SUPPORTING POLICY COHERENCE –

CHALLENGES AND SUCCESSES IN EXTENDING ENERGY SYSTEMS MODELS TO OTHER RESOURCES

SELECTED REFLECTIONS AND CASE STUDIES

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THE NEED FOR MULTI-SECTOR MODELING

Food, water and energy services:

- Billions of people are without secure/affordable/safe access
- Demands are growing but resources are limited
- Traded on global markets
- Rely on:
  - Resources: land, energy, water & Infrastructure:
    - Man made (transmission systems, dams, farms, etc.)
    - Natural (ecosystems: terrestrial, aquatic etc.)
- Resources > infrastructure > service chains are inter-related
- They are managed and analyzed in silos
- They transverse: scale, sector and countries
- They are affected by and affect climate change

TRADITIONAL APPROACHES ARE NOT ENOUGH

- Traditional processes include:
  - Environmental Impact Assessment (EIA): *Project*
  - Integrated Assessment Modeling (IAM): *Global*
  - Strategic Environmental Assessments (SEA): *National*

- Sector specific activities are lacking:
  - *Integrated Land-Use Analysis (ILUA), Integrated Water Resource Management (IWRM), Integrated Resource/Energy Planning (IRP/IEP), Mitigation / Adaptation planning etc*

- Typically assume related sector scenarios are constant:
  - *Feedbacks are ignored*
  - *Stresses are not considered through all sector futures*
  - *Normally do not look beyond specific linkages*

POLICY COHERENCE AND MODELING

-**Policies** what are their aim? (GDP, GNH, PB's, Electioneering? etc.)

-What is policy **Coherence**? (Integrated? Not counter-productive? Adaptive? etc.)

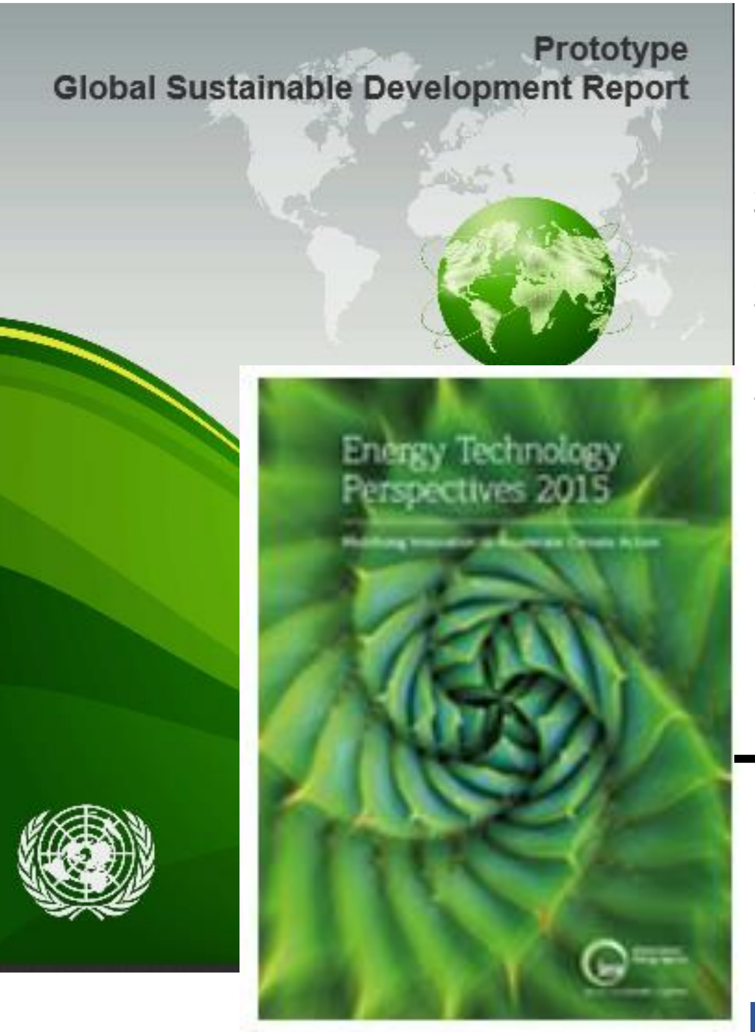
-**Models & Modelers**: Resources, Constraints, Scopes, Objectives, Insights

