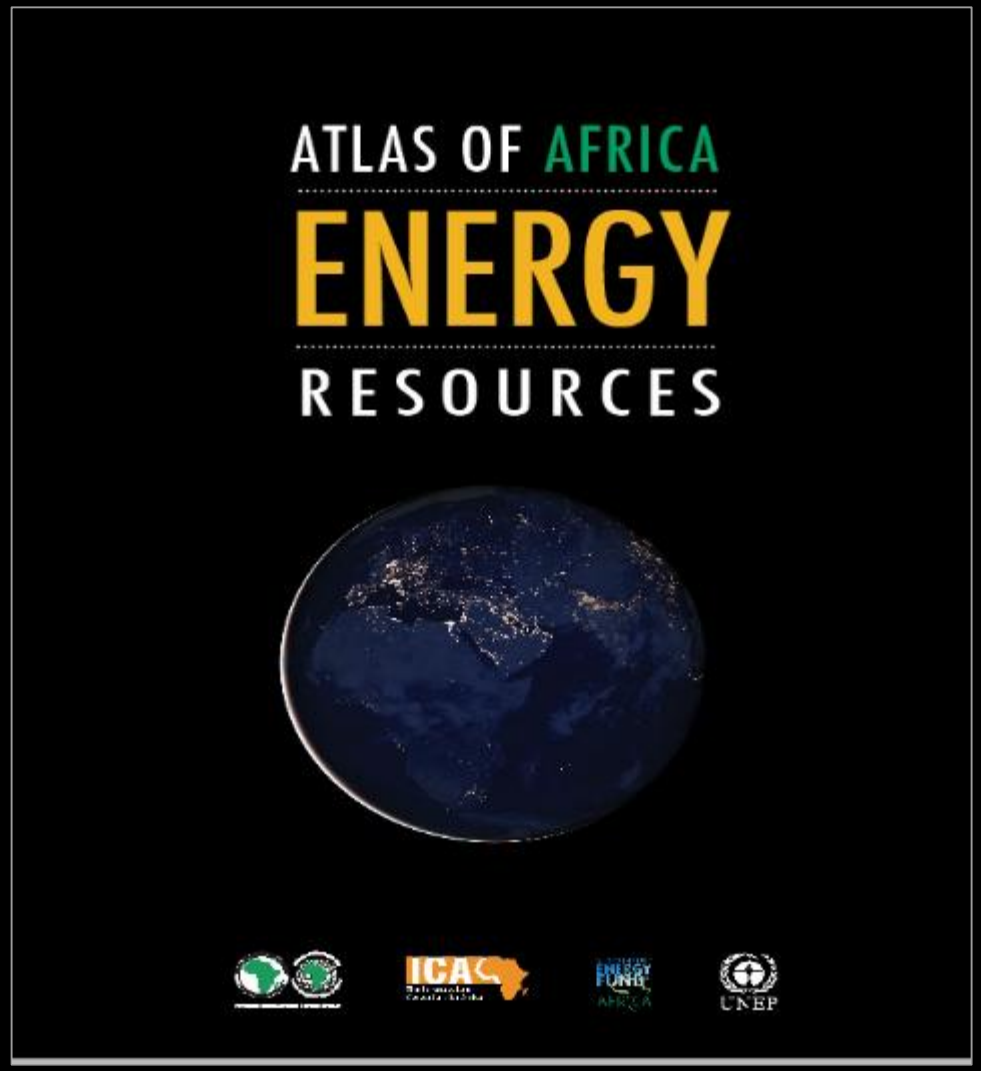


By
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# Atlas of Energy Resources of Africa

- **Why:** Need  to compiles and synthesizes relevant data and information in a format that is easily understandable to public and policy makers.

- **What:** About 350 pages filled with maps, charts and photos and satellite images, to provide a complete view of Africa's energy potential, needs, resources and opportunities.

- **How:** Extensive research of various energy databases, analysis of historical and current satellite images and expert consultations.

# Scope of Atlas

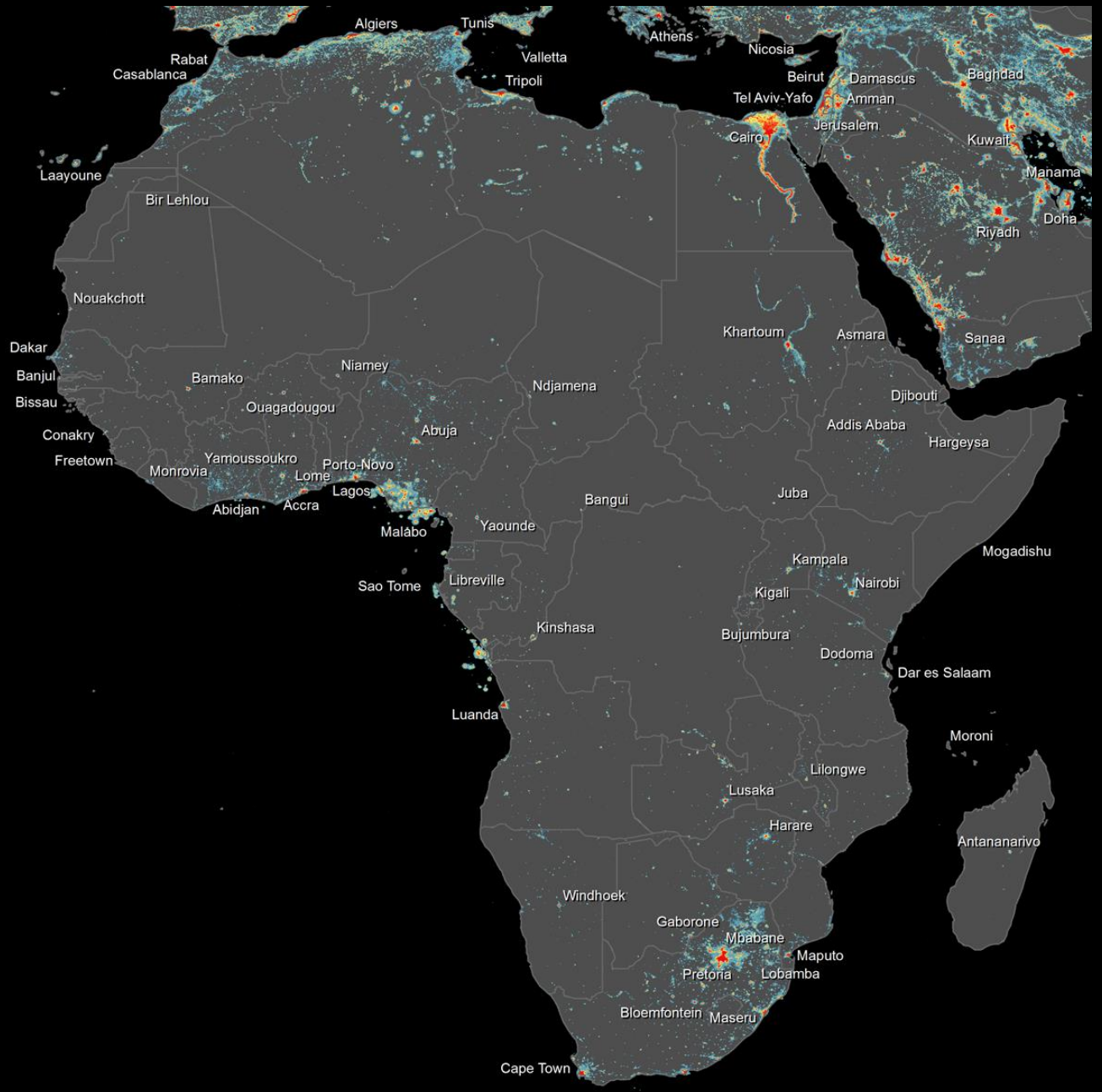
The content of the Atlas is organized in five chapters:

