

*Centre Energie - Centre for Energy*

**Africa's electricity challenges and opportunities**

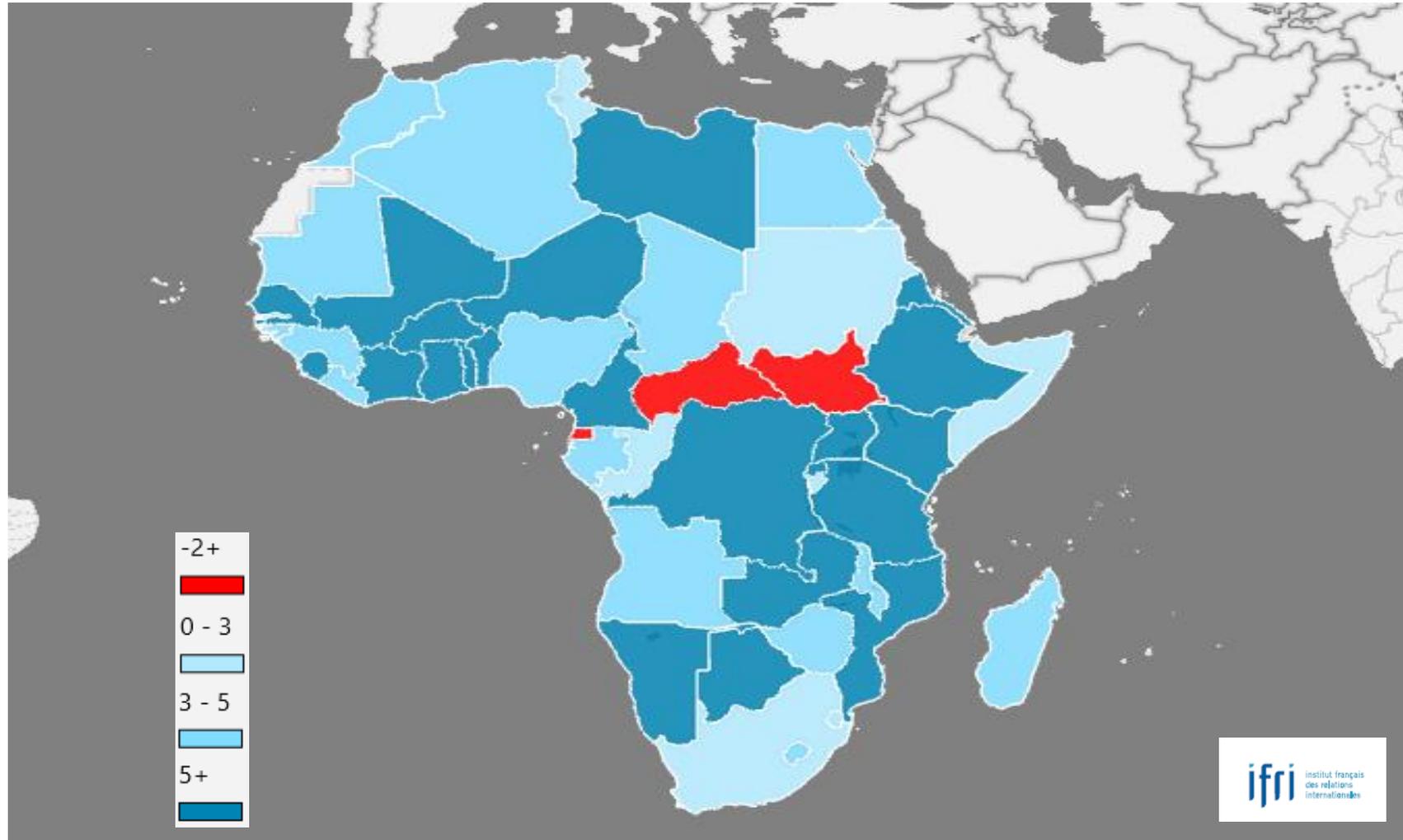


Marc-Antoine Eyl-Mazzega, Director

Oslo, 11 June 2018

# Robust and sustained economic growth, above global average

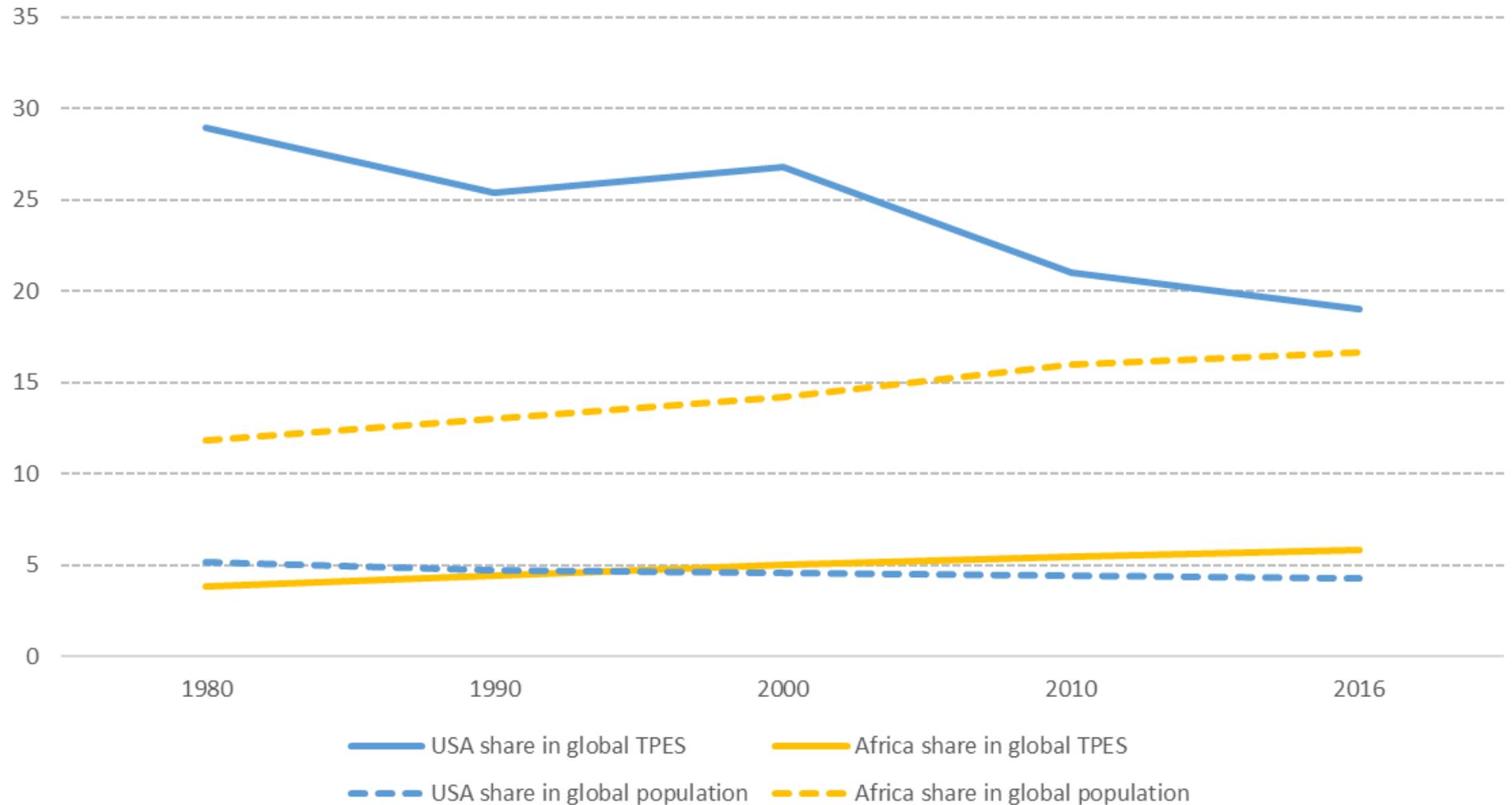
Annual average economic growth over 2012-2017 (%)



