A framework for exploring air pollution mitigation in the South African Highveld region

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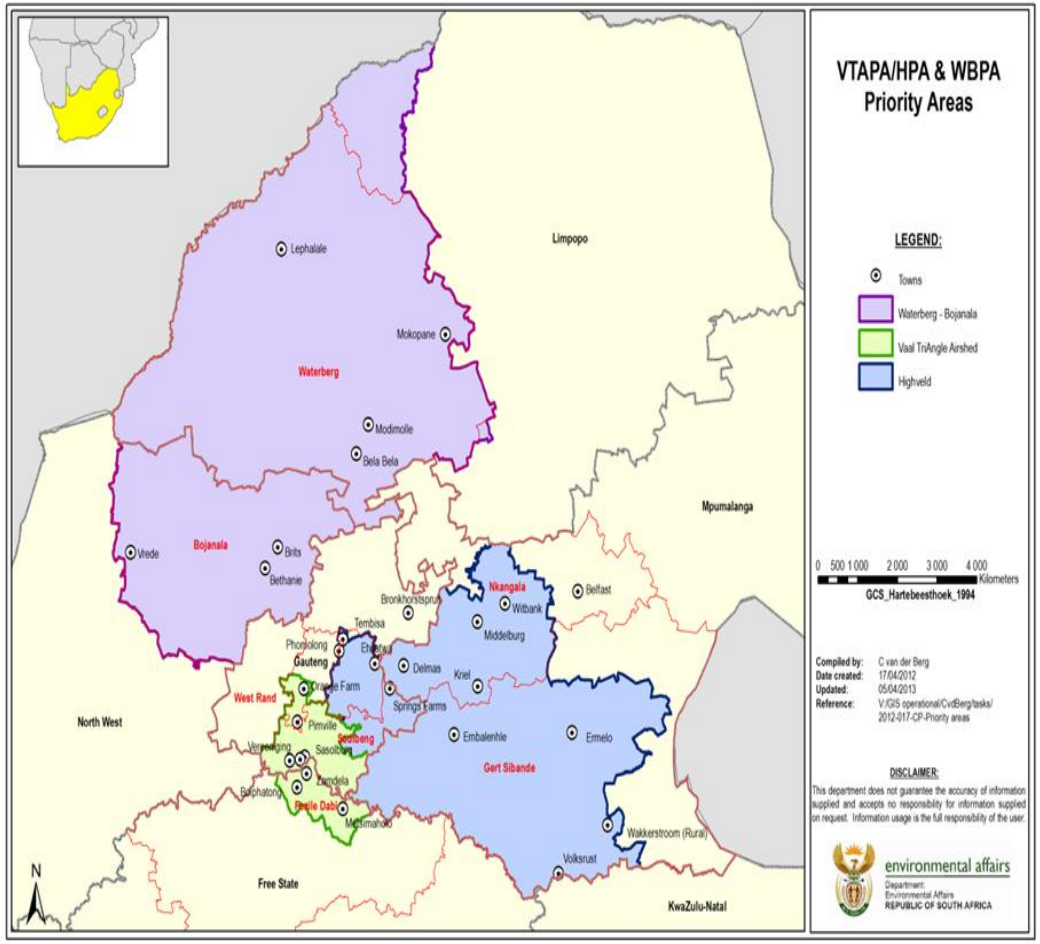
Background

Aim

- **Systematic analysis of air pollution impacts and mitigation opportunities in the Highveld region of South Africa**



- **Dense settlements with limited access to services and cleaner fuels**
- **High coal use and reliance in the domestic sector**
- **Large emissions from power plants**
- **High peak SO2 measurements and high seasonal PM (smoke)**

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Existing solutions/approaches

- **Similar air pollution issues have been assessed and systematically analysed elsewhere in the world with help of scientific tools**

- **In Europe, the tools have been used in a successful dialogue between science and policy to identify mitigation opportunities (e.g UNECE Gothenburg Protocol; EU National Emission Ceiling Directive)**

- **Modelling tools allow for a clear definition of roles for science and for policy makers in finding solutions (e.g. GAINS framework in Europe**

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Framework/toolbox function/role – which questions can it address?