1. Energy Resources of Africa
2. Energy and Cross Cutting Issues (Environmental Dimension, Health, Education and Gender)
3. Regional Energy Integration and Markets
4. Energy and Sustainable Development
5. Energy Profiles of all 54 Countries (INDC Submitted by Countries to UNFCC, Tracking Progress Towards SDG7, Institutional and Legal Infrastructure

# Challenges and Opportunities

- Investment: Attracting investment from current 8 to 9 billion US$ per year to 43 to 55 billion US$ per year
- Regional integration through Regional Power Pools
- Technology Transfer
- Capacity Development
- Building Climate resilient Infrastructure in the face of uncertainty

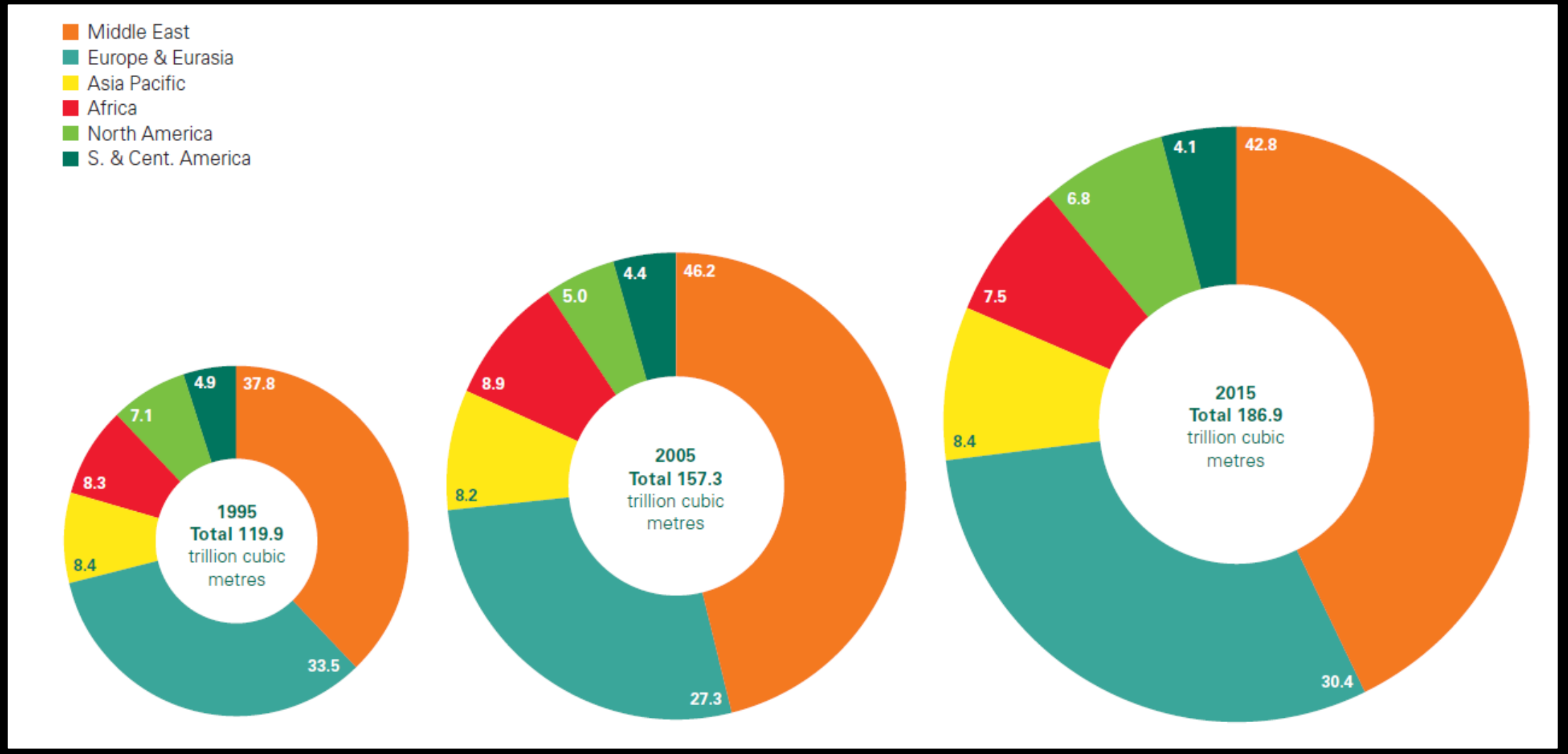
# Night light image of Africa 2013 by satellite



