WITS UNIVERSITY

Research Chair in Applied Systems Analysis

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Deputy Director of the South African Centre for Applied Systems Analysis

NRF Research Chair 16 November 2016

science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

International Institute for Applied Systems Analysis
IIASA

NRF National Research Foundation

Southern African Centre for Systems Analysis

- Collaboration with International Institute for Applied Systems Analysis (IIASA) – To provide insight and guidance to policymakers worldwide by finding solutions to global and universal problems through applied systems analysis in order to improve human and social wellbeing and to protect the environment
- NRF, DST and four SA Institutions

Home of IIASA Since 1972

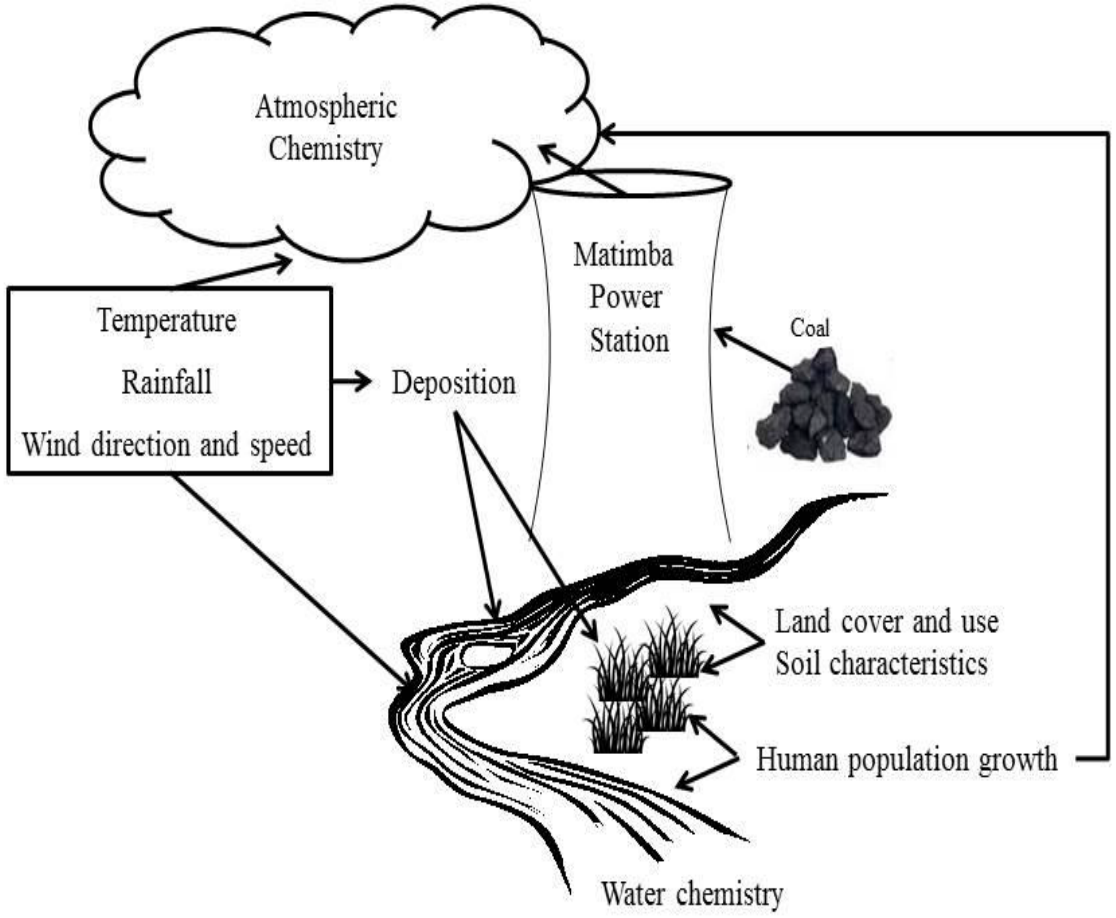

Namibia
Gobabis
Windhoek
Rehoboth
Solitaire
Mariental
Botswana
Gaborone
Polokwane
Kruger National Park
Hazyview
Sun City
Pretoria
Johannesburg
Nelspruit
Maputo
Swaziland
Mahikeng
Kgalagadi Transfrontier Park
Mier
Keetmanshoop
Aus
Ais-Ais
Upington
Riemvasmaak Community Conservancy
Springbok
Kimberley
Bloemfontein
Botshabelo
Welkom
St Lucia
Richards Bay
Dolphin Coast
Durban
Lesotho
South Africa
Mthatha
East London
Grahamstown
Cape Town
Franschhoek
Hermanus
University of Limpopo Campus
University of the Witwatersrand Campus
University of the Western Cape Campus
Stellenbosch University Campus