- What is the current exposure?
- How is it going to change over time?
- Who are the key player (DM & SH) from the polluters and beneficiaries?
- Identify mitigation opportunities
  - How much and where it can be reduced?
  - At what cost?
- What are the targets?
- Allow the simulation of different policy options

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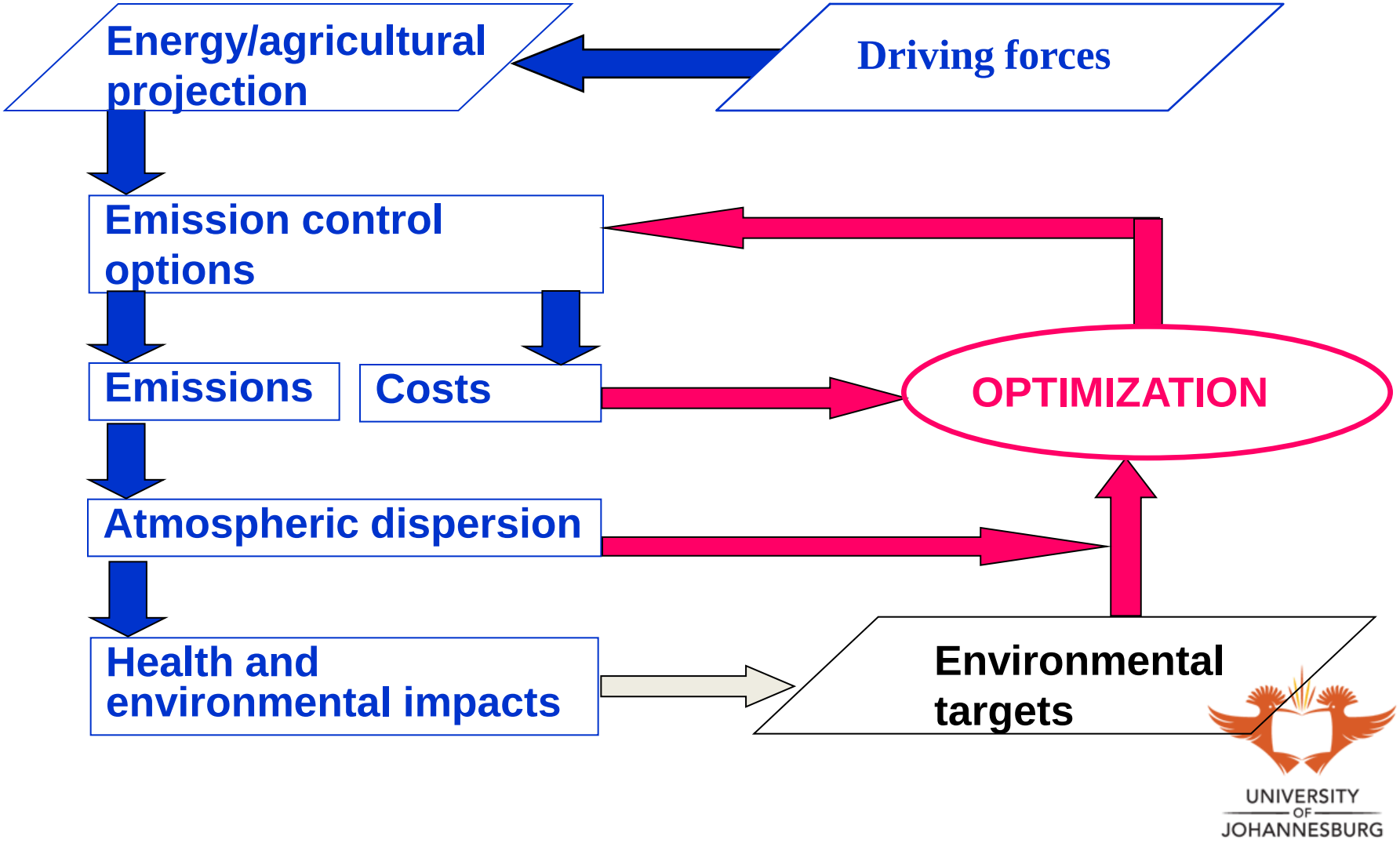
Example of existing framework: *The GAINS model*