Source: World Economic Outlook Database, IMF

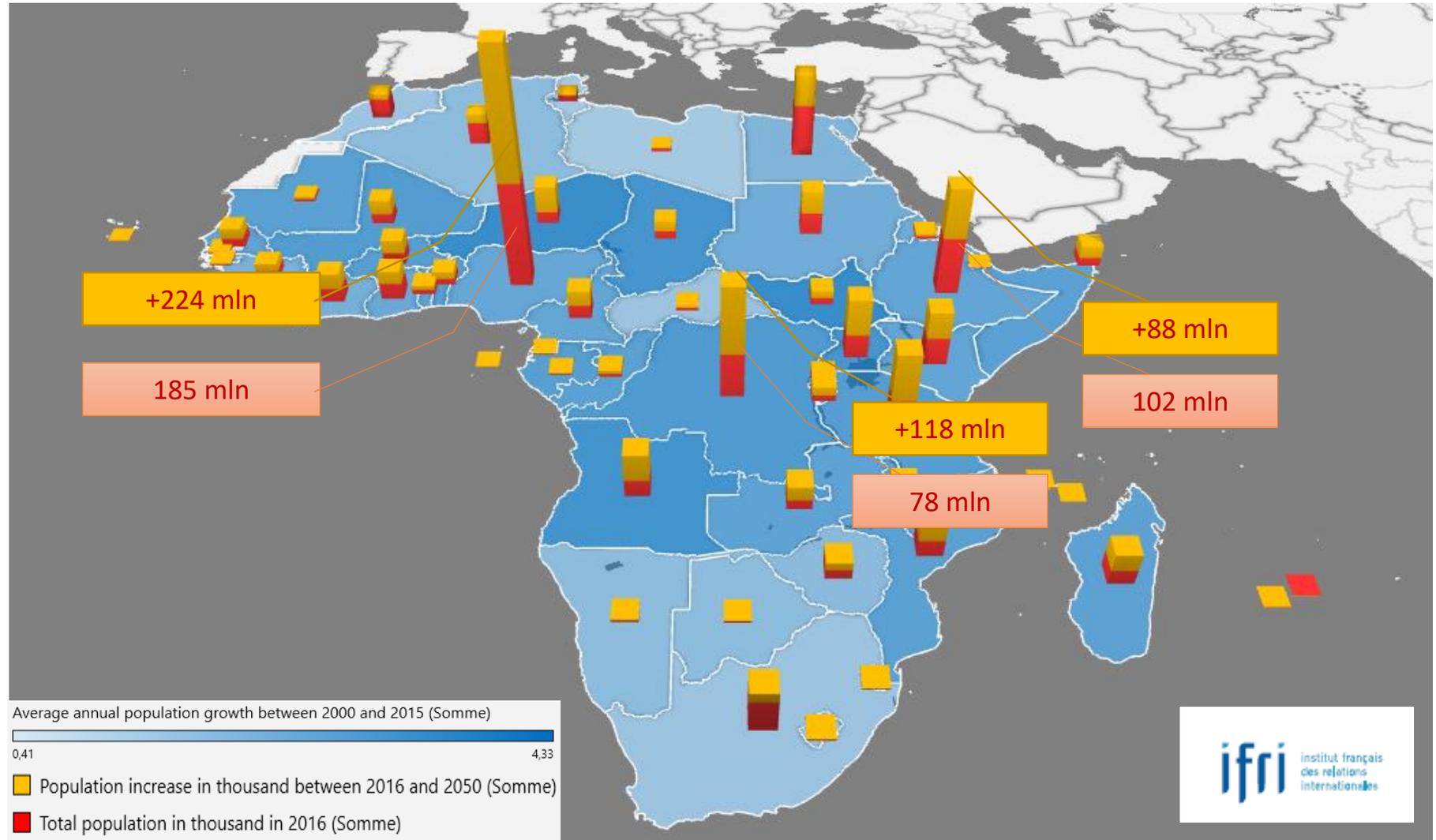
# Africa is big in demography but small in energy and still marginal in greenhouse gas emissions

Comparison of Africa's and USA's share in global TPES and population, 1980-2016



# Surge in population, combined with climate change, water shortage and lack of access are explosive cocktail

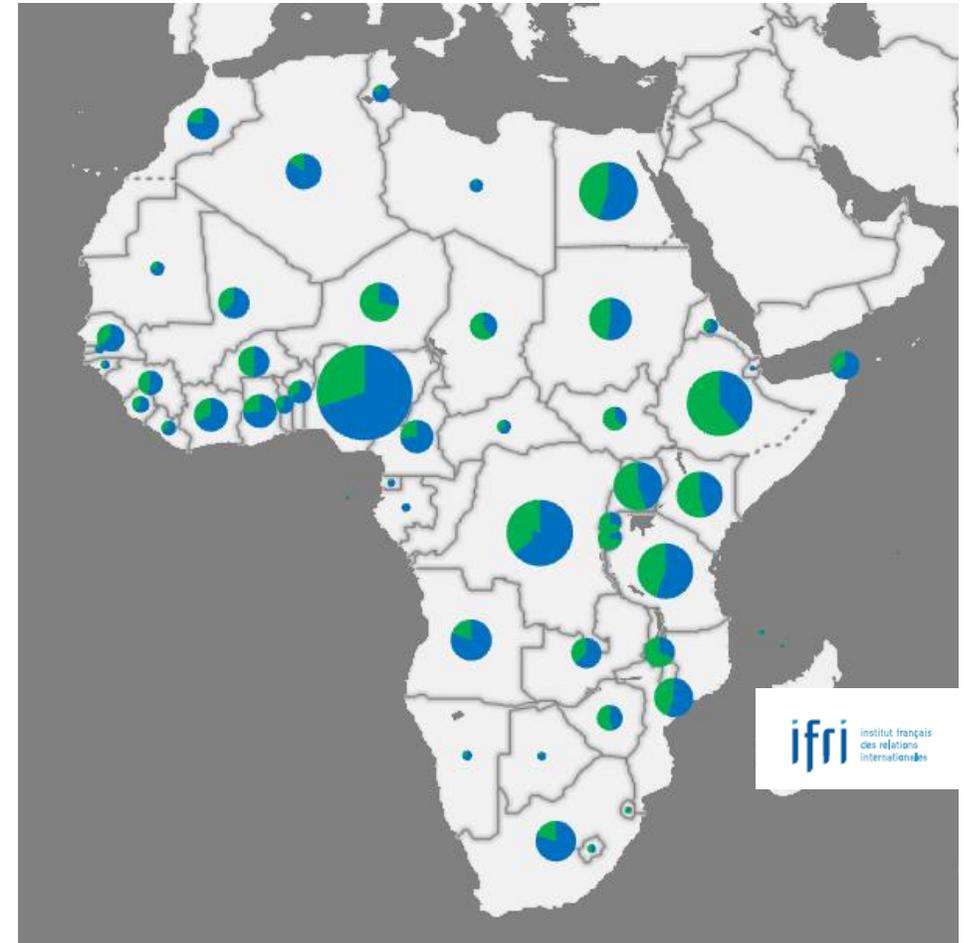
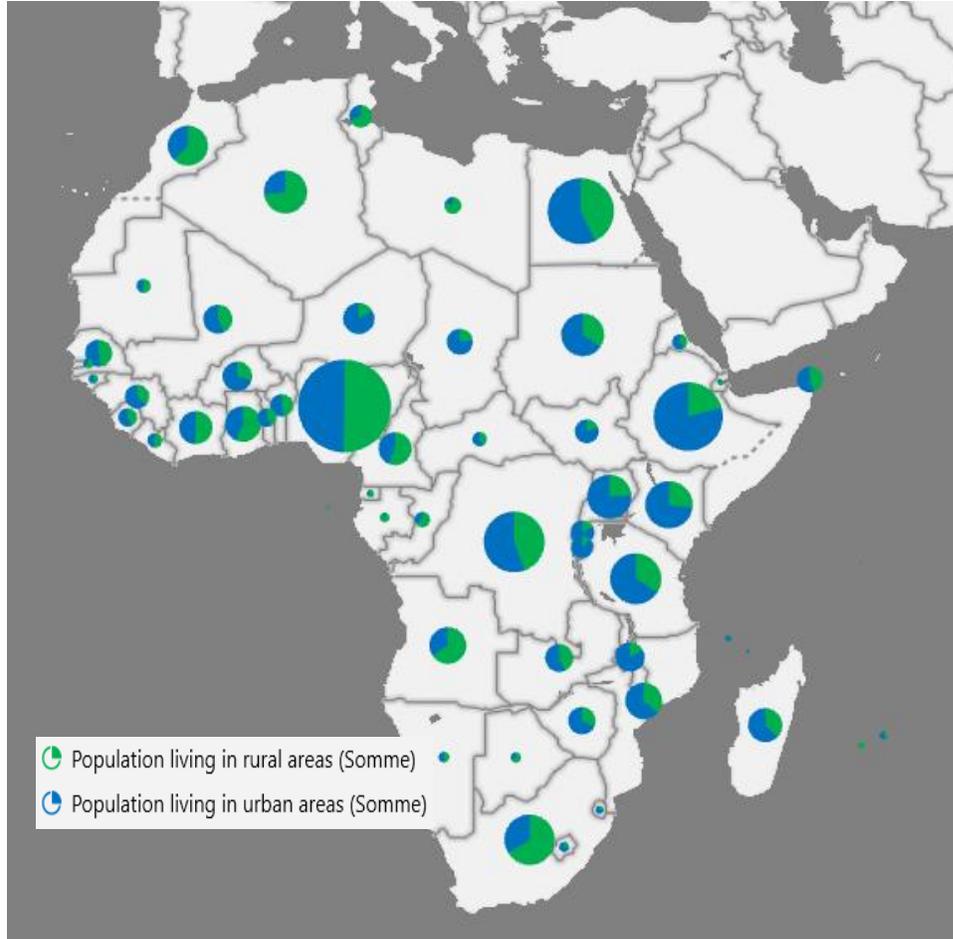
## Population Dynamics