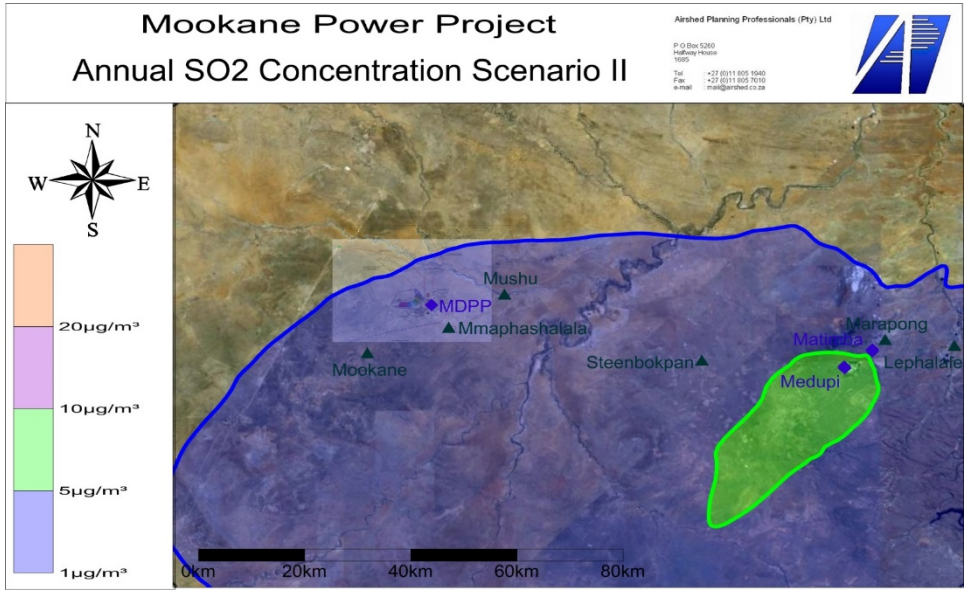
SASAC

- **Two-month Systems Analysis Capacity Development Programme**
  - Twenty students in the early stage of their PhD studies to be identified (NMO members and Africa), bursary support
  - PhD research supported by systems analysis-related research methodology
- **High-Level Capacity Strengthening Programme**
  - A three-week capacity strengthening programme
  - Target supervisors, early career academics and postdoctoral fellows from South Africa and other countries
  - Include high level lectures and capacity development workshops related to systems analysis capacity
- **Early Postgraduate Education Programme**
  - A systems analysis module in Honours programmes (*from 2018 onwards*)

