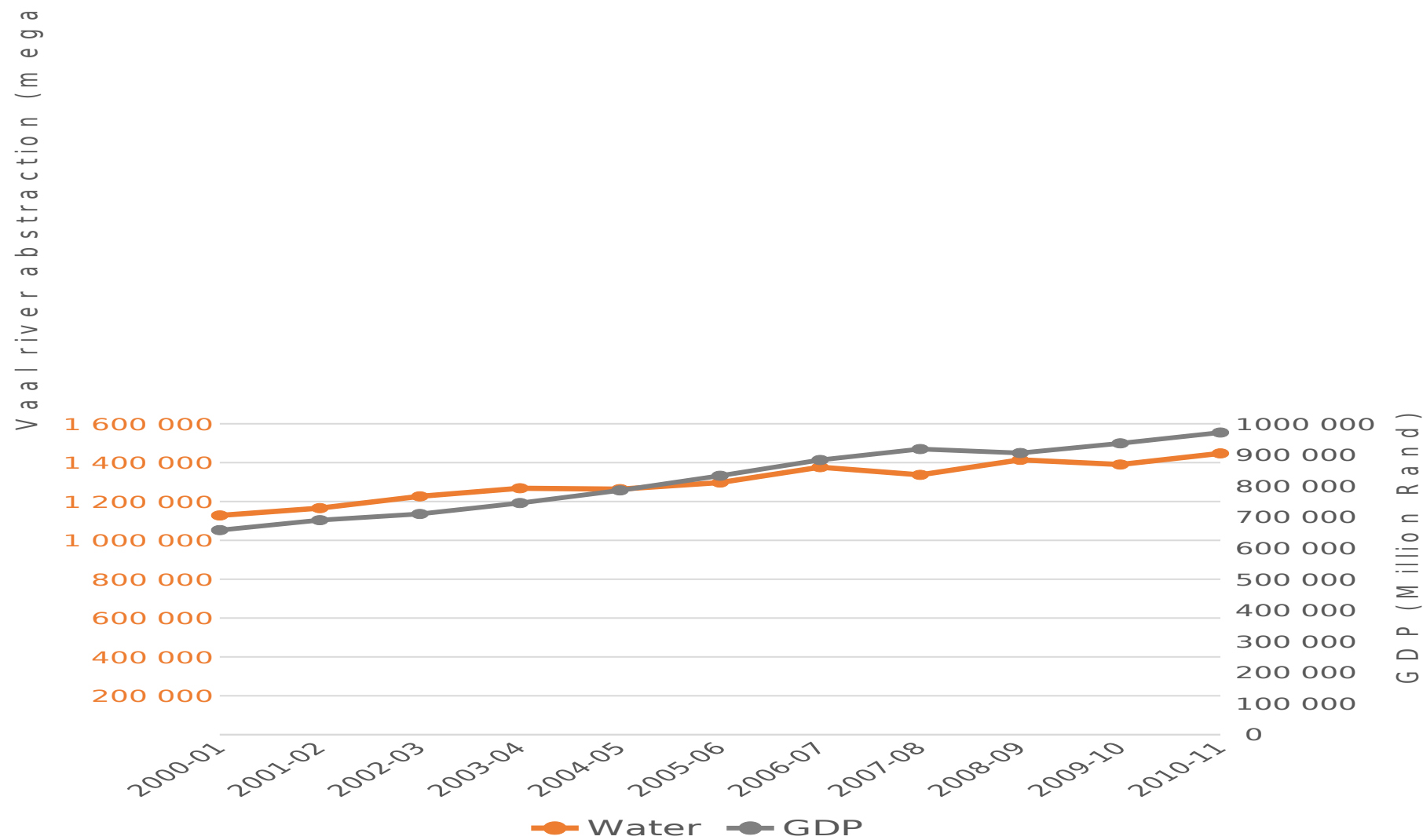
- Waste
- Energy
- Water
- Food
- Other materials (e.g. cement)