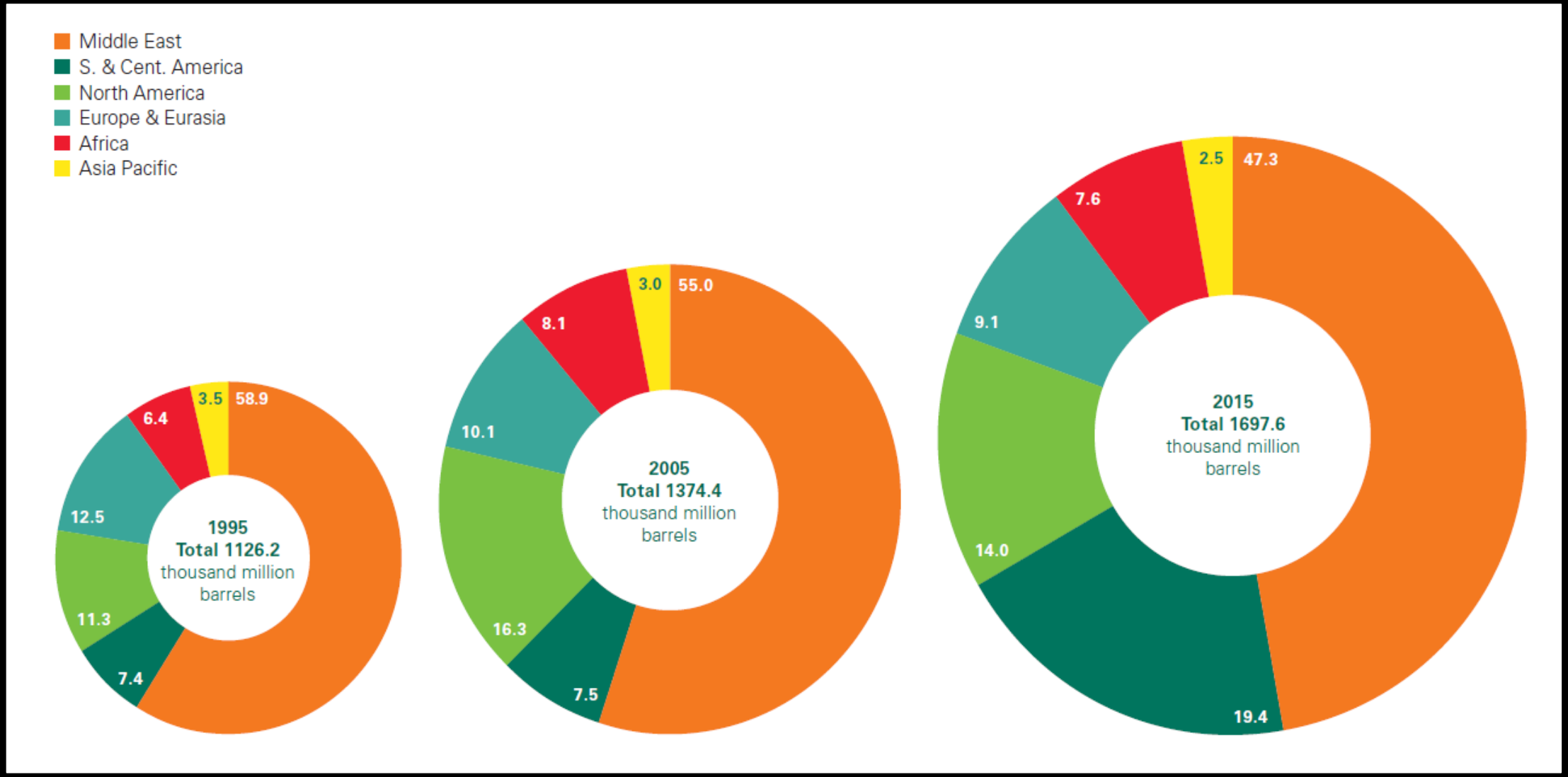
# Energy Resources of Africa

- Africa is richly endowed with energy resources. Reserves of coal, natural gas and oil represent 3.6 per cent, 7.5 per cent and 7.6 per cent of global reserves, respectively;
- Africa's renewable energy resources are diverse, unevenly distributed and enormous in quantity —solar potential is almost unlimited (10 TW) and there are abundant hydro (350 GW), wind (110 GW) and geothermal energy sources (15 GW);
- Africa has 16 per cent of the global population, but consumes only 3.3 per cent of its primary energy;
- More than 30 per cent of the energy consumed in Africa and about 80 per cent in many sub-Saharan African countries comes from biomass;
- Sub-Saharan Africa has undiscovered, but technically recoverable, energy resources estimated at about 115.34 billion barrels of oil and 21.05 trillion cubic meters of gas.

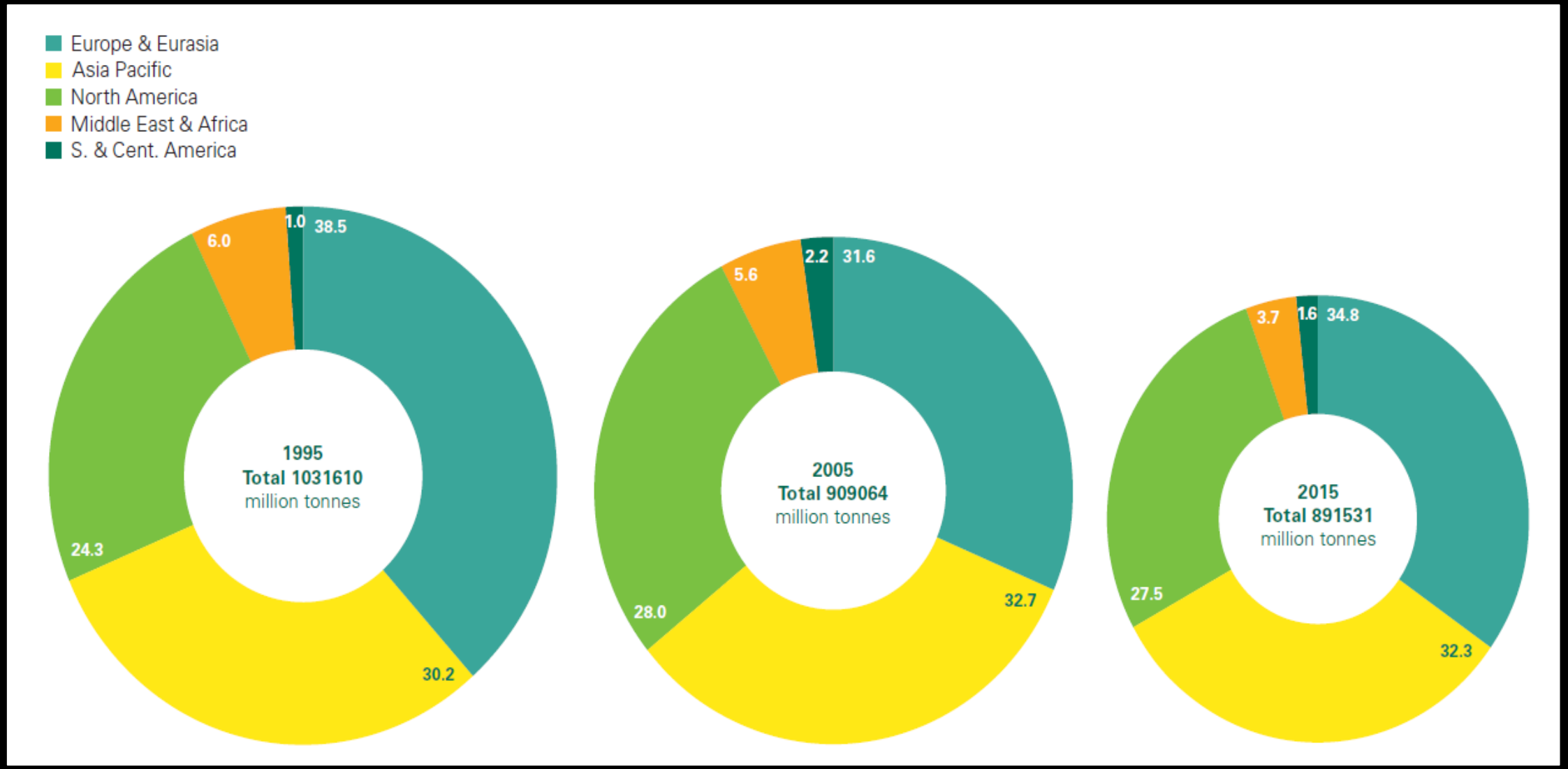
# Global distribution of proved natural gas reserves (percentage) 1995, 2005 and 2015