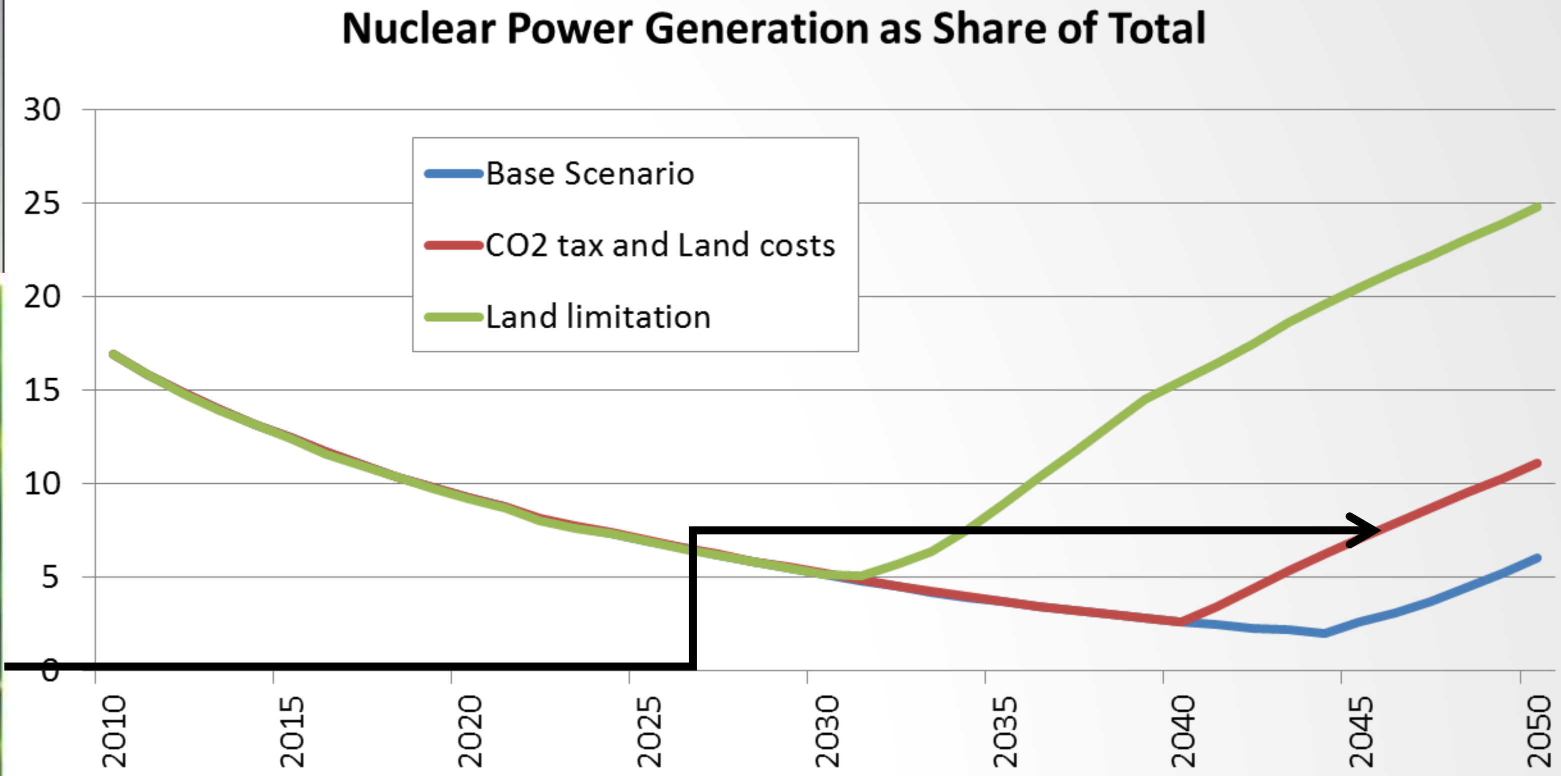
- -**Resource**: **M**oney, **M**aps, **M**ass, **M**ega joules
- -**Constraints**: **B**usiness-economic, **B**io-physical, **B**ehavioral
- -**Scope**: **T**emporal, **T**erritory, **T**echnology, Ins**ti**tu**ti**ons.
- -**Objective: M**inimizing, **M**aximizing, **M**anaging for **M**ono/**M**any agents.
- -**Insights** relate to: **P**rojecting, **P**redicting, **P**rovoking, **P**ostulating, and **P**rospecting.

EXAMPLES

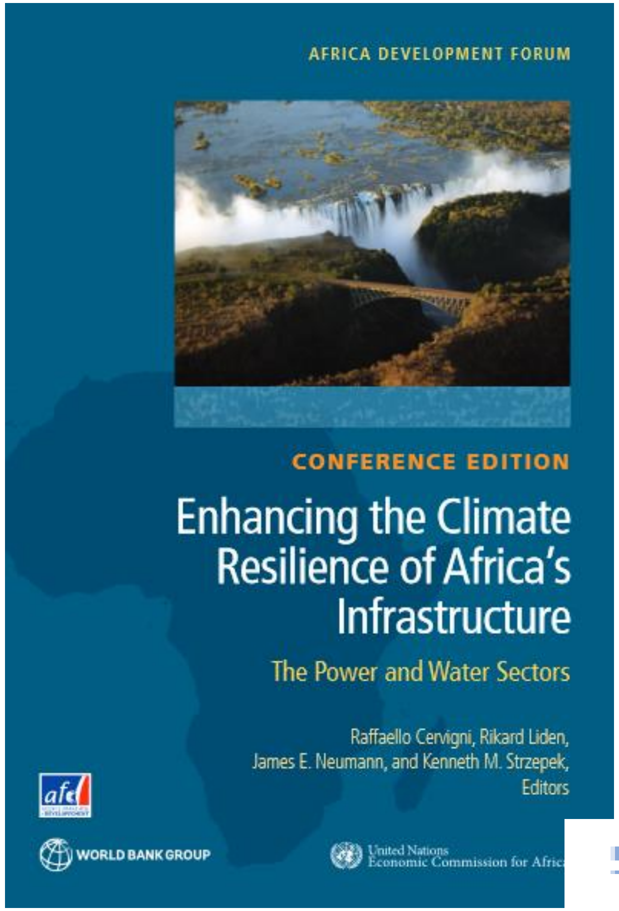
- Global, Continental, 3 River Basins, National, NYC
- Publications in: World Bank Special Series, Nature CC, Science (forthcoming), UN Global Sustainable Development Report
- Partners: RAND, UNDESA, MIT, World Bank, UNECE, Brookhaven, SEI and others.
- Key Messages:
  - Going beyond energy provides important and relevant insights
  - No one size fits all, a 'mega tool' might not be the best bet
  - Need for expert dialogue
  - A new step, as some of our previous work was misdirected