Data collection was conducted by commissioned experts and GCRO staff



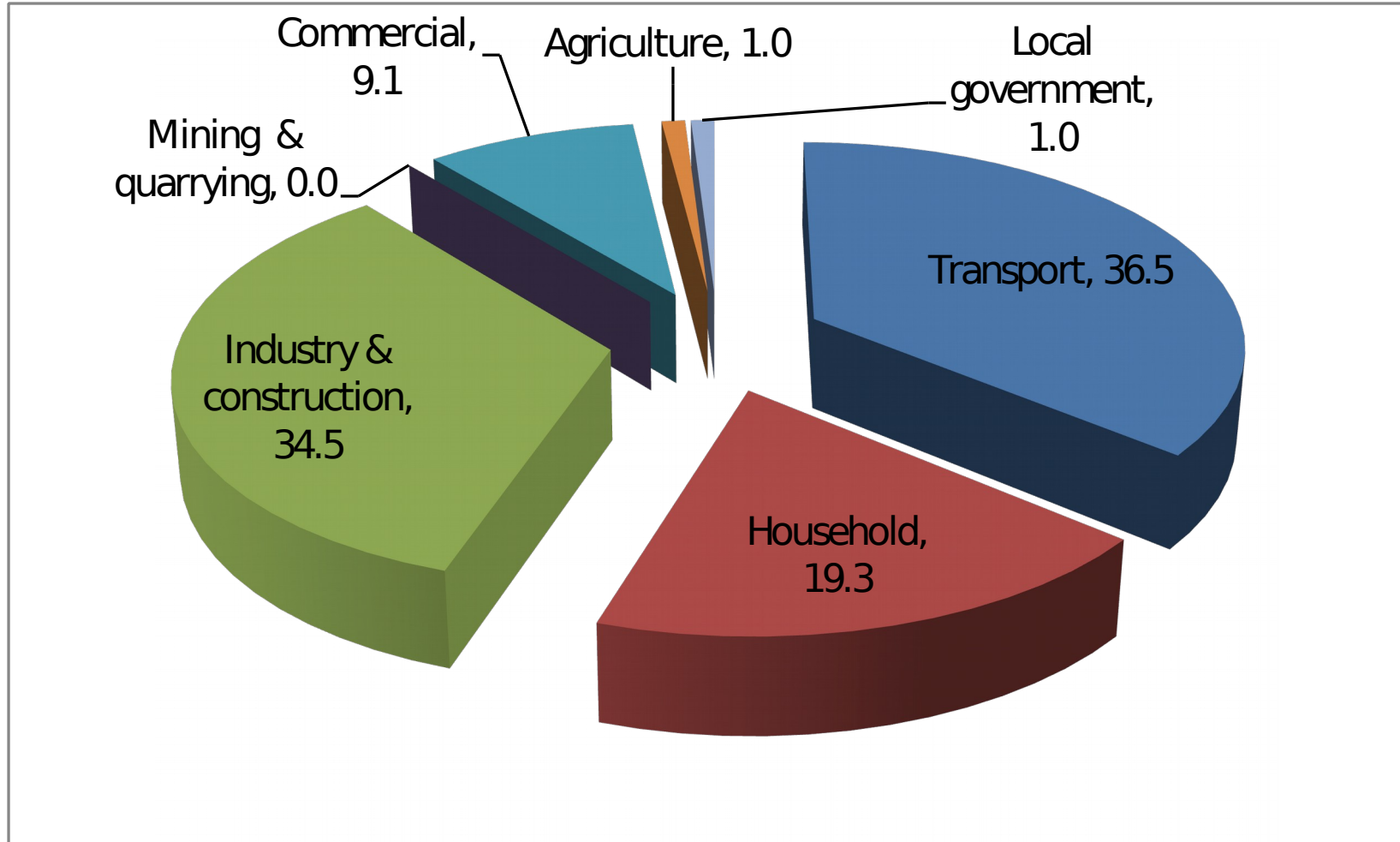
Results from data collection

Vaal River System abstraction (megalitres per year) vs GDP (R millions constant 2010 prices)