# Global distribution of proved oil reserves (percentage) 1995, 2005 and 2015



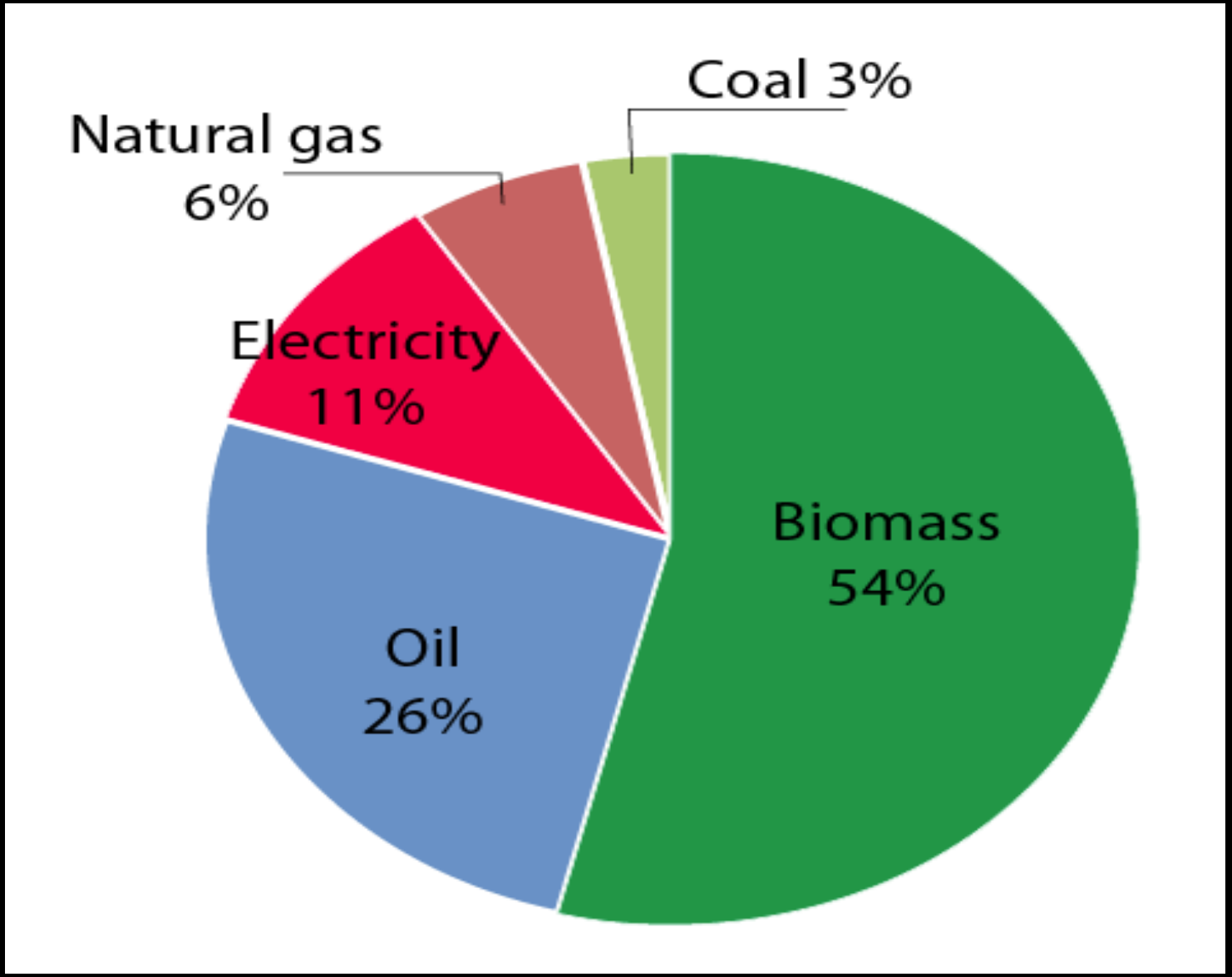
# Global distribution of proved coal reserves (percentage) 1995, 2005 and 2015