# The challenge of growing urbanization

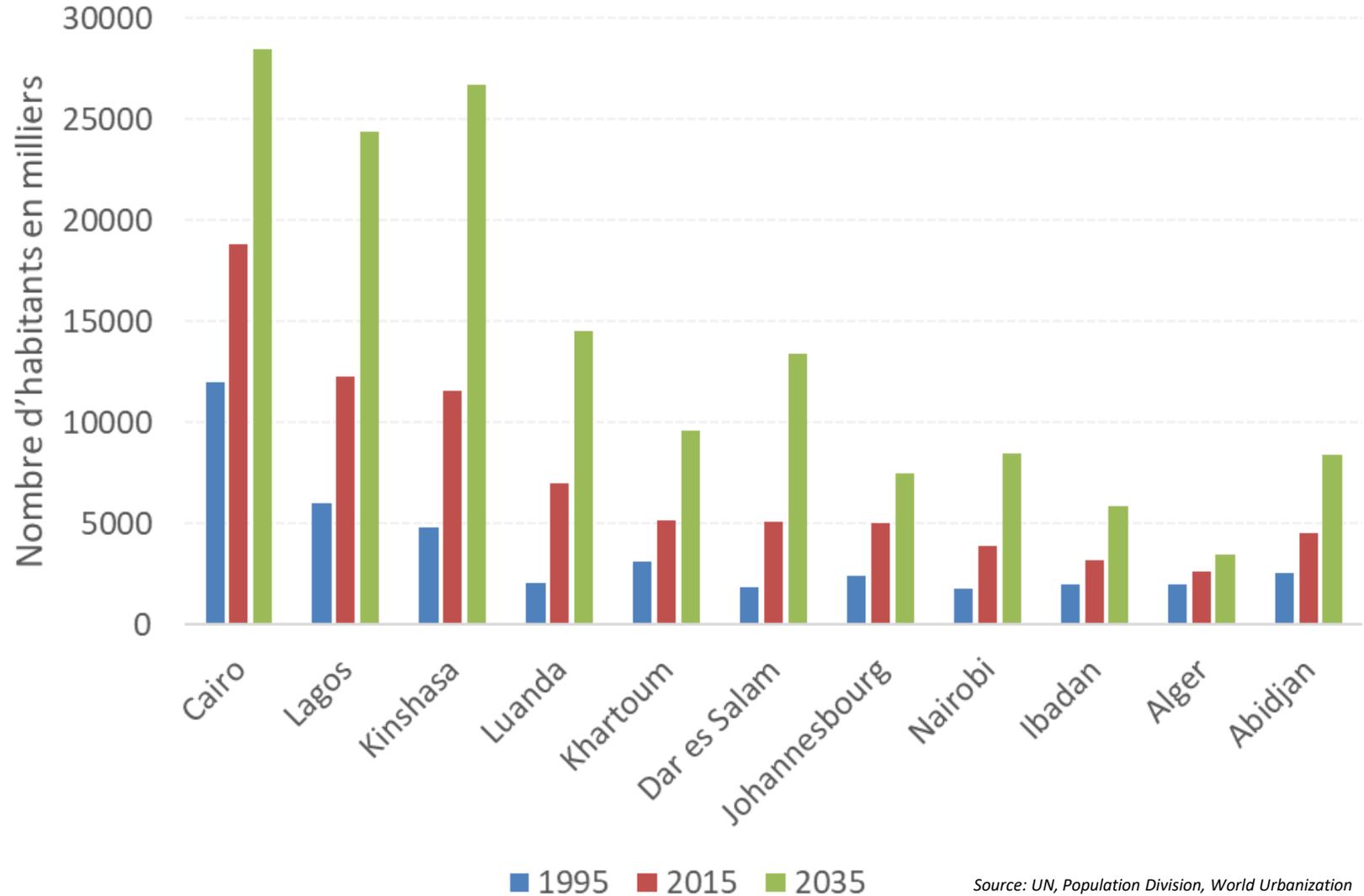
Share of urban and rural population at mid-year 2018

Share of urban and rural population in 2050



# Powering cities and controlling their energy demand and emissions will be key, especially with soaring cooling needs

Population growth in Africa's main cities



Source: UN, Population Division, World Urbanization Prospects 2018

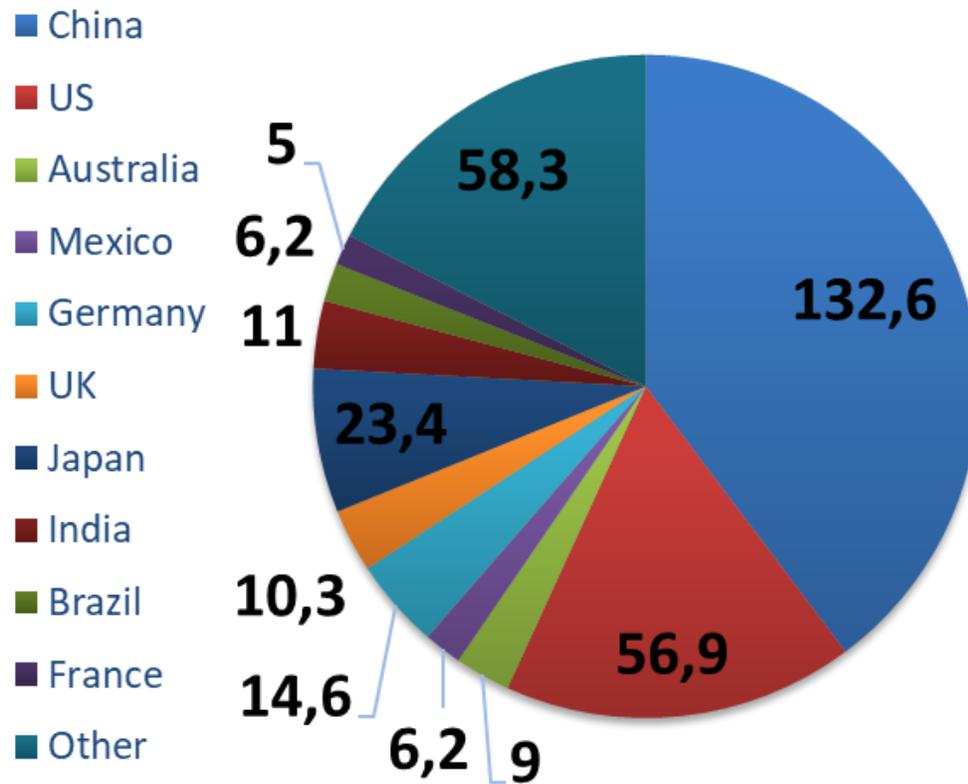
# The threat of inefficient air-conditioning equipment with growing cooling needs

- Economical development, higher incomes, urbanization and global warming are all factors that will contribute to the surge in demand for fans (in a first time), and AC in middle and upper class homes and commercial spaces.
- Air conditioning tends to create demand peak which put strain on an already unstable electricity network
- In Africa today, less than 5%\* of the population own an AC (large potential market, LG just launched its last AC energy efficient conditioner tailored for the Nigerian market).
- Energy use per capita for space cooling in 2016 was of 35kWh\* for Africa and more than 500 kWh\* for the Middle East.