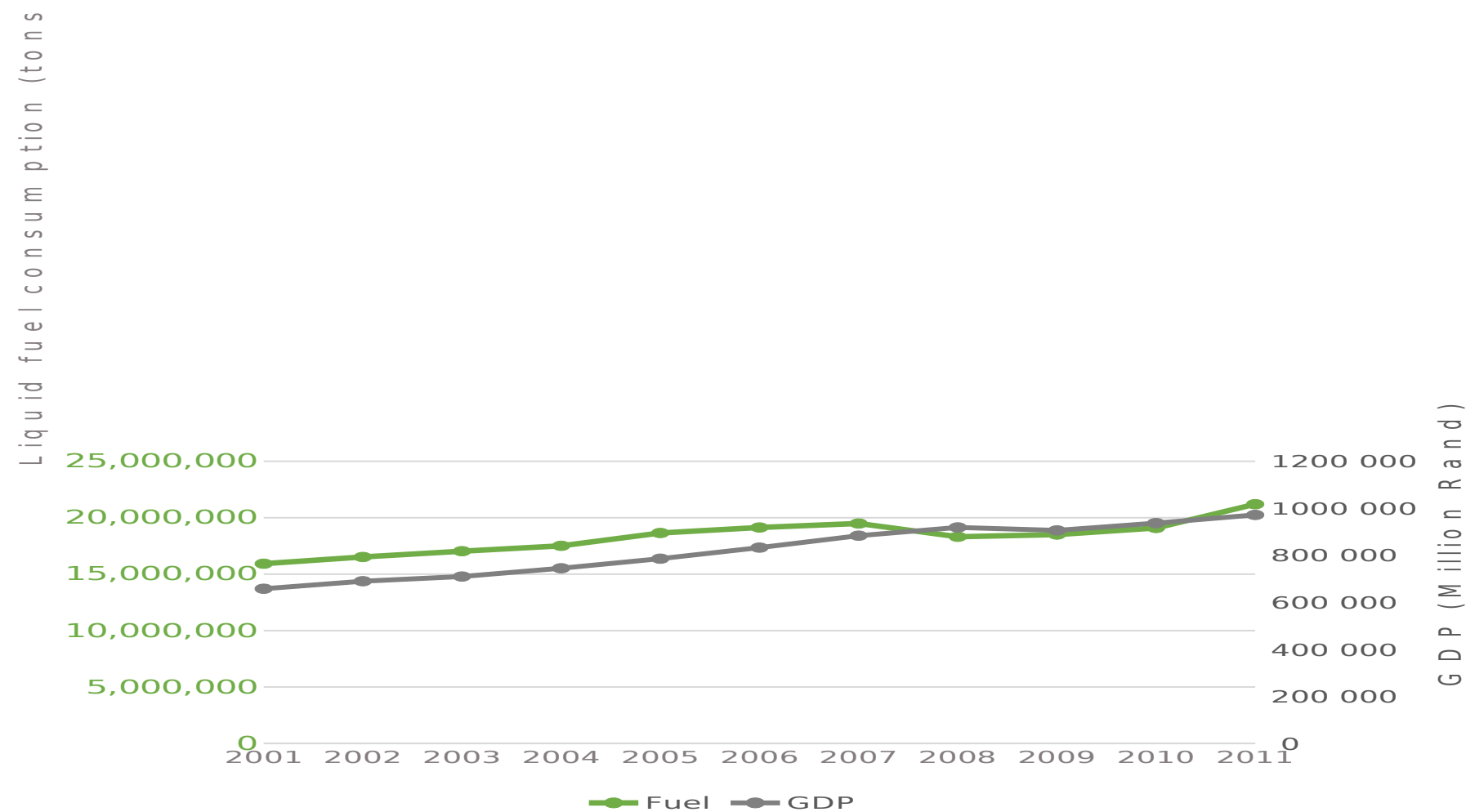
Results from data collection

Energy demand by sector (in PJ) for City of Tshwane Metro Municipality 2004