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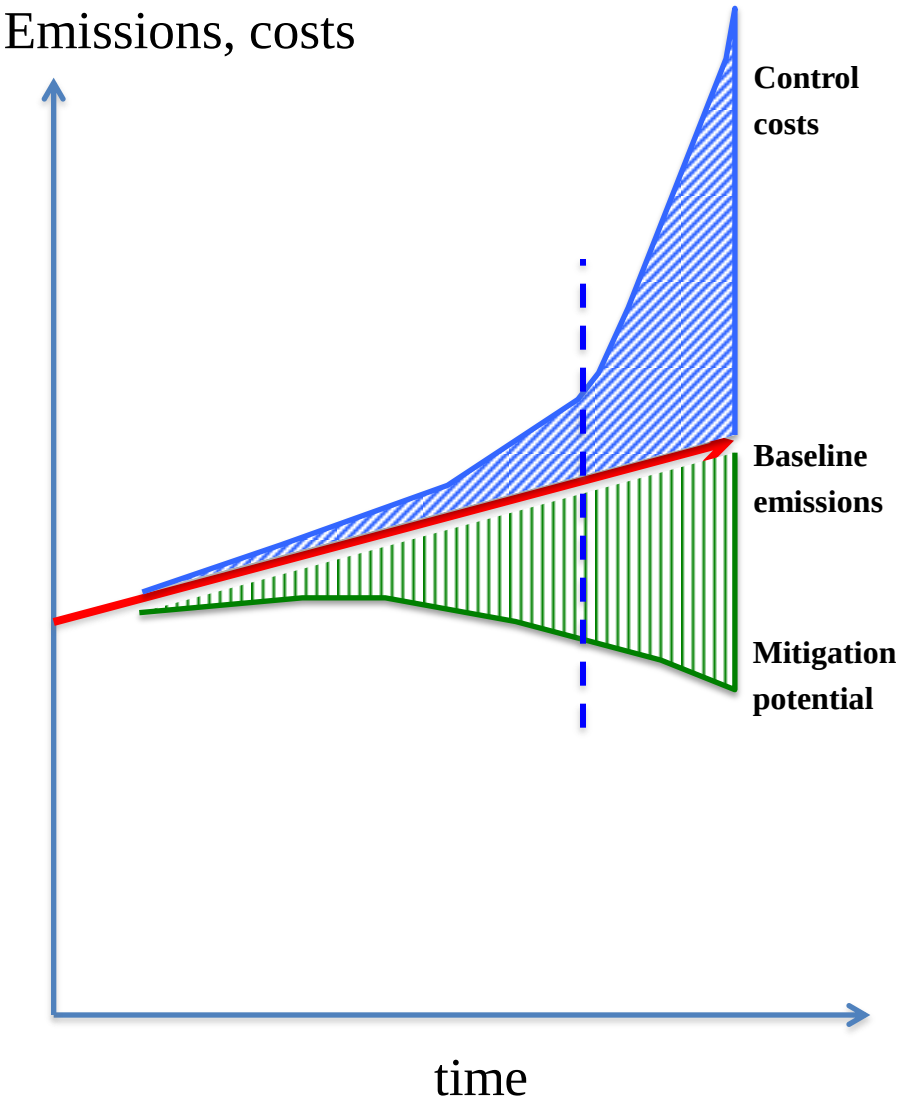
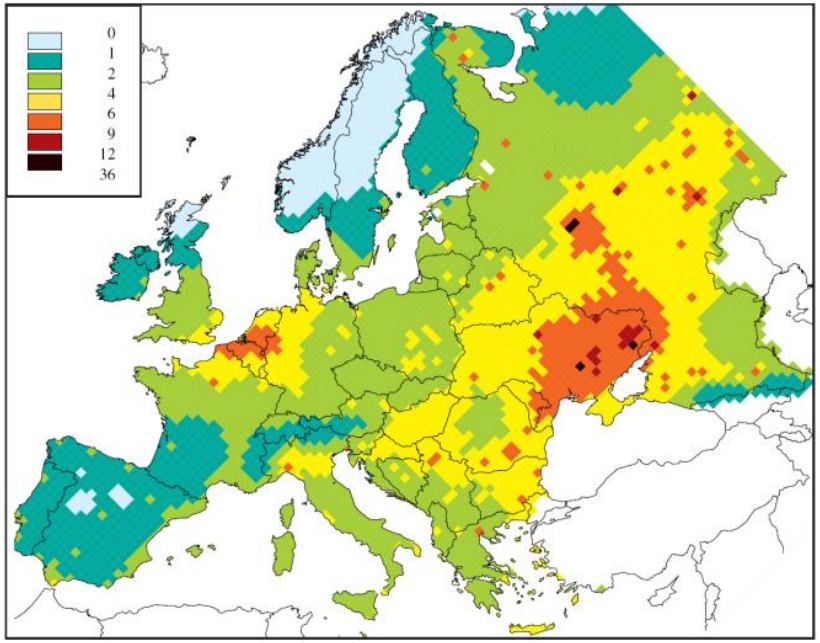
Example features/results of the toolbox