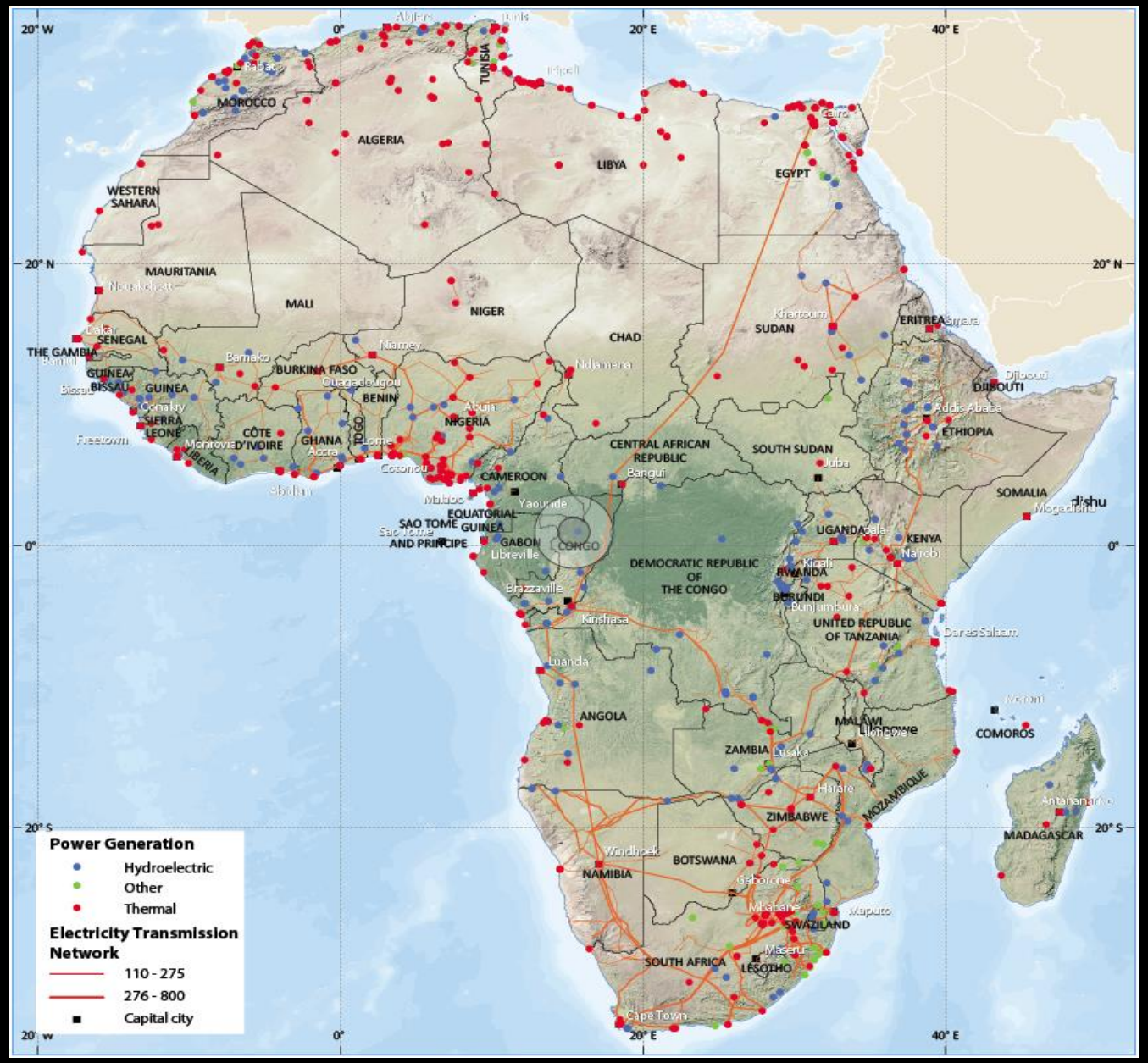
# The state of electrification in 2013

| Region | Population without access to electricity (Millions) | Electrification rate (percentage) | Urban electrification rate (percentage) | Rural electrification rate (percentage) |
|---|---|---|---|---|
| **World** | 1,201 | 83 | 95 | 70 |
| **Africa** | **635** | **43** | **68** | **25** |
| **North Africa** | 1 | 99 | 100 | 99 |
| **Sub-Saharan Africa** | 634 | 32 | 59 | 17 |

# Percentage share of Fuels in Africa



# Power generation and electricity transmission network



# Energy and cross cutting issues (1/2)

- Africa contributes 3 per cent of global energy-related CO2 emissions but will suffer disproportionately from climate change impacts, potentially exacerbating drought, for example, with adverse effects on the availability of biomass and hydropower for energy.
- Average electricity consumption in Africa (sub-Saharan), excluding South Africa, is only about 150 KWh/capita per year compared to a global average of 7,000 KWh.
- The cost of transporting goods in Africa is among the highest in the world; by 2050, however, its transport fuel consumption is expected to double.

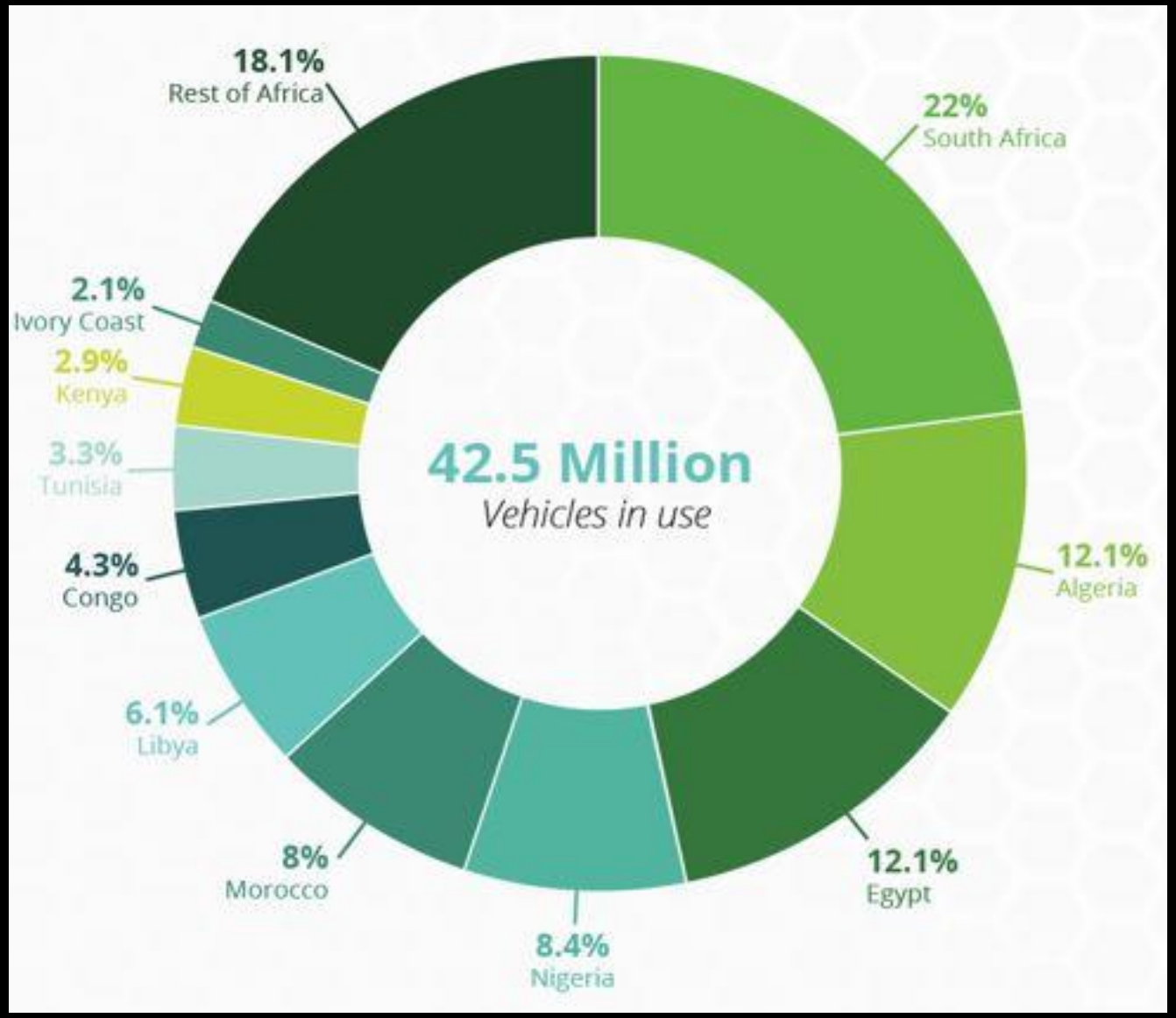
# Energy and cross cutting issues

- The agriculture sector uses only about 6 Mtoe of energy, which is very low by world standards, and only 6 per cent of Africa's land is irrigated.

- The provision of reliable electricity in hospitals and clinics is highly inadequate: about 58 per cent of health care facilities in sub-Saharan African countries have no electricity at all.

- Indoor pollution from biomass cooking – a task usually carried out mainly by women – will soon kill more people than malaria and HIV/AIDS combined.