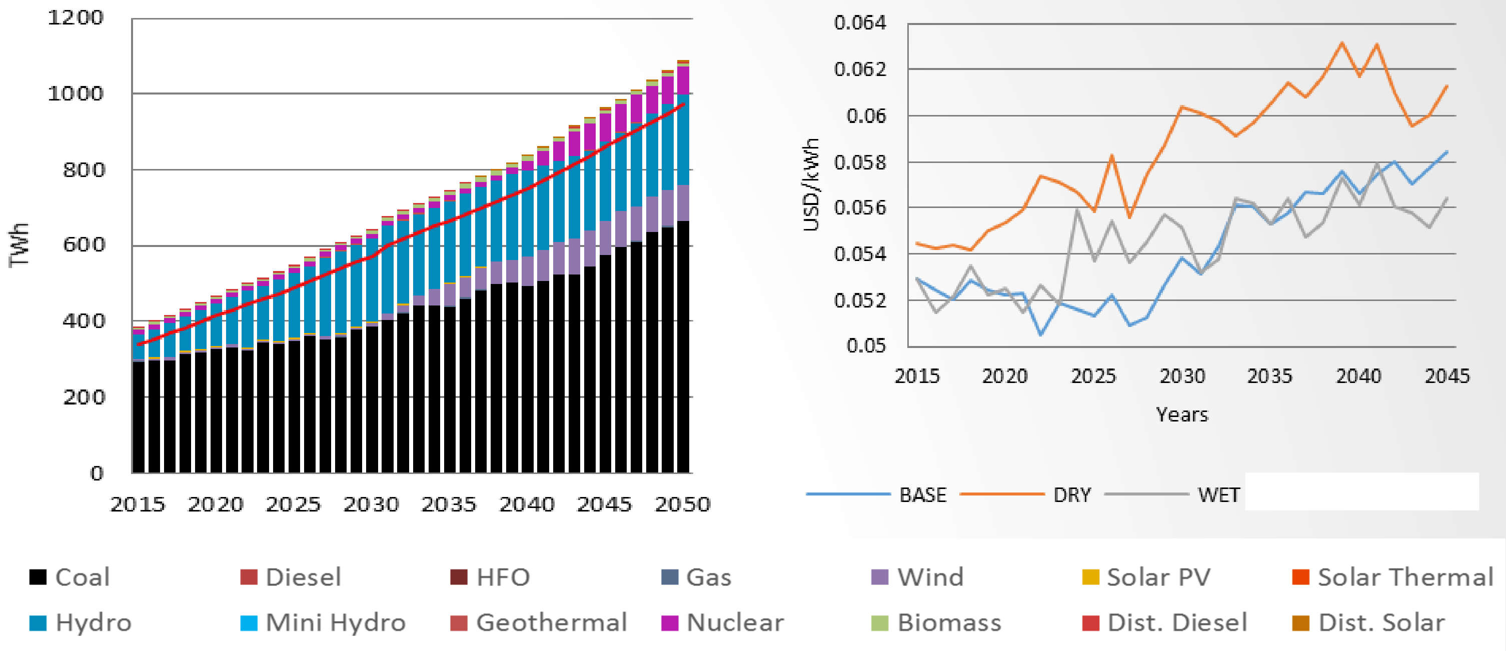
GLOBAL MODELLING





Agricultural, hydrological, Energy – All optimizing



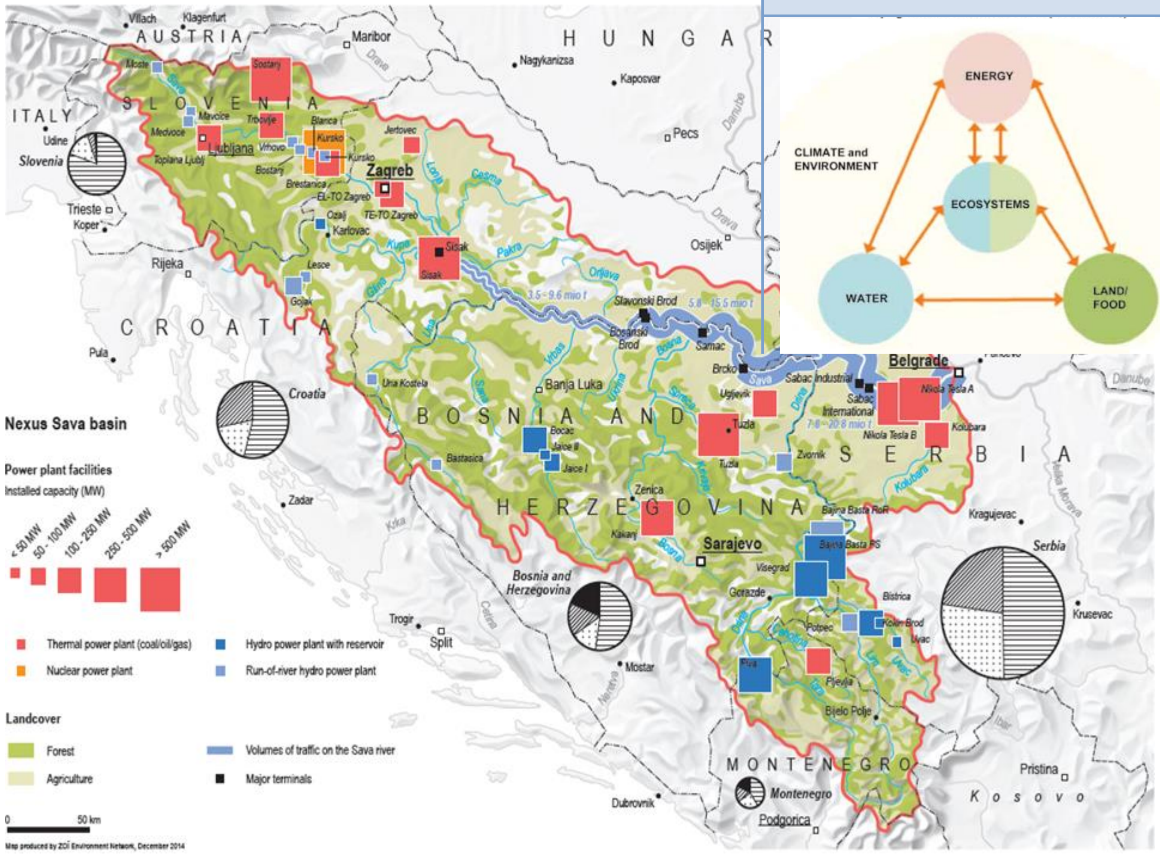


5 The Impacts of Climate Change on Infrastructure Performance