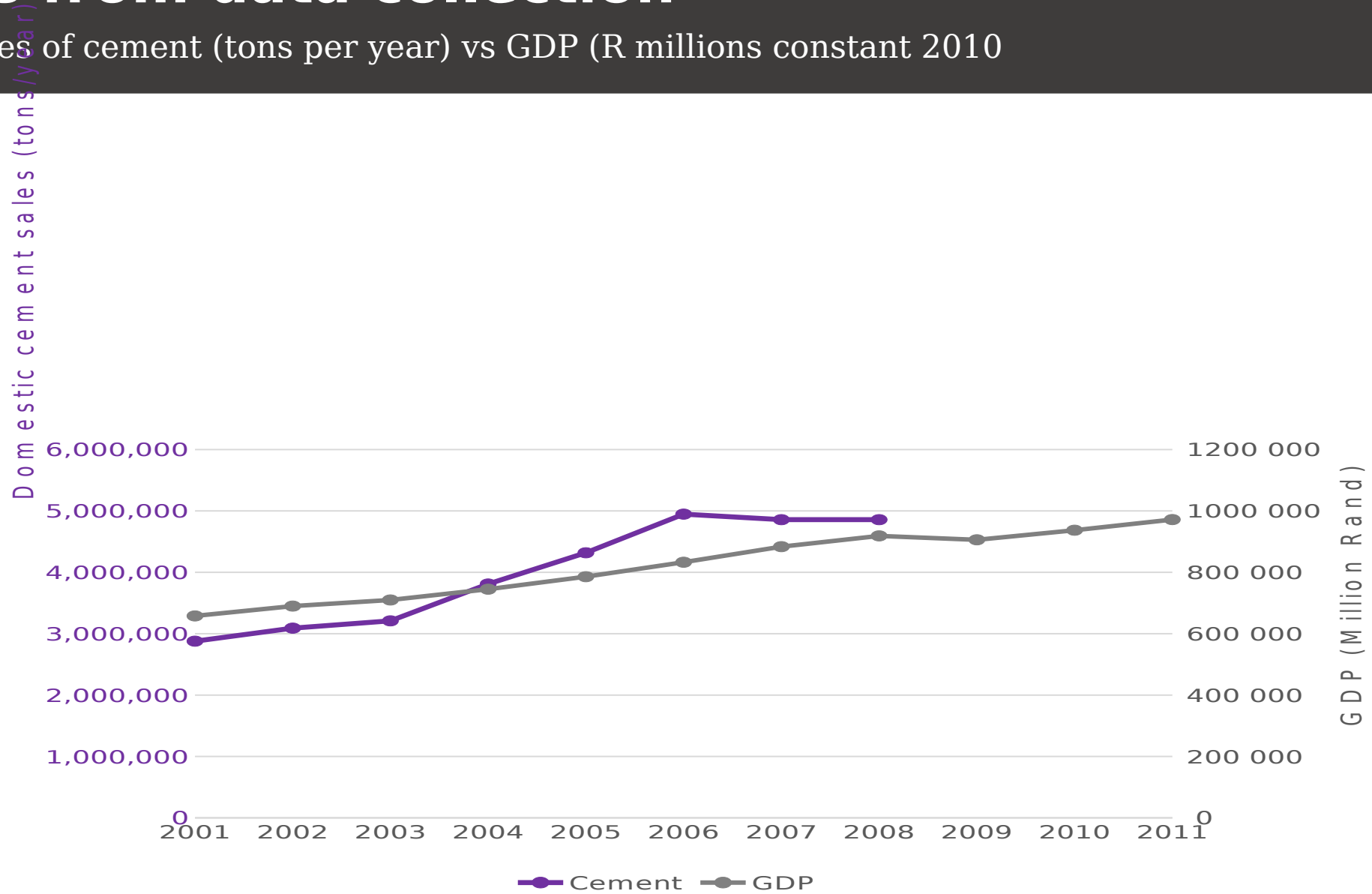
Results from data collection

Liquid fuel consumption (tons per year) vs GDP (R millions constant 2010 prices)