# Vehicle use in Africa

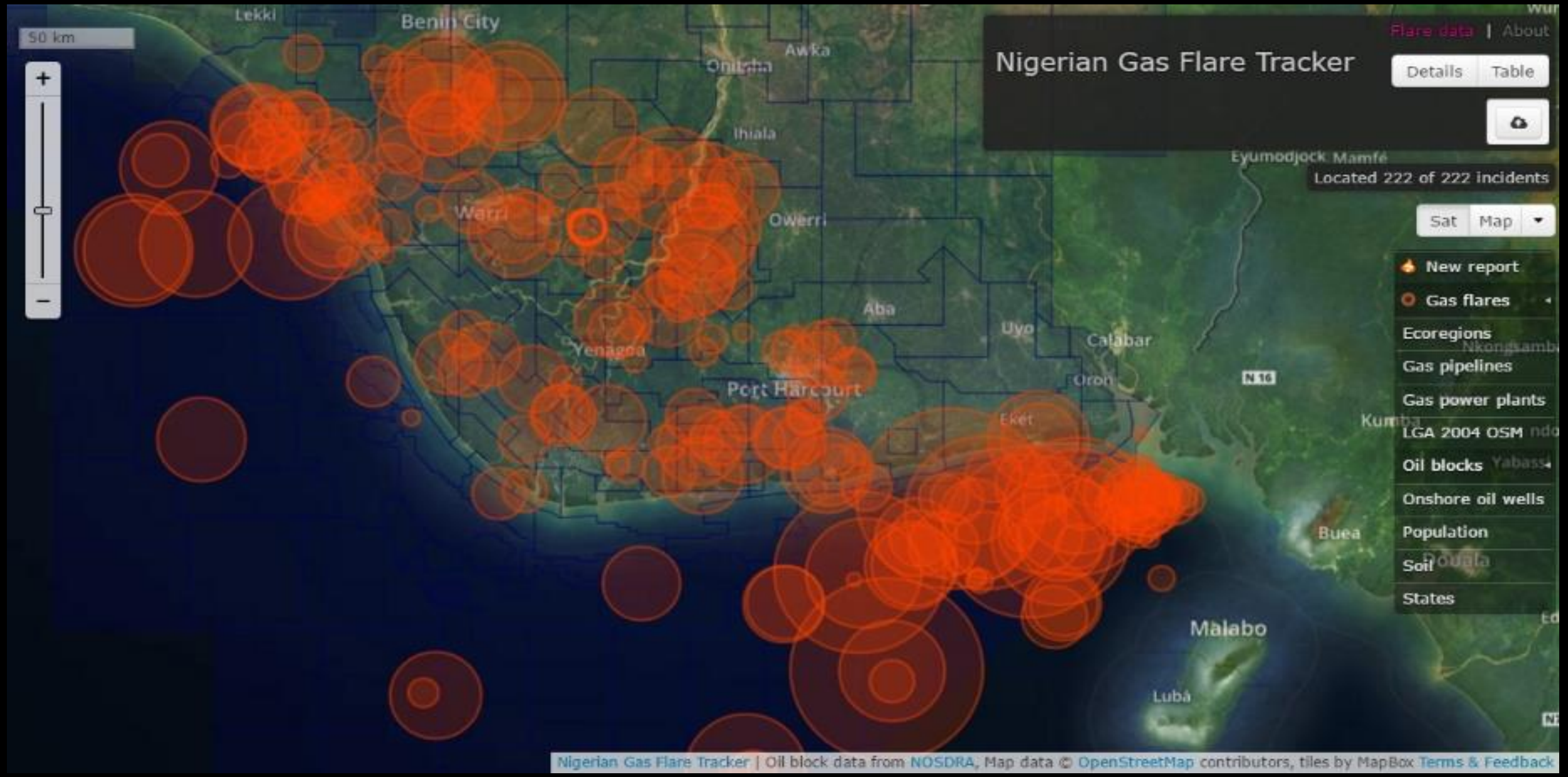


# Environmental consequences

## Gas flaring in Nigeria, estimated totals per year

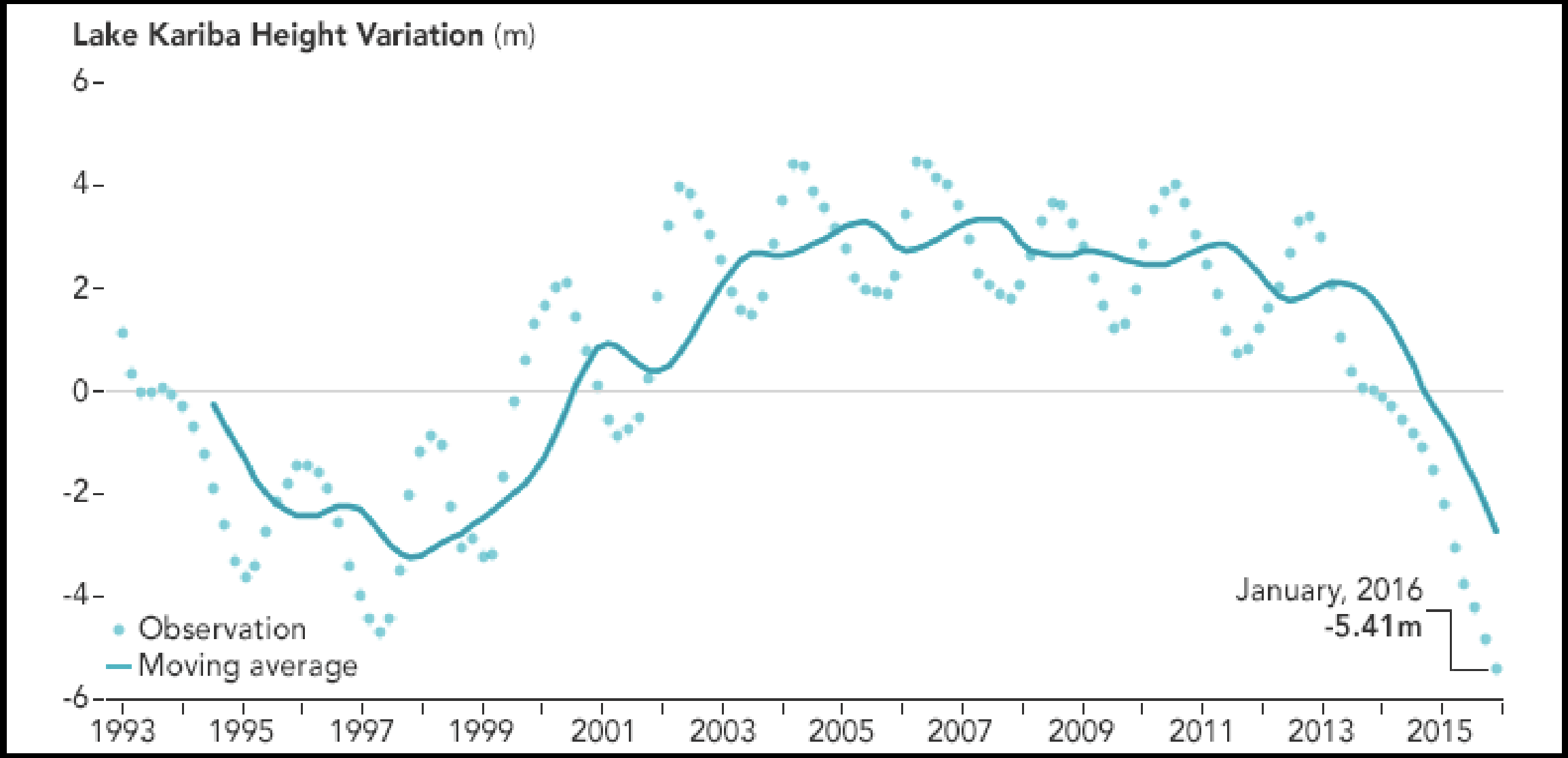
| Attribute | Amount |
|---|---|
| **Volume** | 313,553,980 Mscf |
| **Fines** | 1,097,438,930 US$ (1097 million) |
| **Gas value** | 783,884,950 US$ (783 million) |
| **Power generation potential** | 27,091 GWh |
| **$CO_2$ emissions** | 16,531,992 tonnes (16 million) |