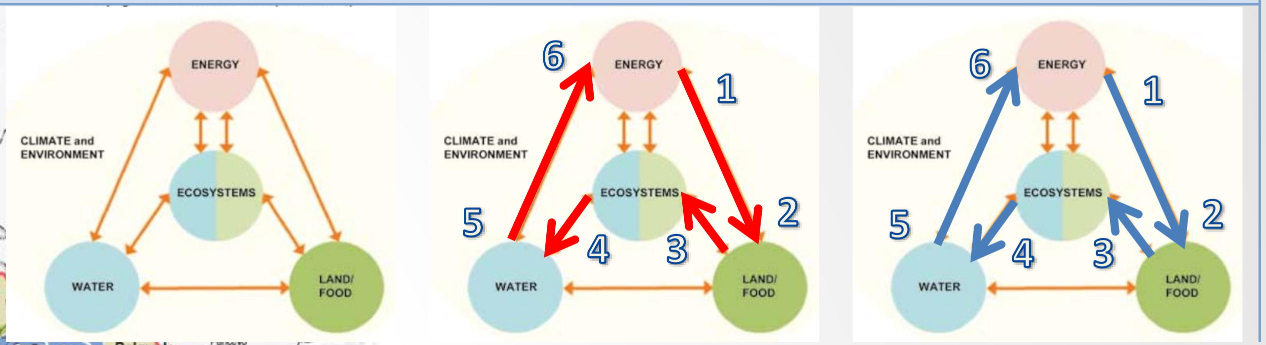
Mark Howells, Brent Boehlert, Brian Joyce, Oliver Broad, Vignesh Sridharan, David Groves, Kenneth M. Strzepek, Robert Lempert