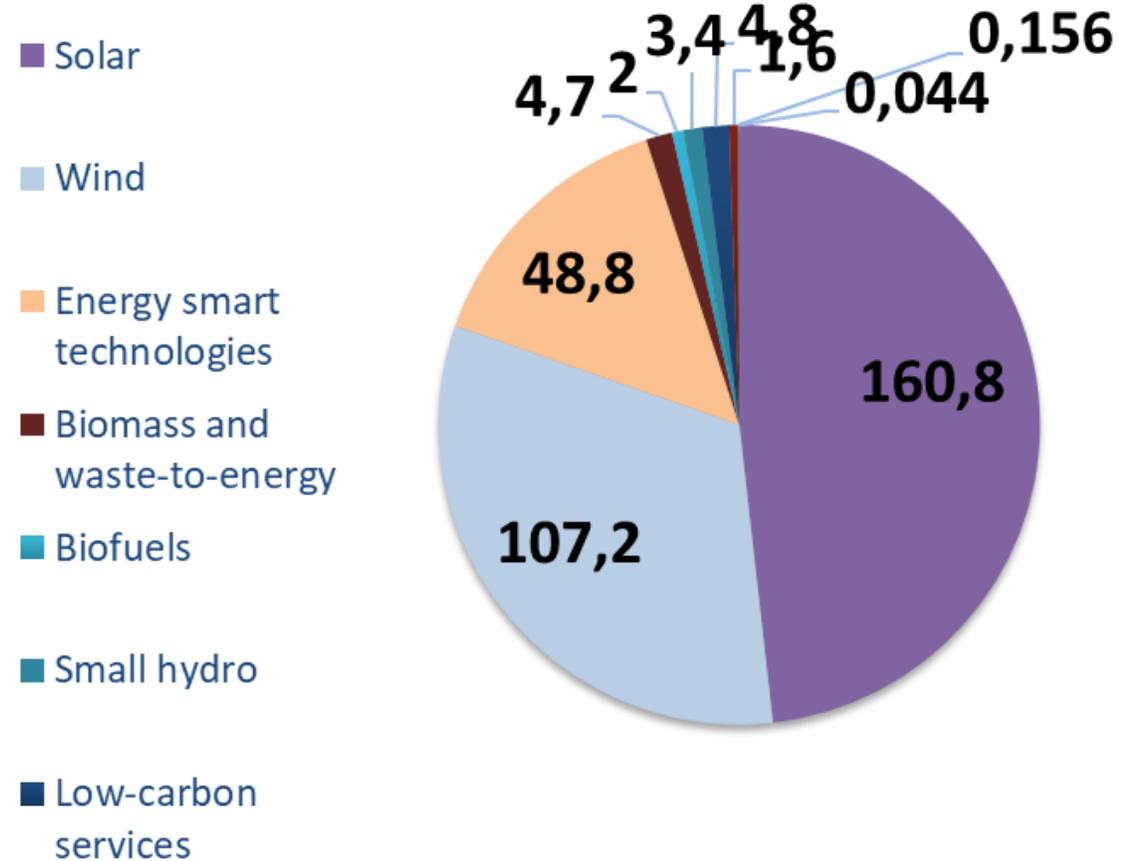


# 2017 renewable investment high but too little in Africa, especially solar PV where the potential is strongest

Global RES investments in 2017 in key countries (\$ billion)



Global RES investments in 2017 by technologies (\$ billion)

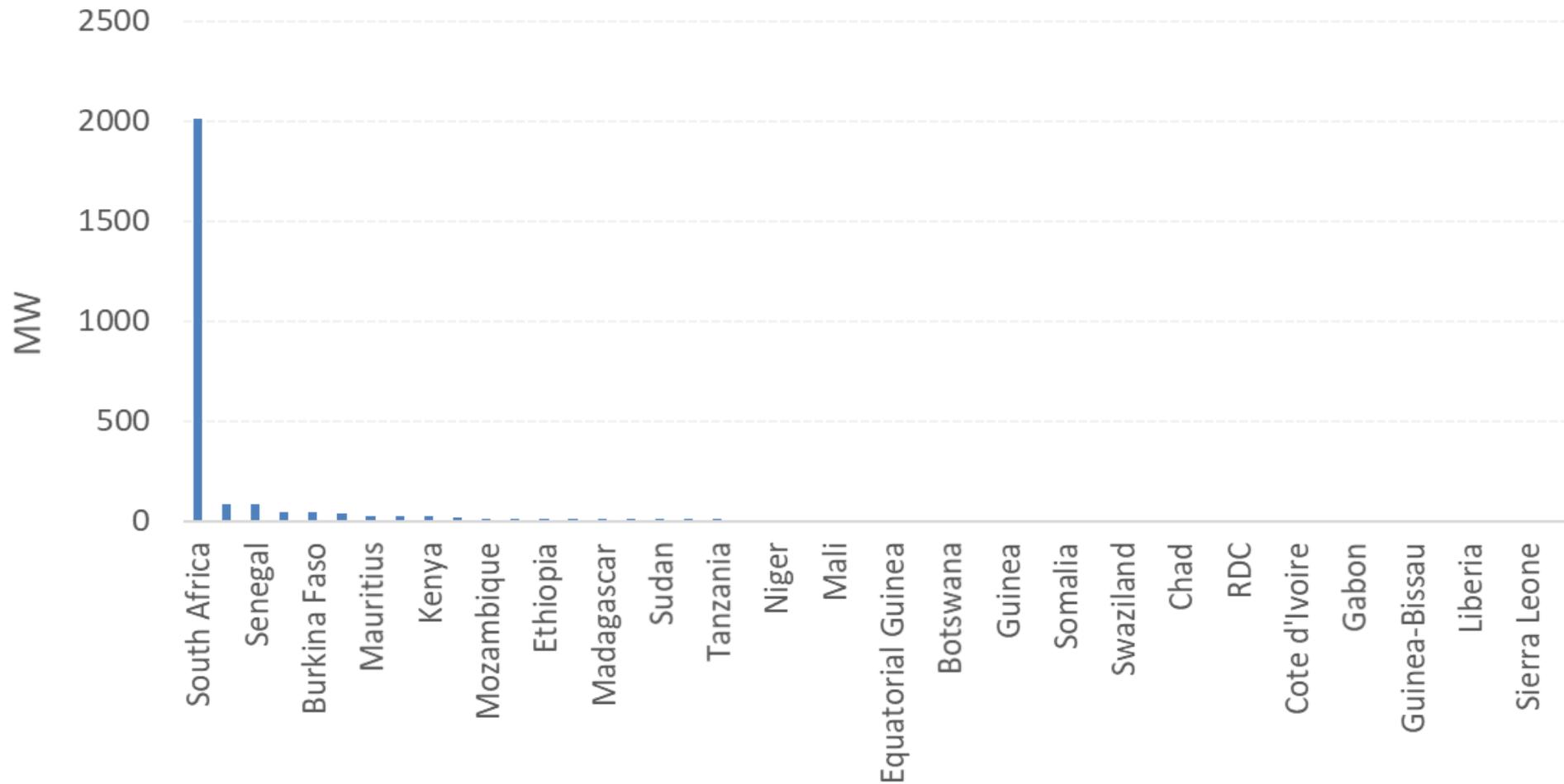


Source: Bloomberg New Energy Finance

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# With the exception of South Africa, solar power in Sub-Saharan Africa is at an embryo stage

