



Connecting climate action with other Sustainable Development Goals

A partnership between KTH and the UN system of organisations

November 14th 2019

Mark Howells, Francesco Gardumi, Francesco Fuso Nerini, Will Usher, Holger Rogner, Morgan Bazilian, Vignesh Sridharan, Abhishek Shivakumar, Oliver Broad, Constantinos Taliotis, Dimitris Mentis, Alexandros Korkovelos, Ioannis Pappis, Eunice Ramos, Rebecka Engstrom, Manuel Welsh, Nandi Moksnes, Shahid Siyal, Babak Kahvari, Andreas Sahlberg, Camilo Ramirez, Agnese Baltrame, Hauke Henke, Georgios Avgerinopoulos & Gabriela Pena.

Modelling Tools for Sustainable Development

← → ↻ un-modelling.github.io/about/ 🔍 ☆ 📄 👤 ⋮

MODELLING TOOLS

FOR SUSTAINABLE DEVELOPMENT

UNDP UN DESA

ABOUT MODELLING TOOLS COUNTRY PROJECTS OUTREACH TRAINING NEWS AND EVENTS

Wednesday, 13 November 2019

Modelling Tools for Sustainable Development

PARTNERSHIPS

UNDESA and UNDP work with key research partners including: the Universidad de La Plata (Argentina), the Royal Institute of Technology in Sweden (KTH-dESA), the International Atomic Energy Agency (IAEA), the International Institute for Applied Systems Analysis (IIASA), the Stockholm Environment Institute (SEI-US), the International Centre for Theoretical Physics (ICTP-Italy), the Policy Centre (IPC-IG, Brazil), the University of Cambridge (United Kingdom) and the British Columbia Institute of Technology (Canada)



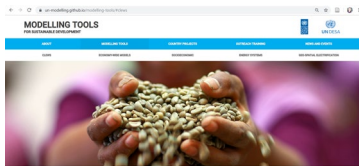
United Nations Department
of Economic and Social Affairs



United Nations
Development Programme



Royal Institute of Technology



MODELLING TOOLS FOR SUSTAINABLE DEVELOPMENT

Five quantitative modelling tools are being used by UNDESA and UNDP to help countries assess sustainable development policy options.

- The Climate, Land-use, Energy and Water Systems analysis and model (CLEWS)
- Energy systems models
- Socioeconomic integrated models
- Energy systems models
- Conceptual decarbonisation assessment modelling

The modules use the latest available open source software and state-of-the-art knowledge. Continuous development and improvement, backed by a global community of experts, opens innovation and addresses challenges.

THE CLIMATE, LAND-USE, ENERGY AND WATER SYSTEMS (CLEWS)

Climate, land-use, energy and water systems (CLEWS) models are used for simultaneous consideration of land, energy and water security. They are designed to assess how production and use of these resources may contribute to climate change, and how climate change may affect resource systems.

By comparing different technologies and value chains, the model can identify growth paths, and indicate strategies and tradeoffs to reach development goals. CLEWS can analyse policy decisions on issues such as the promotion of clean energy, competition for water and agricultural modernisation.



ENERGY SYSTEMS MODELS

Energy systems models can be used for energy policy analysis or to conduct medium- and long-term energy planning. They can help assess the synergy between the technical and economic characteristics of energy technologies, and explore how technology choice impacts energy security, access and affordability, as well as the environment.



GEO-SPATIAL ELECTRIFICATION

The Open Source Spatial Electrification Tool (OSSET) uses geospatial data to determine the most cost-effective conventional and renewable energy technologies for bringing electricity to specific localities. It is designed to identify means of providing access to safe, affordable and reliable electricity to households close currently to the grid. The model compares options such as connections to the electrical grid, and energy or stand-alone systems. It allows for prediction electric demand, transmission and local network, renewable energy potential, fuel prices and estimated electricity consumption per household, among other considerations.



nature > nature sustainability > perspectives > article

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sustainability

Perspective | Published: 15 July 2019

Connecting climate action with other Sustainable Development Goals

Francesco Fuso Nerini, Benjamin Sovacool, Nick Hughes, Laura Cozzi, Ellie Cosgrave, Mark Howells, Massimo Tavoni, Julia Tomei, Hisham Zerriffi & Ben Milligan

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Perspective | Published: 25 June 2018

Integrated analysis of climate change, land-use, energy and water strategies

Mark Howells, Sebastian Hermann, Manuel Welsch, Morgan Bazilian, Rebecka Segerström, Thomas Allstad, Dolf Gielen, Holger Rogner, Guenther Fischer, Harrij van Velthuisen, David Wiberg, Charles Young, R. Alexander Roehri, Alexander Mueller, Pasquale Steduto & Indoomate Ramma

Nature Climate Change 3, 621–626 (2013) | Download Citation

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Article | Open Access | Published: 17 January 2019

Resilience of the Eastern African electricity sector to climate driven changes in hydropower generation

Vignesh Sridharan, Oliver Broad, Abhishek Shivakumar, Mark Howells, Brent Boehlert, David G. Groves, H-Holger Rogner, Constantinos Taliotis, James E.