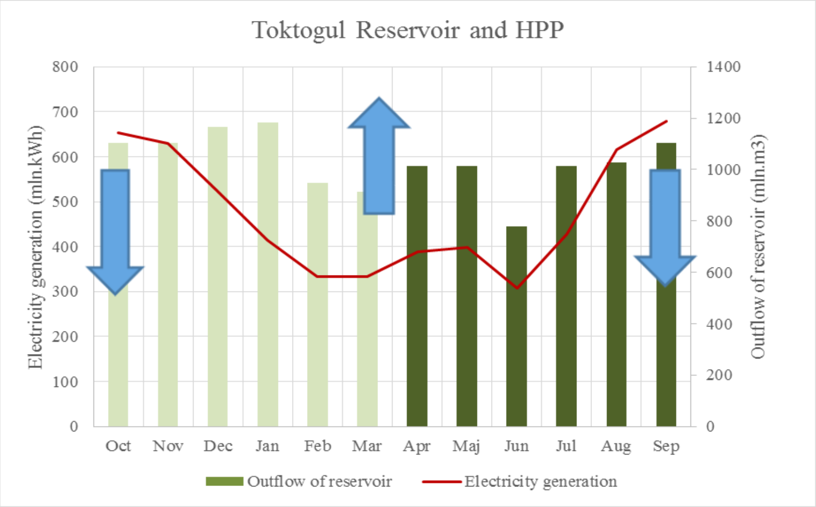
TRANSBOUNDARY RIVER BASIN MODELLING

Situation specific suite of tools



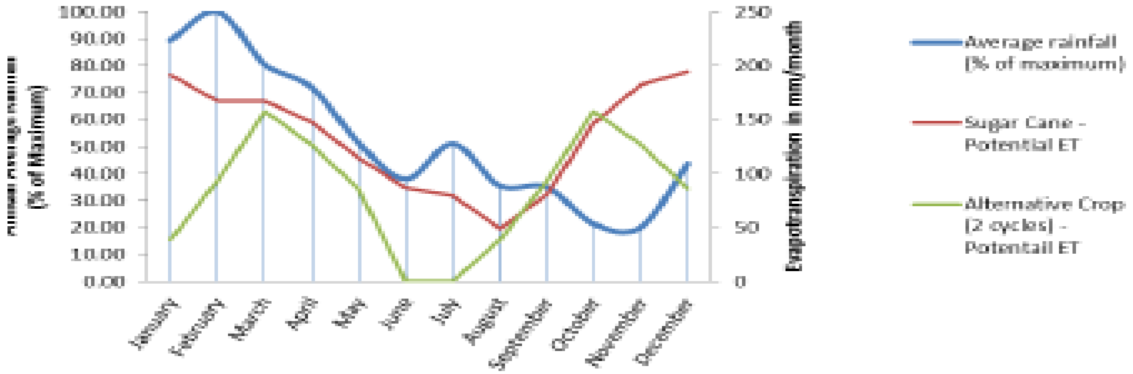
Nexus interaction diagram	Impacts of fuelwood use	Nexus solution – modern energy



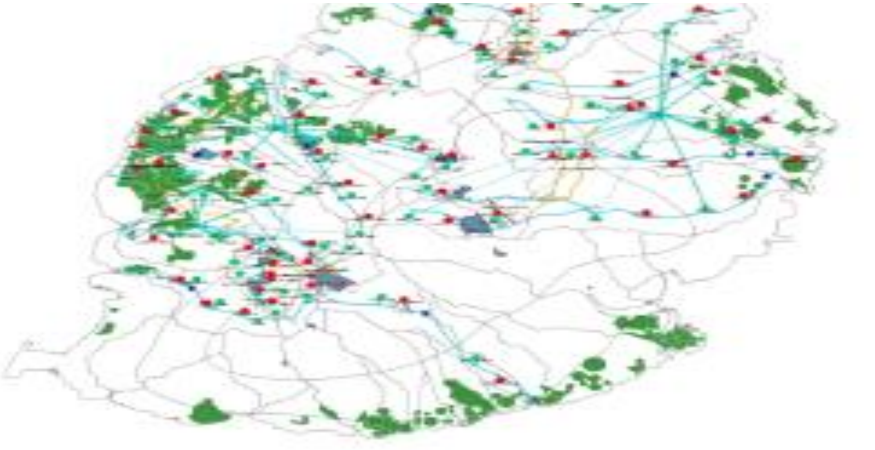


Agricultural, hydrological, Energy – All accounting

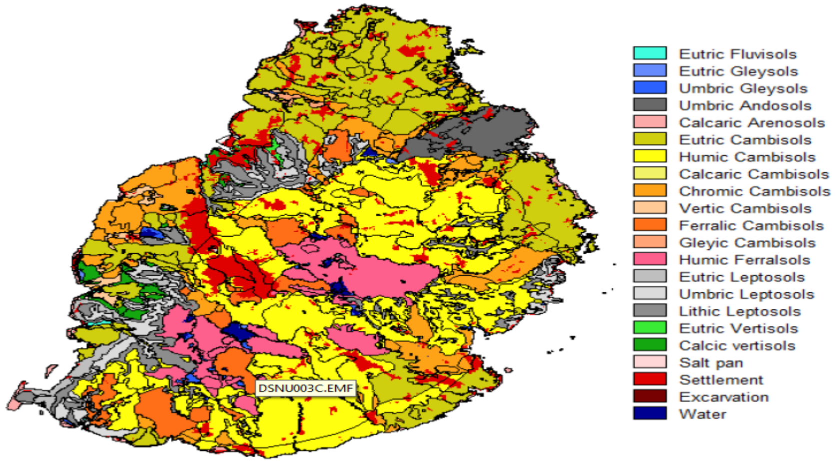
Available Rainfall in Mauritius and Water demand of different Crops



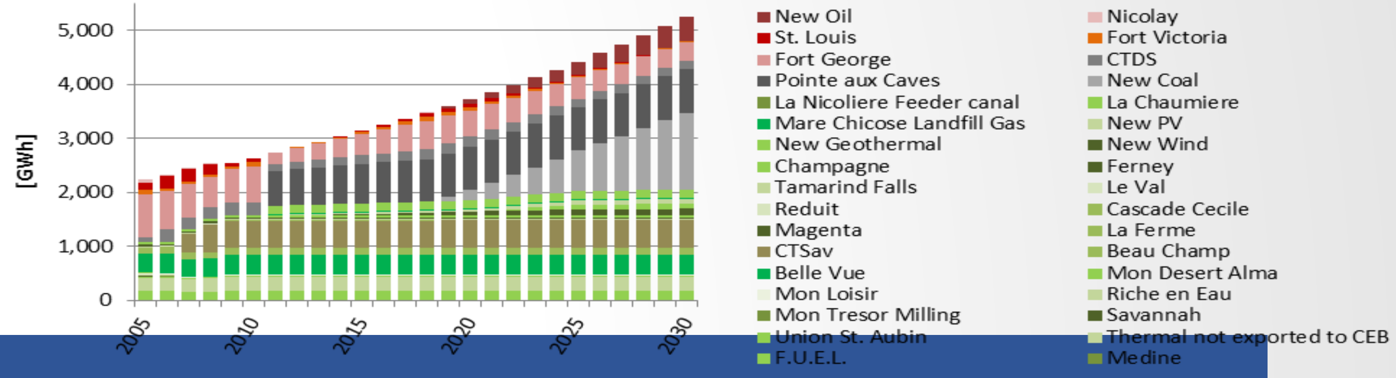
Basin level water modellig



Soil Map of Mauritius (FAO'90 dominant soils)