# Real time tracking of gas flares in Nigeria



# Kariba dam from space

# Potential impact of climate change
(water level down due to drought)



# Regional integration and markets

- Regional energy integration through power pools is a prerequisite for sustainable development.
- Considering the small size of many of the economies of African countries, regional energy integration is extremely important to attract investment and to reduce the cost of doing business (economies of scale) and costs to consumers.
- Regional energy generation provides an optimal economic solution to energy generation and use, because energy is generated where it is most economical and supported and provided where it is most highly needed.
- In a full energy integration scenario, power pools would save US$ 43 billion per year by 2040.

# Grand Ethiopian Renaissance Dam (2010)

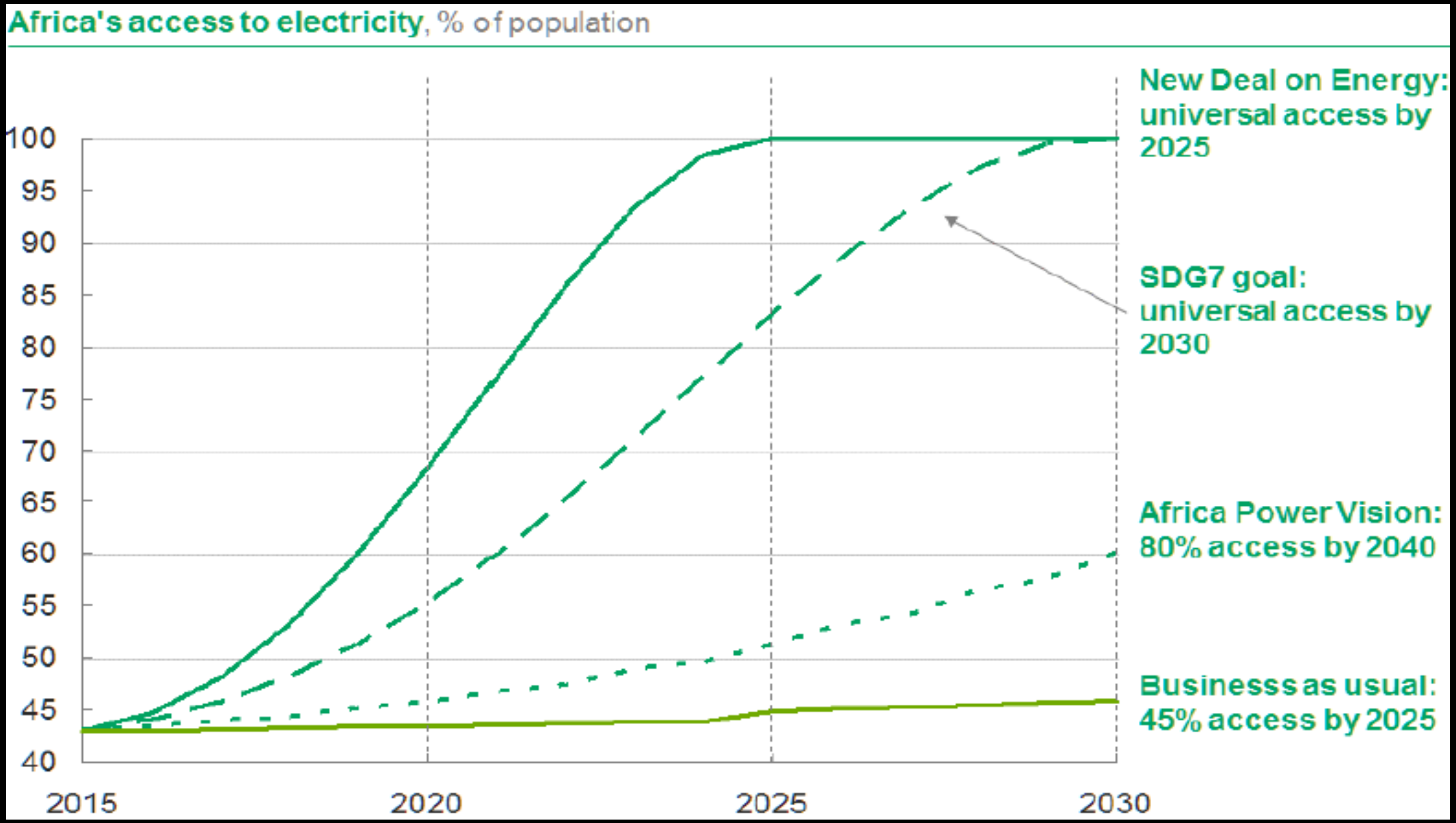
(6000 MW the largest hydro power plant in Africa)