Bringing electricity to the World



worldbank.org/en/news/press-release/2017/07/20/new-open-source-tool-a-breakthrough-in-electrification-planning



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Who We Are / News

PRESS RELEASE | JULY 20, 2017

New Open Source Tool a “Breakthrough” in Electrification Planning



July 20, 2017 – Governments and others planning how to reach more households with electricity have a powerful, new open source tool that estimates the optimal way to do so, now available on the recently launched [ENERGYDATA.INFO](#).

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MALAWI

CHANGE COUNTRY

Grid Electricity Cost
US\$/kWh

0.06 0.08 0.10

Diesel Price
US\$/liter

0.32 0.70

Electricity
Consumption
kWh/household/year

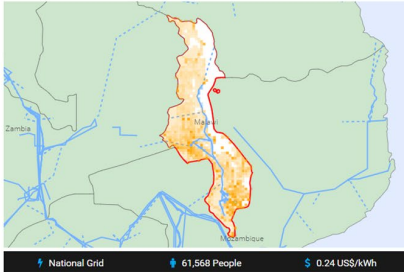
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224

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1,800

2,195



Transmission Lines
— Existing Line
— Planned Line

Grid Data
Map Image
Context Data

About this Map

Population Distribution by Scenario

People to receive electricity (2012 - 2030): 24.19 Million People



Population Graph
Population Summary Data

Total Cost of Electrification by Scenario (2012-2030)

1.47 B US\$



MALAWI

CHANGE COUNTRY

Grid Electricity Cost
US\$/kWh

0.06 0.08 0.10

Diesel Price
US\$/liter

0.32 0.70

Electricity
Consumption
kWh/household/year

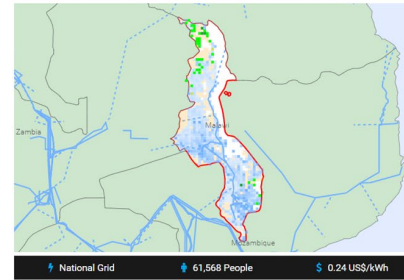
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Population Graph
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Total Cost of Electrification by Scenario (2012-2030)

37.03 B US\$



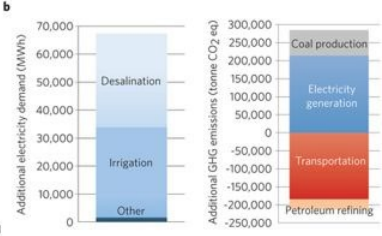
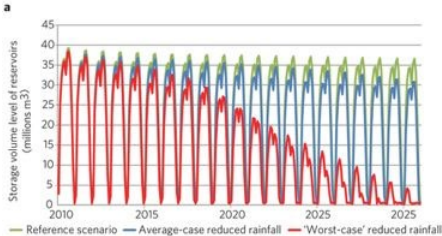
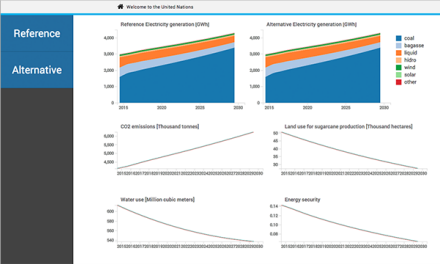
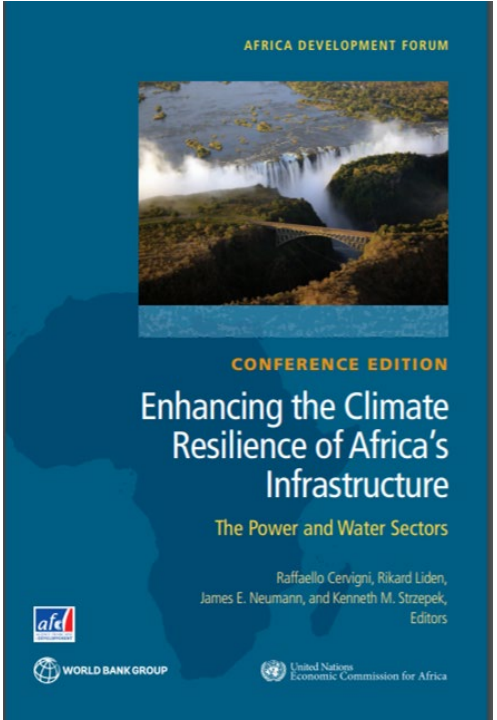
Climate compatible Energy Strategies