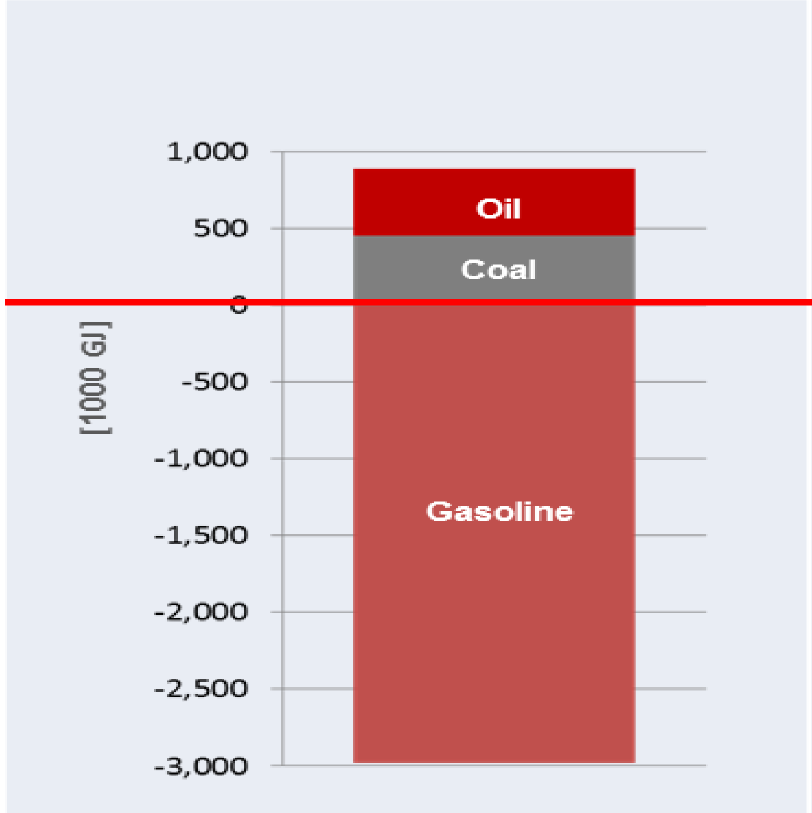


Electricity modelling

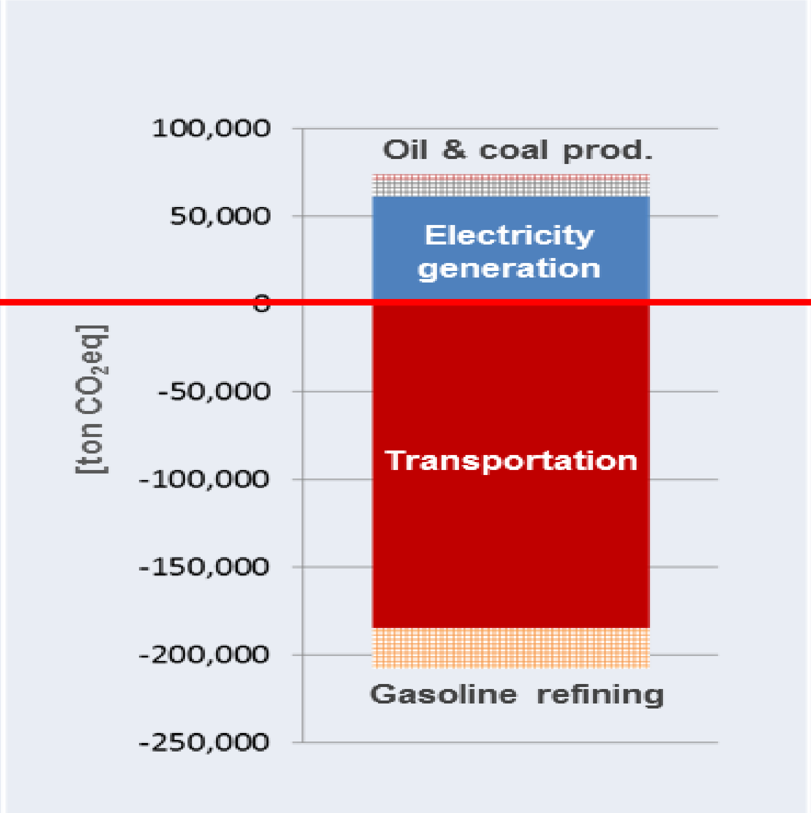


Agricultural, hydrological, Energy – All accounting

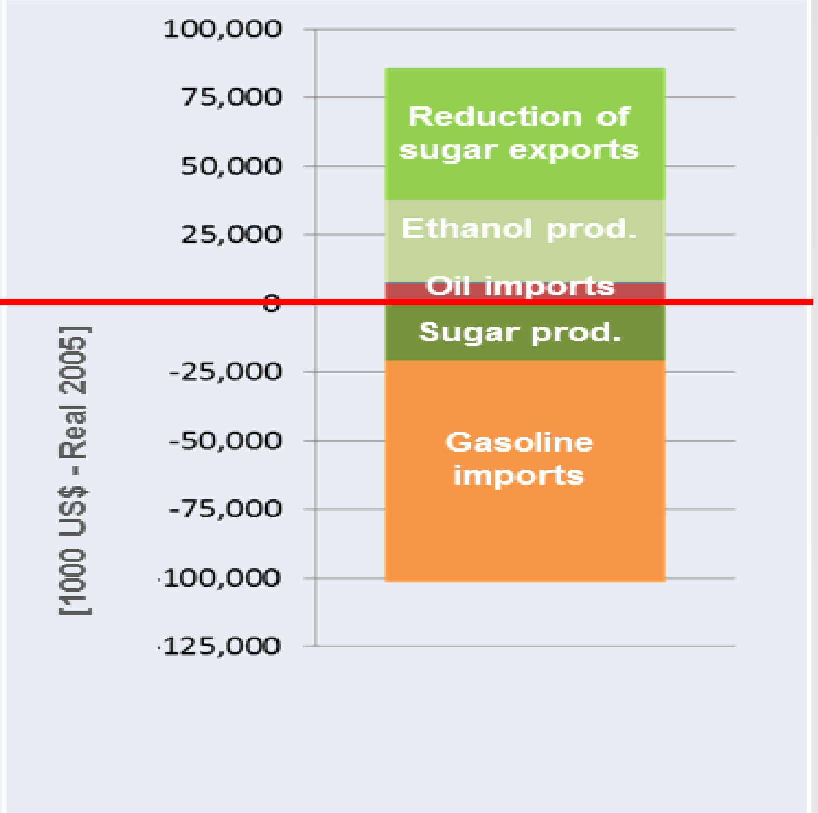
Reduced fuel imports



Reduced greenhouse gas emissions