Installed solar capacity in Sub-Saharan Africa in 2016



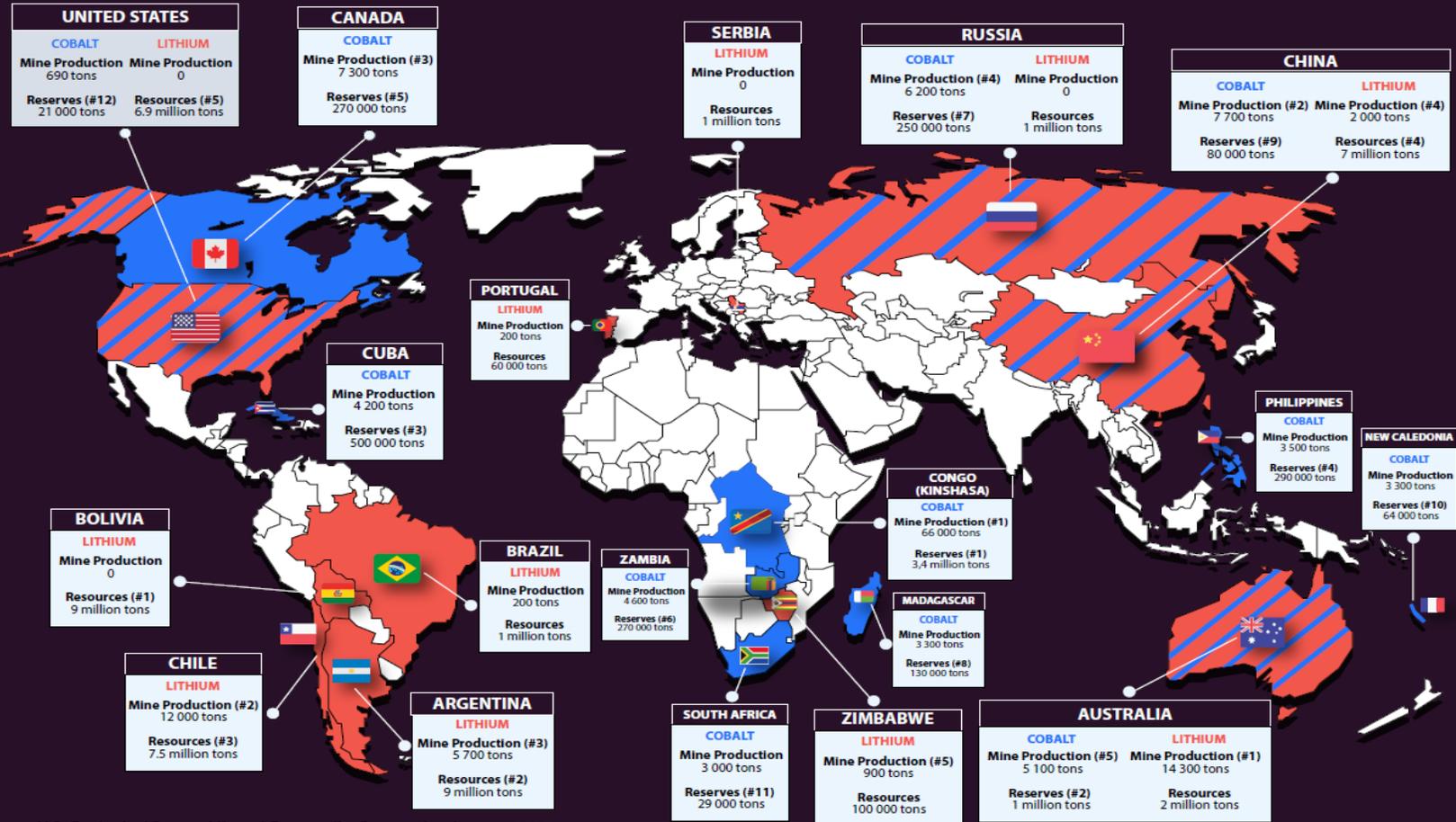
■ Solar Capacity 2016 in Mw in Subsaharan Africa

Source: IRENA, Renewable Capacity Statistics 2018

# Africa well endowed with critical metals: geopolitical, economic, social, environmental stakes

**Lithium production and resources and cobalt production and reserves in a selection of countries and their ranking, year 2016.**

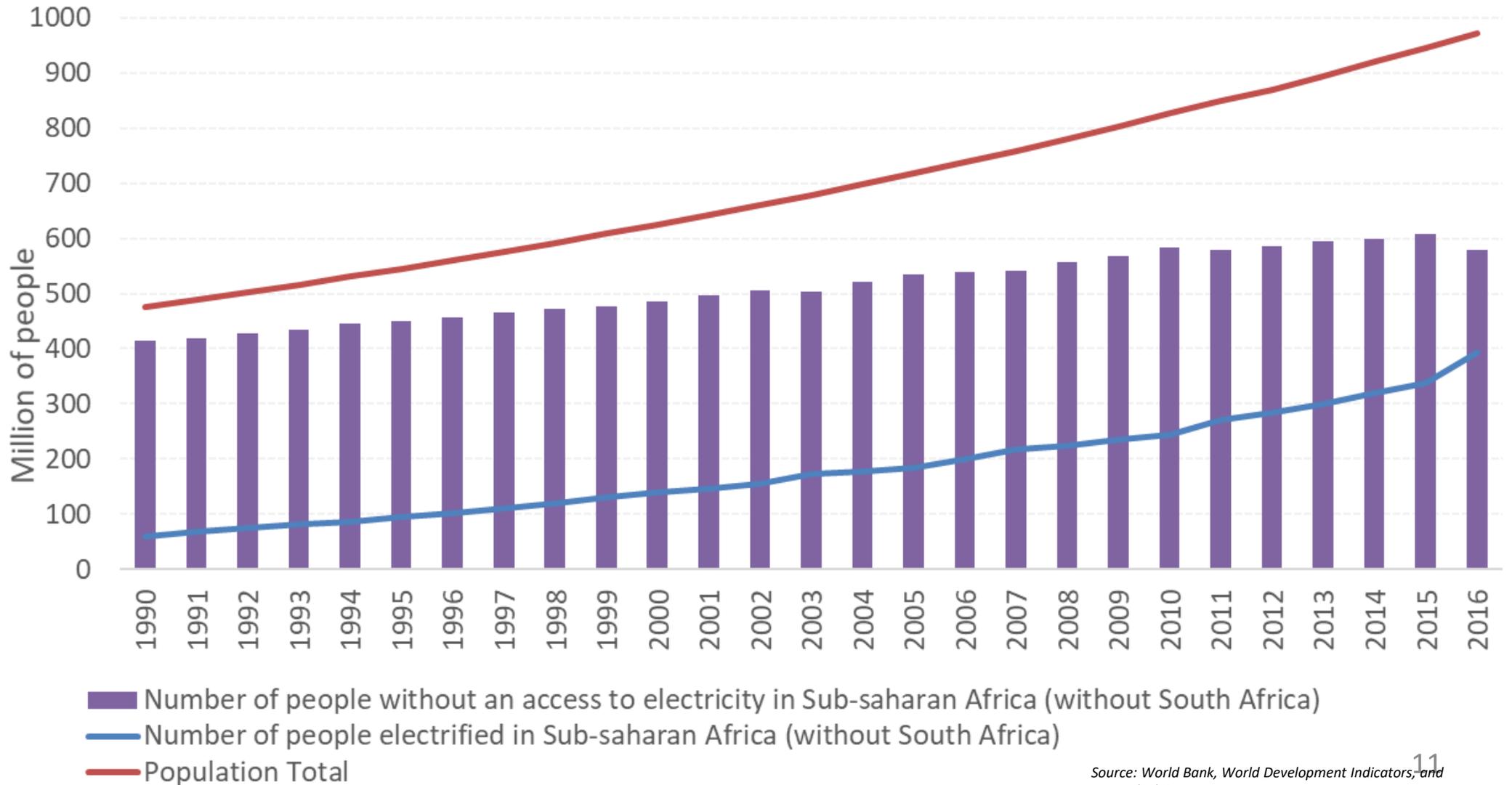
■ Cobalt | 
 ■ Lithium | 
 ■ Cobalt & Lithium | 
 # Ranking