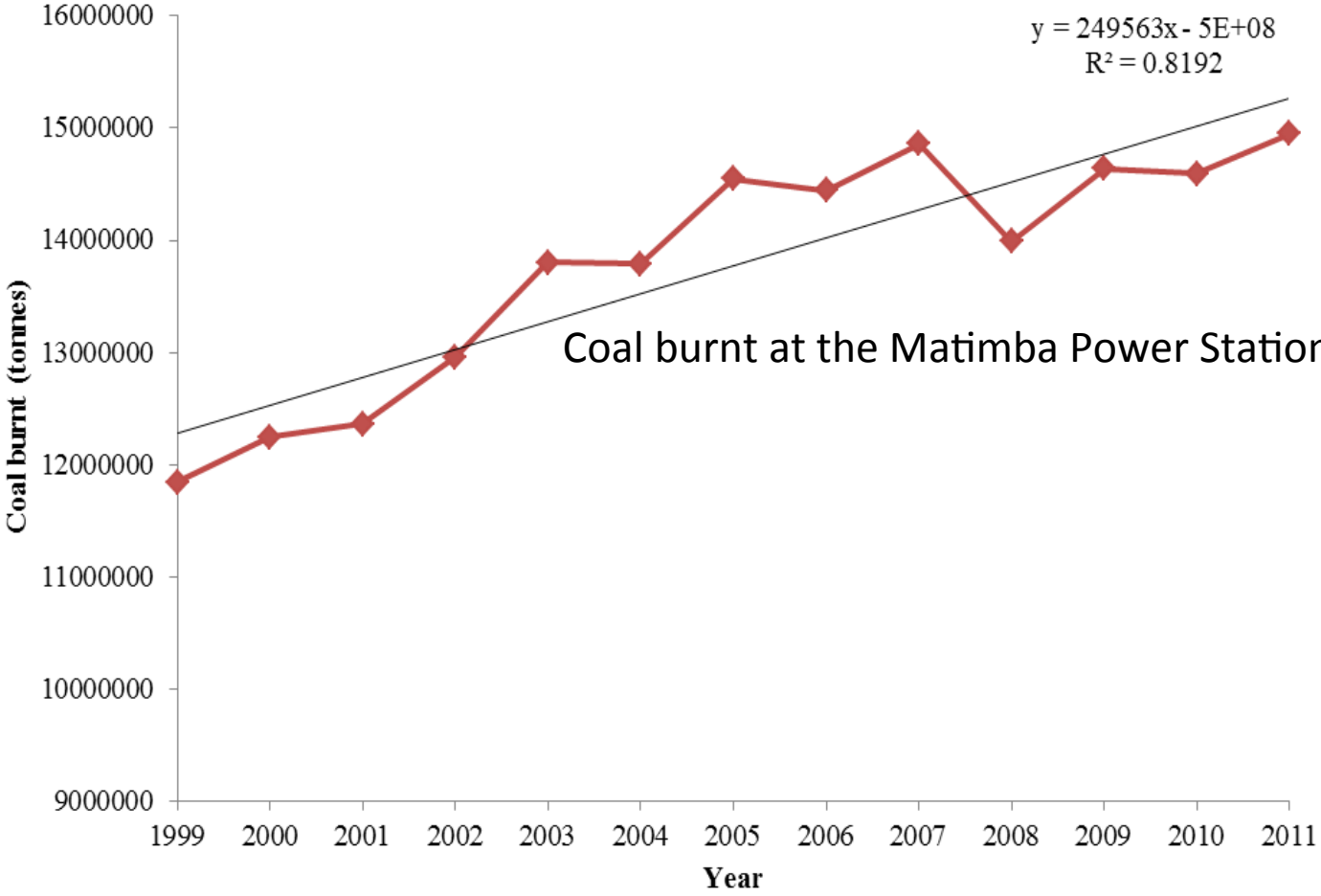
Integrated Study in the Waterberg

My current research programmme





Matimba Power Station



Coal burnt at the Matimba Power Station 1999-2011

Medupi power station

Ongoing studies

- Atmospheric – emissions and deposition
- Biosphere – plants and soils
- Hydrosphere – three rivers – long term data sets from 1999-2012.
- Health




Collecting Lichens (as indicators of air pollution) in the Waterberg National Priority Area

Downwind of Power Stations (potentially impacted)

33 lichens from 42 trees
=78 lichens from 100 trees

Upwind of Power Stations (non-impacted)

59 lichens from 70 trees
= 84 lichens from 100 tress

Results indicated a similar total number of lichens upwind and downwind, but because lichens are differentially sensitive to air pollution, diversity of lichens had to then be assessed.