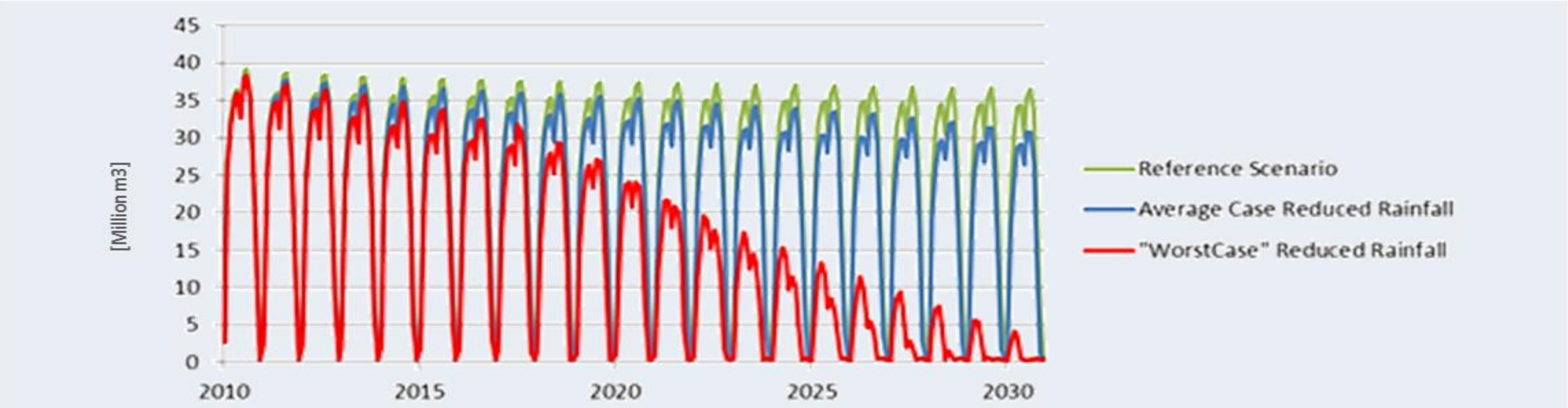


Reduced expenditures

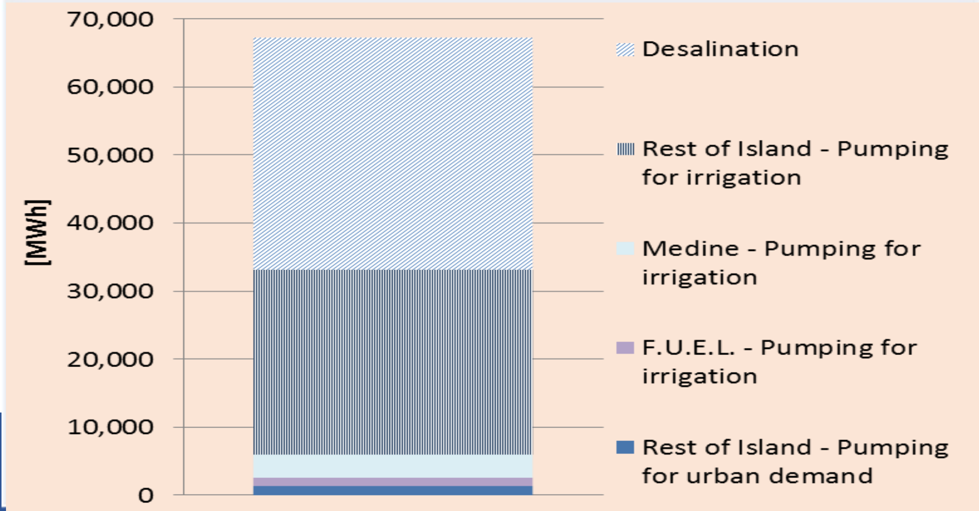


Agricultural, hydrological, Energy – All accounting

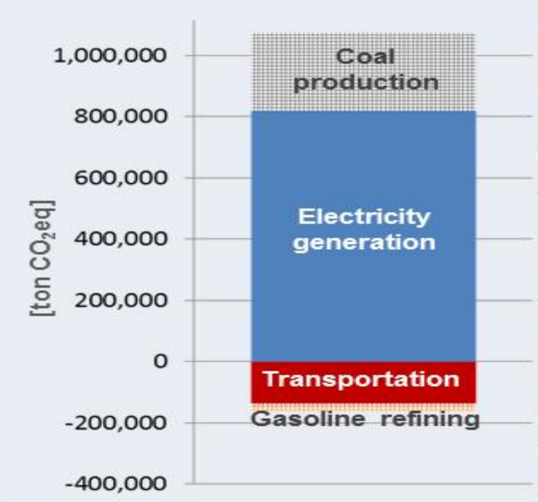
Storage volume level of reservoirs in Mauritius