Results from data collection

Domestic sales of cement (tons per year) vs GDP (R millions constant 2010 prices)



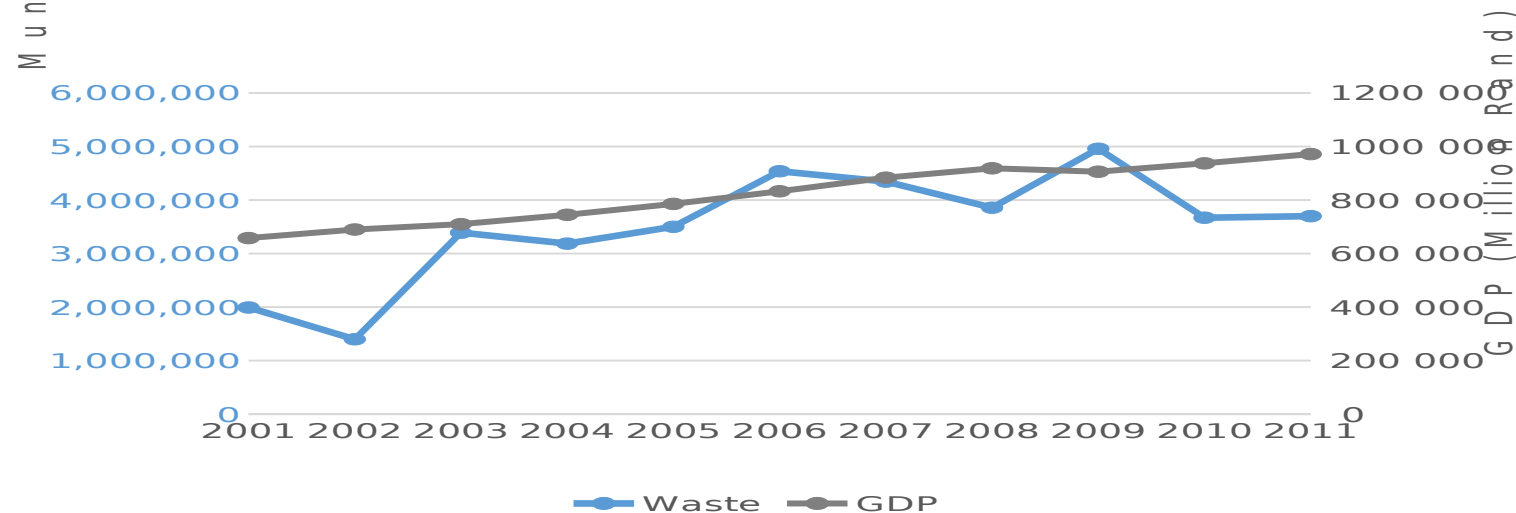
Data challenges



Despite some success, there were serious challenges – greater than what were anticipated

- **Data availability:** e.g. Cement & concrete was monitored closely with publically accessible data until 2008. Data was basis for collusion so data collection was shut down
- **Boundary issues:** the functional city-region is very different from the administrative boundaries, and different data custodians collect and store data very differently