Plant and soils

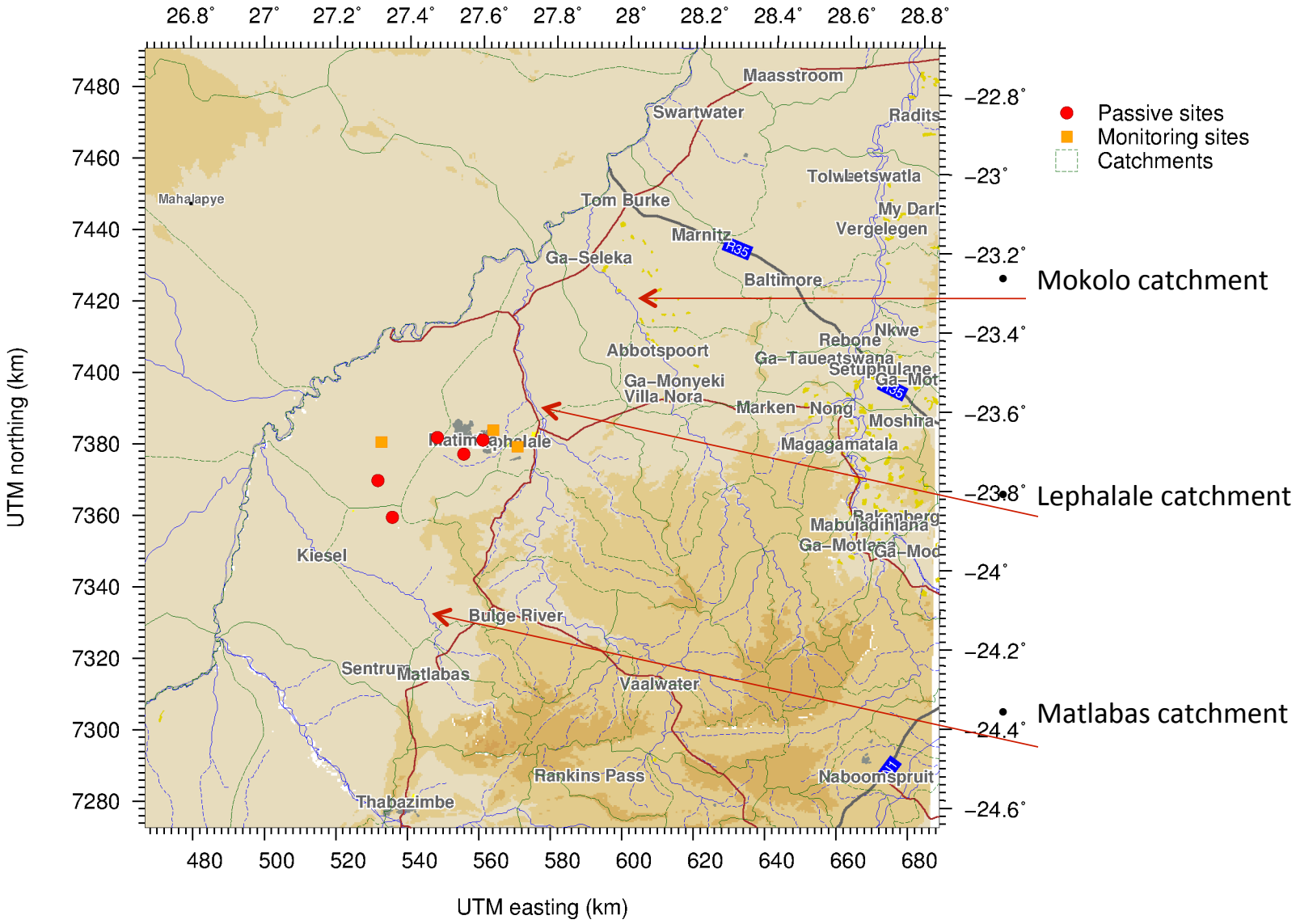
4 sampling locations – upwind and downwind of Matimba

Diversity studies

Grew grasses and tree seedlings in pots:

- Grasses less sensitive than trees to additional nitrogen and sulphur applications

Catchments: pH, cation and anion data from three rivers show no statistical changes between 1999-2012



Health in Waterberg, Up in Smoke?

- **Socio-economic and energy analysis**

- **Households** surveyed at **3 sites** were found to have with **significant differences** with regards to household size, qualifications, poverty levels, grants, family structure, medical aid, home ownership, electricity access and presence of a ceiling.

1. **Lephalale (formerly Ellisras): highest socio-economic status**
2. **Marapong: the middle site in terms of socio-economics**
3. **Steenbokpan: the lowest socio-economic status**

Other studies

Health service delivery in SA.

Coast line stabilization in UKZN.

Sustainable rural livelihoods in the Eastern Cape

Mathematical modelling of complex ecosystem processes

Engineering solutions for efficient and sustainable processing of waste water