Source: U.S. Geological Survey, Mineral Commodity Summaries, January 2017

# Population increase is stronger than energy access progress

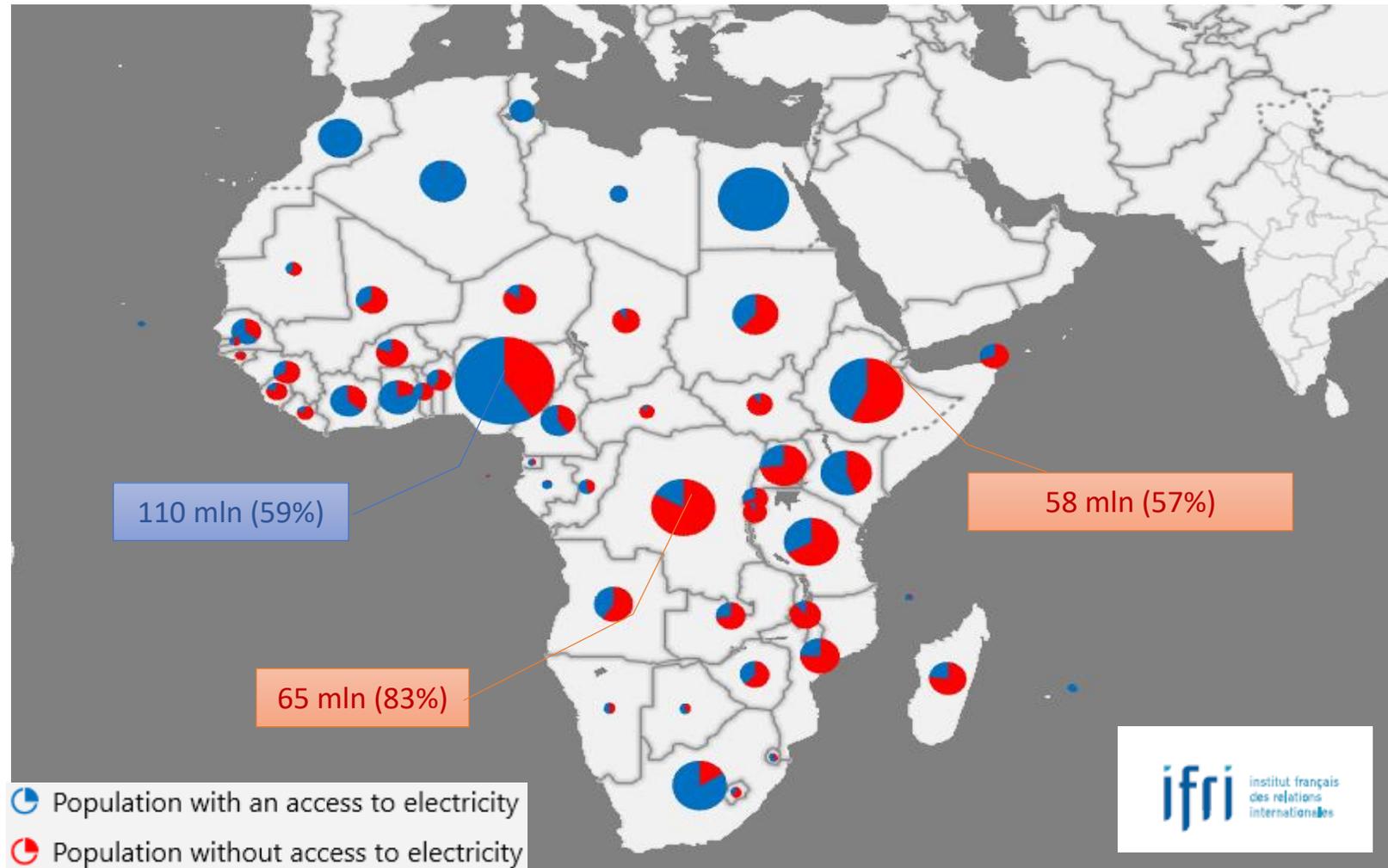
Number of people with and without electricity in subsaharan Africa (without South Africa)



Source: World Bank, World Development Indicators, and own calculations

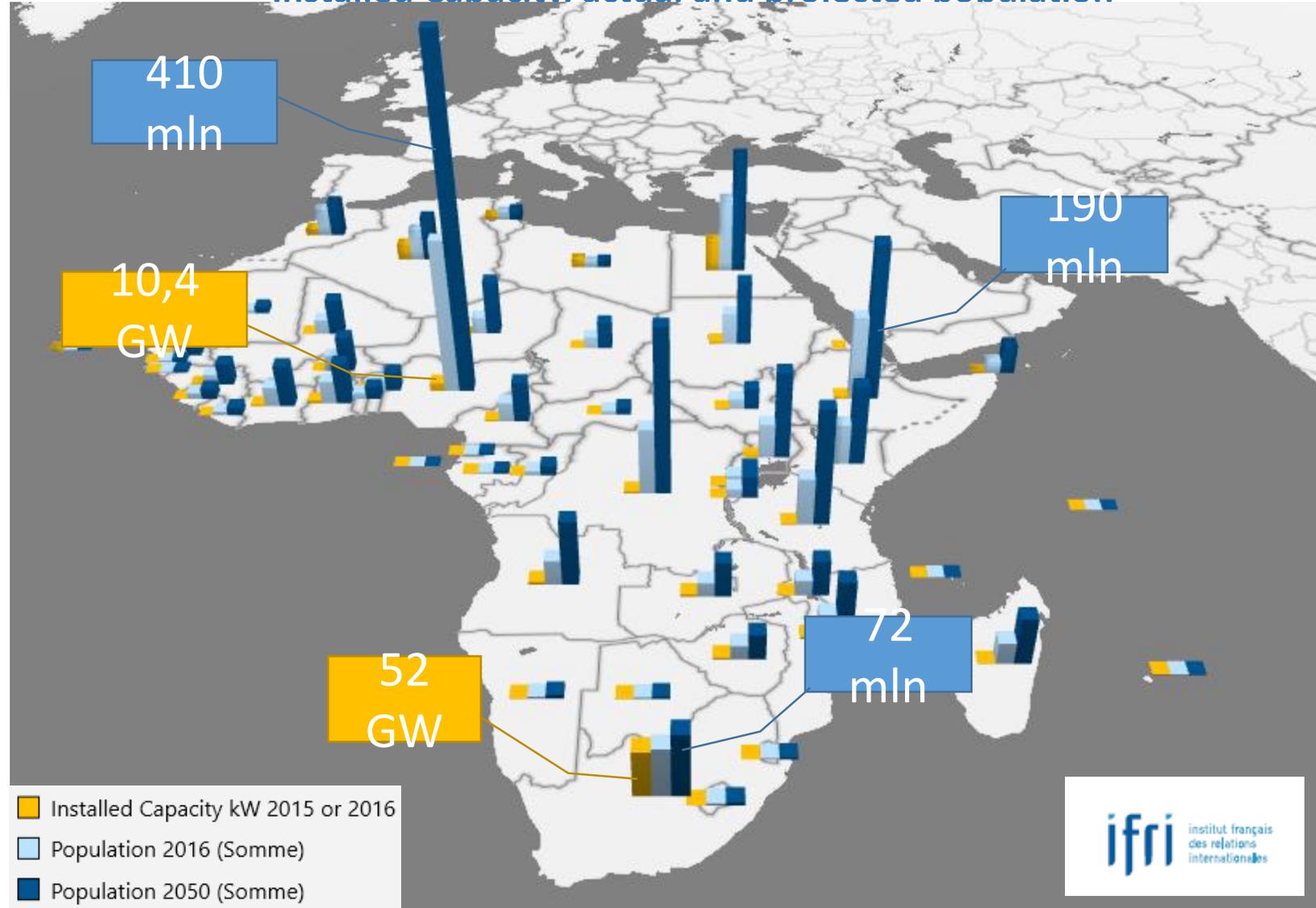
# Sub-Saharan Africa electricity access challenge is unaddressed