Data anomalies

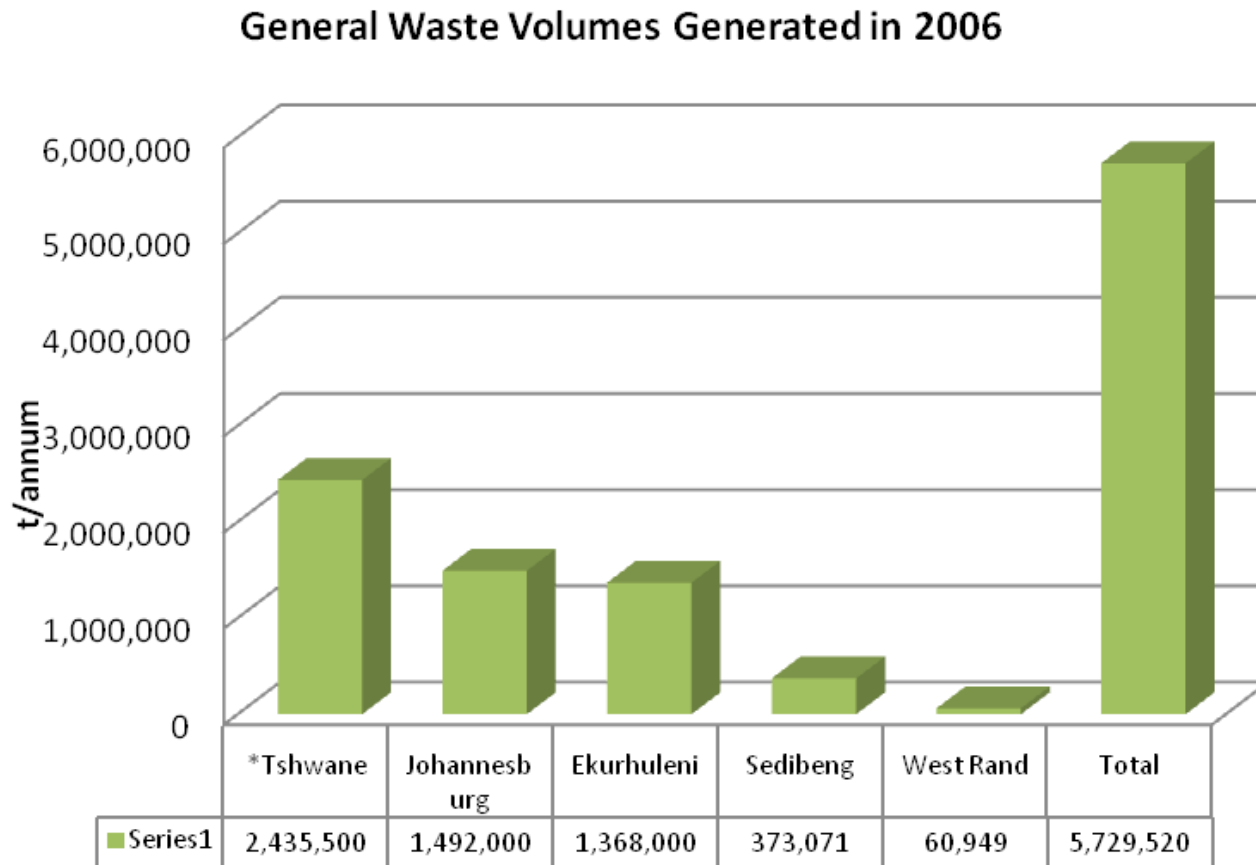


Municipal solid waste (tons per year) vs GDP (R millions constant 2010 prices)

Waste data seems plausible at an aggregated scale, but issues arise with closer inspection

Fluctuations over time resulting from data availability issues – some municipal data is not available in some years

Data anomalies - continued



2006 waste results not believable

- Tshwane & Johannesburg

Possible reasons from qualitative analysis

- Issues at weighbridges
- Disincentive to dispose of waste properly because of costs -> bribes & broken weighbridges

Total waste flow data rendered meaningless

Waste generated 2006 (t/annum) for the Gauteng Metro and District Municipalities

Reflections on metabolic flow analysis

Increasingly important to pair metabolic flow analysis (e.g. EW-MFA) with a range of other data and investigations:

- Bottom up data collection at household and neighbourhood levels
- Political ecology type analyses to explore where structural disincentives exist within data collection & sustainability transitions

The focus must remain on how these analyses can support a transition to sustainable urban development and in identifying where blockages exist – within physical flows *and* governance structures



Thank You

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