# Grand Ethiopian Renaissance Dam (2016) : Regional markets needed

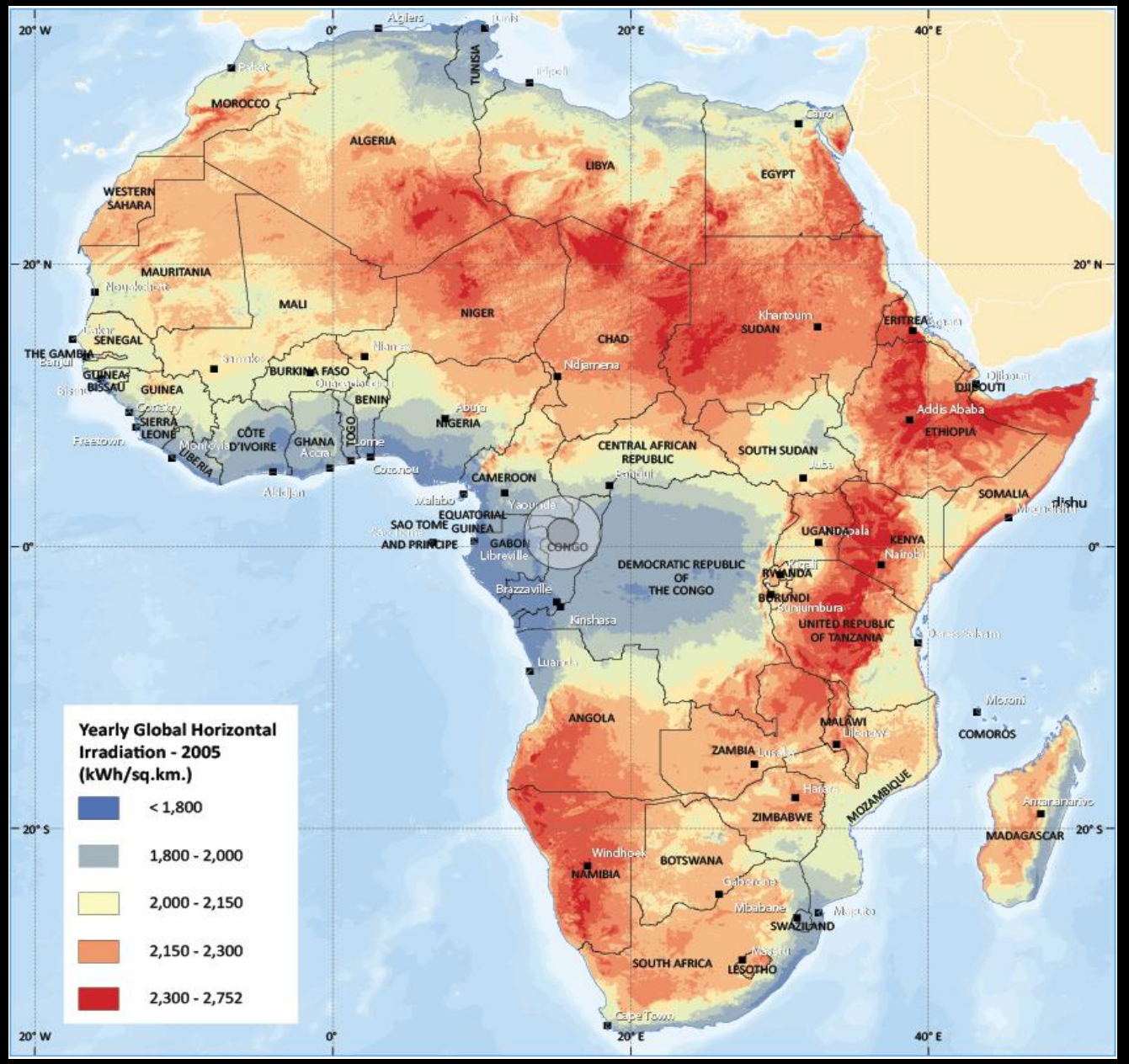
# Sustainable Development Goals

| Goal 7. | Targets | Indicators |
| --- | --- | --- |
| Ensure access to affordable, reliable, sustainable and modern energy for all | **7.1** By 2030, ensure universal access to affordable, reliable and modern energy services<br>**7.2** By 2030, increase substantially the share of renewable energy in the global energy mix<br>**7.3** By 2030, double the global rate of improvement in energy efficiency<br>**7.a** By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology<br>**7.b** By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programmes of support | **7.1.1** Proportion of population with access to electricity<br>**7.1.2** Proportion of population with primary reliance on clean fuels and technology<br>**7.2.1** Renewable energy share in the total final energy consumption<br>**7.3.1** Energy intensity measured in terms of primary energy and GDP<br>**7.a.1** Mobilized amount of United States dollars per year starting in 2020 accountable towards the $100 billion commitment<br>**7.b.1** Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services |

# Access to electricity: different scenarios

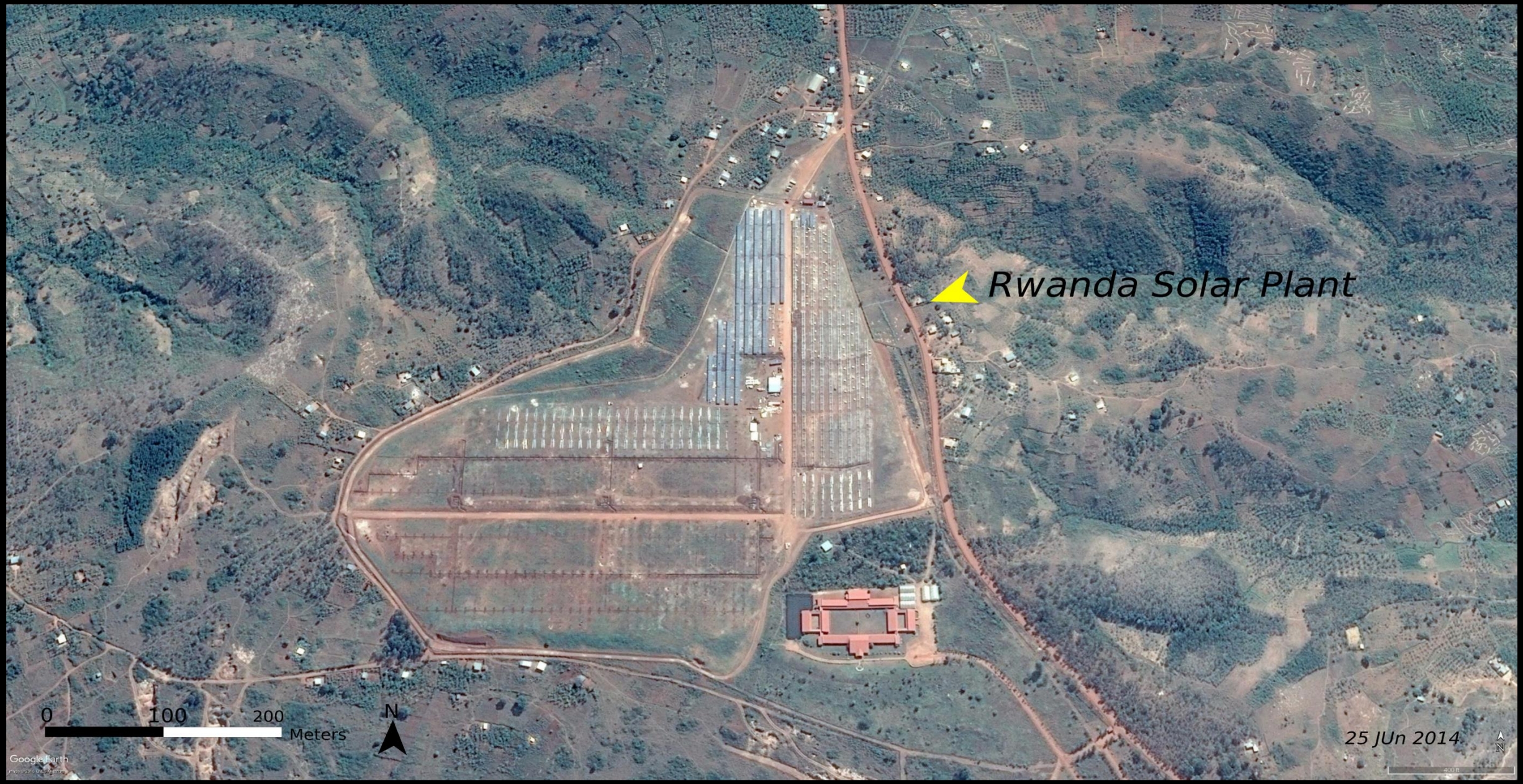


# Solar map of Africa



# Growth in Solar energy: A power plant site in Rwanda, 2011

# Same solar power plant site in Rwanda, 2014



# Sustainable Energy for All