Access to electricity (% of population) in 2016



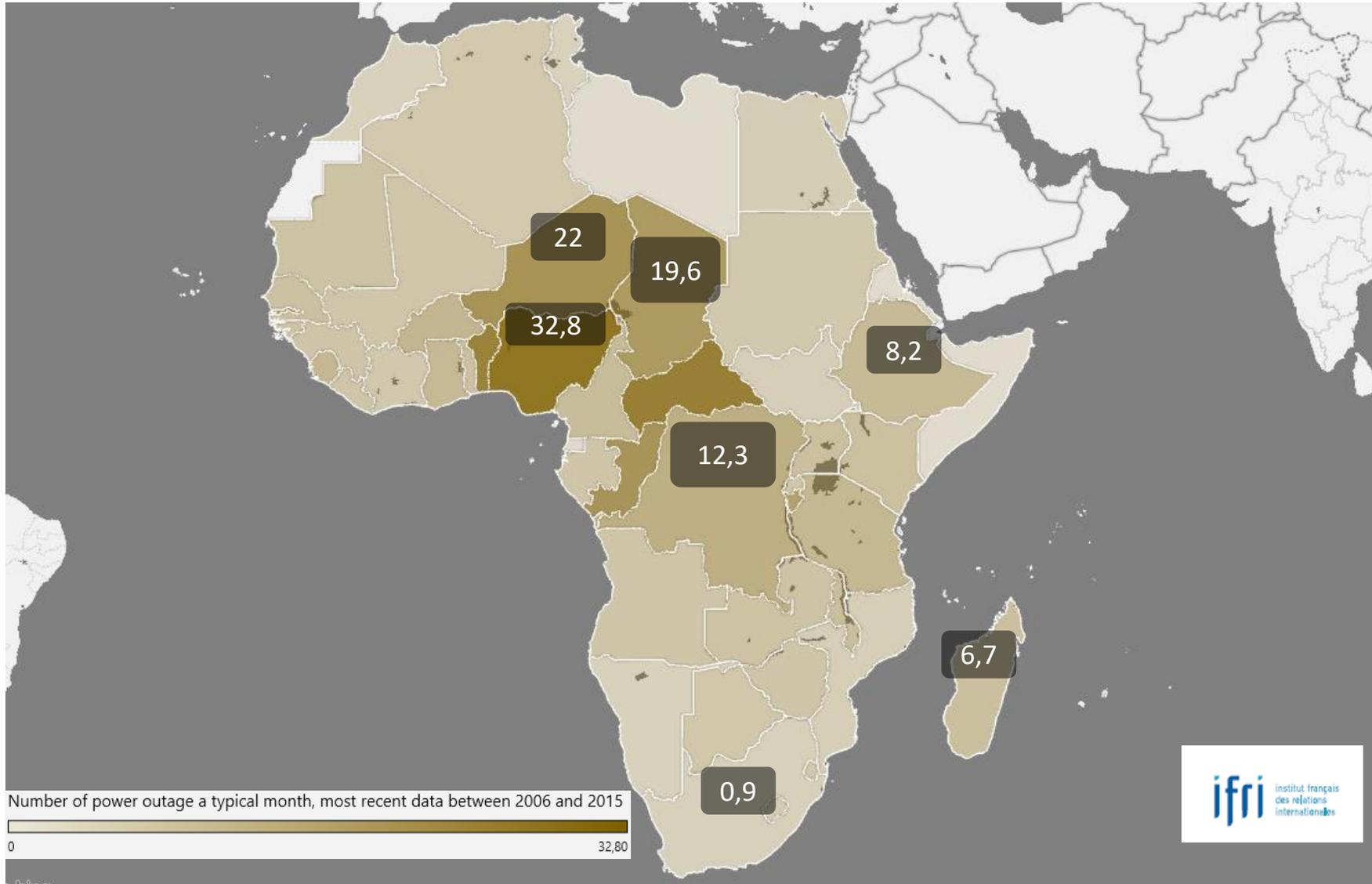
# Tiny installed power generation capacity

Installed Capacity, actual and projected population



# Power outages impede economic activities

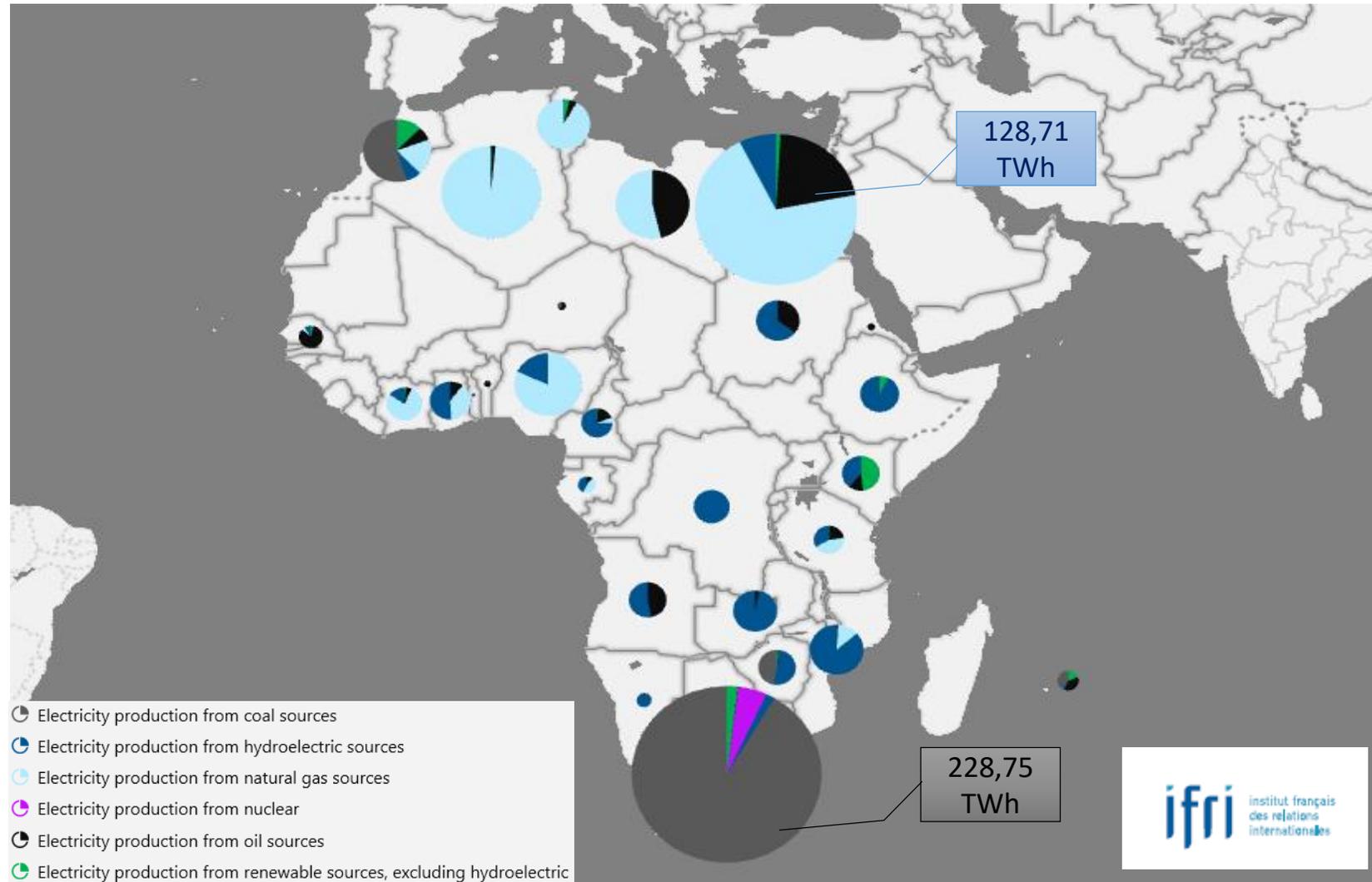
Power outages in a typical month (indicative)