Health impacts from fine PM in 2000 and 2020 policy

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Collaborative effort

- **The framework is a collection of tools/models that require collaboration between different communities involving academia, industry, and policy makers**
- **It needs to be tailored to local issues and circumstances**

- **For example:**
  - **GAINS model developed at IIASA**
  - **AERMOD and CALPUFF dispersion modelling of specific pollutants (PM10, SO2, NOx) and determination of exposure indices.**
  - **Energy modelling tools**
  - **Economic modelling tools**
  - **Access to regional statistics**
  - **Access to data on spatial distribution of sources**
  - **Population statistics, e.g., housing densities in the region**

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The model needs regional data & analysis

- Good inventories/ system of inventories and proper institutions for managing and maintaining them
- Ambient air monitoring network
- Understanding the transition of technology in the past
- Portfolio of available technologies
- Means of introducing the technologies – through different policies or system of subsidies
- How quick technology penetration can happen (resistance to change, barriers for implementation)

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Referring to current policy discussion

- **‘Offset’ policy discussion for air quality management – currently circulating for public comment**
- **Strategy for reducing air pollution in low income dense income settlements - Abatement strategies include clean fuels and technologies, technology subsidies**
- **Integrated assessment models can be used to identify portfolios of measures that improve air quality and reduce emissions at least cost - compare alternative strategies**
- **Framework can be used to inform the key negotiations on air pollution agreements.**