Additional energy demand for water in 2030



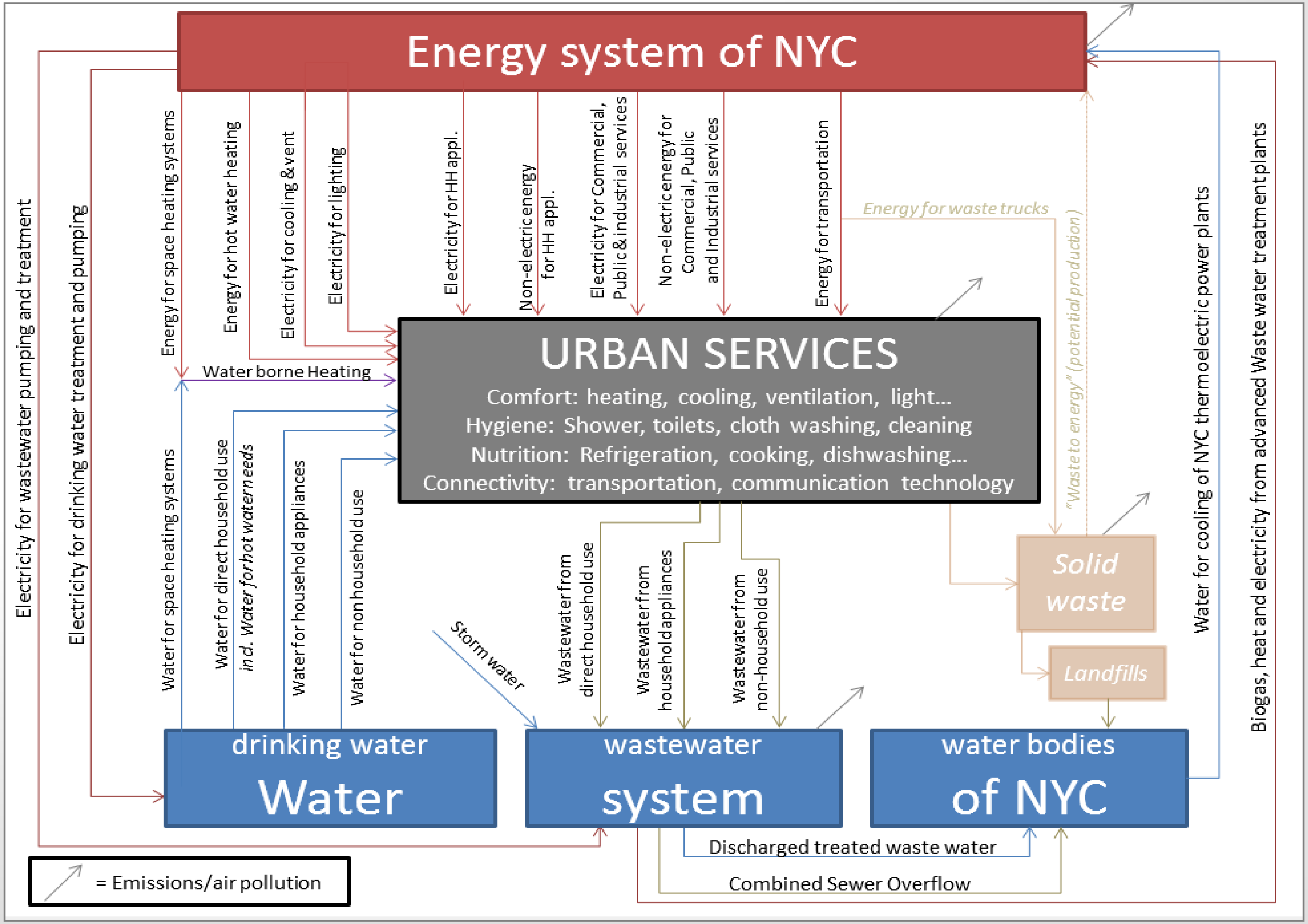
Additional greenhouse gas emissions in 2030



Due to this additional energy demand, overall greenhouse gas emissions increase.

The additional demand is largely met by coal-based electricity generation. These emissions cannot be compensated by the reductions in the transport sector due to 1st generation ethanol production.

Fully integrated accounting



SOME REFLECTIONS

- What to model: when is too much, too much?
- Model compatibility
  - Allocations: Rules, social discount rates, markets?
- What are we modeling and why
  - Simulating policy and response
  - States from which policy is derived
  - Armageddon to be avoided
- Emerging Implications: Missing markets / distortions
- Urgent need to bring the state of knowledge further.

CLEWS
– CLIMATE LAND ENERGY WATER STRATEGIES

FURTHER READING

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MANY THANKS