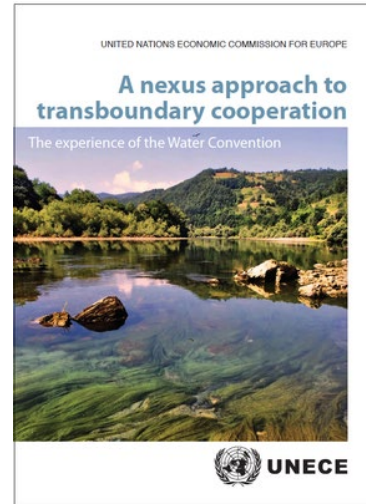
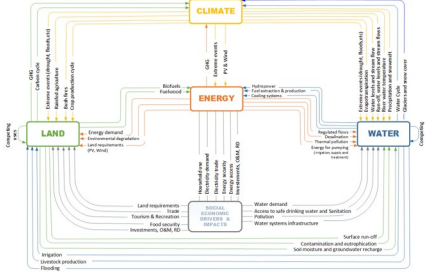
INTENDED NATIONALLY DETERMINED CONTRIBUTION FROM THE PLURINATIONAL STATE OF BOLIVIA

Energy

For the modelling of the scenarios in the electricity sector, as well as the calculation of carbon equivalent emissions (CO₂e) and the optimization for each stage of electricity generation, the OSeMOSYS program (Open-Source Energy Modelling System), developed by the Royal Institute of Technology in Sweden (KTH)¹. This program is an open source software that allows modelling and optimization the planning of medium and long-term energy systems.



Climate compatible Development



Welcome to the United Nations

COMPARE CLIMATE SCENARIOS

Use the dropdown menus to compare the emissions and energy produced by various industries under different scenarios from 2010 to 2050. All scenarios follow current assumptions for energy supply and renewable energy generation potentials.



CHOOSE SCENARIO:

This is the **business-as-usual** scenario. Greenhouse gas emissions are expected to **increase average temperature to between 4°C and 6°C**. Consumption and production grow according to trend and no new environmental regulations are considered.

CUMULATIVE AMOUNTS, 2010 TO 2050

- How much water is consumed?**
 1,850 km³ baseline value
 Annual average is 142% of 2010 values
- How much CO₂ is produced?**
 1,552 CO₂ eq
 Annual average is 123% of 2010 values
- What is the total investment in energy and material production?**
 \$228,071 billion 2010 USD
 Annual average is 8.1% of global GDP

CHOOSE SCENARIO:

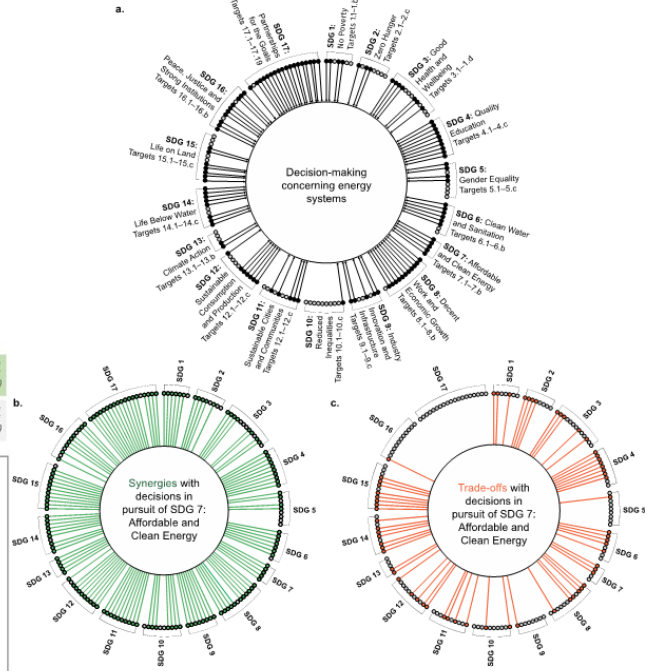
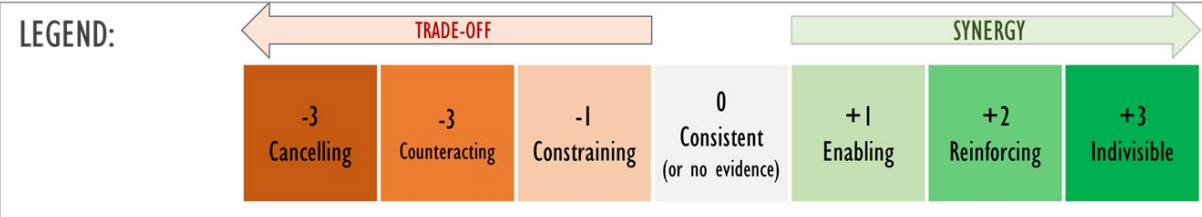
This scenario poses a limit on use of fossil fuels such that **average global temperature does not increase above 2°C**.

CUMULATIVE AMOUNTS, 2010 TO 2050

- How much water is consumed?**
 2,454 km³
 Annual average is 189% of 2010 values
- How much CO₂ is produced?**
 1,052 CO₂ eq
 Annual average is 83% of 2010 values
- What is the total investment in energy and material production?**
 \$256,257 billion 2010 USD
 Annual average is 9.2% of global GDP



Climate compatible Development





*"It always seems impossible,
until it's done..."*

-Nelson Mandela



Thank you for your attention