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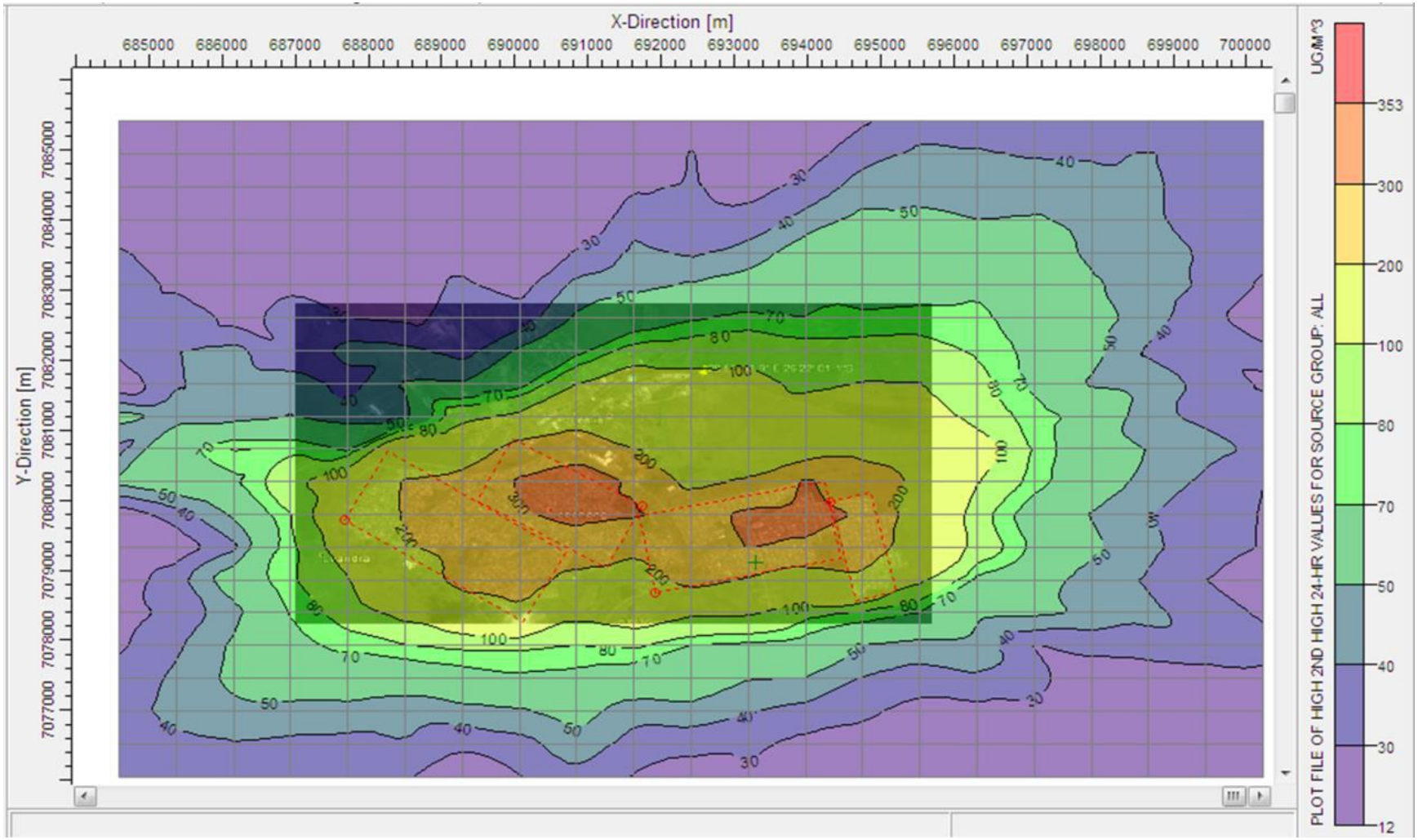
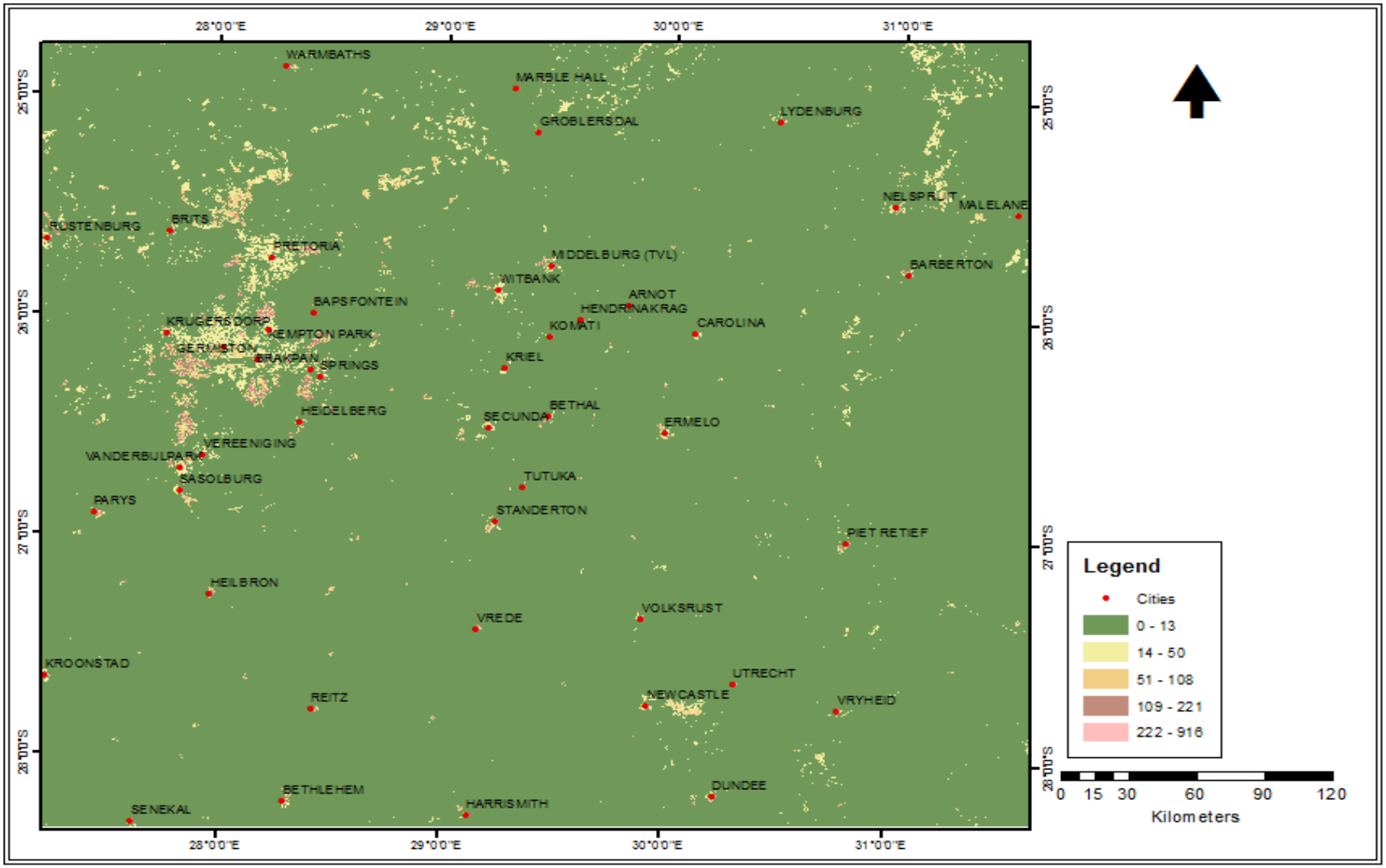
Work with the dispersion modellers

- **AERMOD model runs for PM10 for a selected domestic sector (Leandra Township) within the region- highlight hot**



GIS housing data in the Highveld region

- **GIS data on housing densities for the region**



Next steps

- **Our thesis is that human exposure is based upon space–time–activity data and spatio-temporal air quality predictions.**
- **Source apportionment – determination of emissions from the domestic sector vs the power sector**
- **Determination and estimation of population densities in the region using GIS**
- **Carry out exposure assessment using AERMOD for the affected population**
- **Determination of exposure indices for sectors within the region**

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- ESKOM