Source: World Bank, World Development Indicators

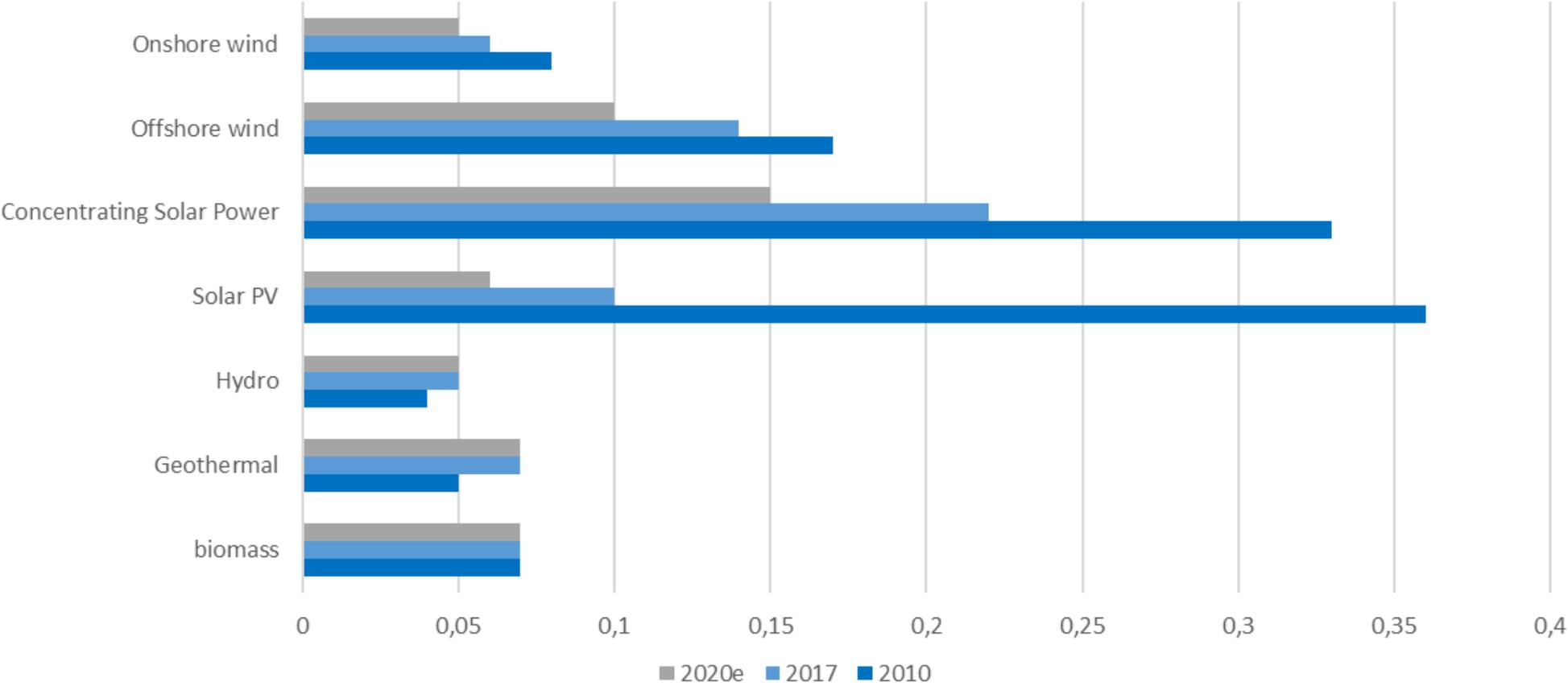
# Sustainable electricity access is not a given, coal is still strong and developed in many countries

Total electricity generation in 2015 by sources



# Historical opportunity: renewable energy technologies increasingly competitive, 2016-2017 breakthrough years

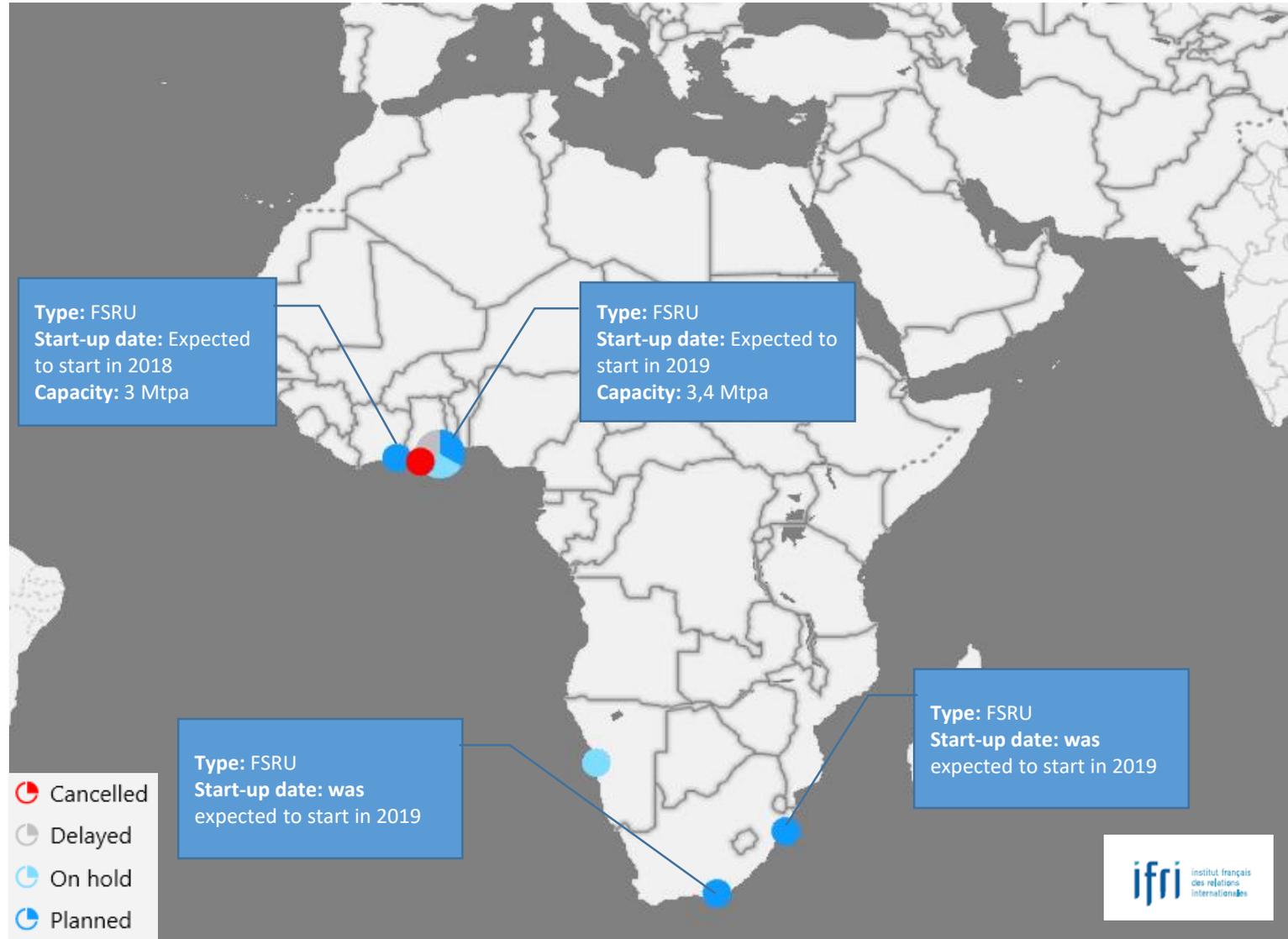
Global levelised costs of electricity from utility-scale renewable power generation technologies, 2010-2020<sup>e</sup> (\$/kWh)



Source: IRENA, Renewable Power Generation Costs in 2017, January 2018

# LNG to power is an option, but no game changer

## Main proposed LNG import terminals in Sub-Saharan Africa



# International initiatives: too many, what results? (1/2)

## ➤ Sustainable Energy for All

- Launched in **2011** by the **UN General Assembly** at the Initiative of Ban Ki-Moon with three main objectives:
  1. Ensuring universal access to modern energy services
  2. Doubling the share of renewable energy in the global energy mix
  3. Doubling the global rate of improvement in energy efficiency

## ➤ Power Africa

- Launched in **2013** by **Barack Obama**, it aims to support economic growth while giving access to reliable, financially accessible and clean energy to Africa.
- It focused at first on 6 countries: Tanzania, Kenya, Ethiopia, Ghana, Nigeria and Liberia before enlarging to whole Sub-Saharan Africa.
- One of its key partner is the **African Development Bank** which committed about **3 billion dollars**
- **It aims at building a platform to put stakeholders together and facilitate investments.**
- It focussed at first on financing new capacity generation before moving also to the distribution and transmission sector following recurrent system breakdown in countries like Nigeria.

➤ **Sustainable Energy Fund for Africa**

- The Fund aims to boost economic growth and support employment in Africa while providing an access to reliable, clean and accessible energy in Africa.
- It is mainly funded by the **Denmark**, the **US** and administred by the **African Development Bank** the financing of **small on medium renewable** power projects.

➤ **Electrification Financing Initiative (ElectriFI)**

- It aims to tackle energy poverty by promoting decentralized renewable power project in developing countries.
- It is funded by the **European Commission** and administred by the **Association of European Development Finance Institutions (EDFI)**.

➤ **The New Deal for Energy in Africa**

- Launched by the **African Development Bank** in **2015**, it aims to provide universal energy access in Africa by 2025 through financing renewable energy projects, offer technical assistance to energy utilities, promoting regional interconnections etc...

# Lessons from India and Bangladesh

## Mini-grids to non connected and densely populated rural area

- For a representative village in Gujarat

Price of subsidized main network electricity < Cost of Mini-grids' electricity < Household level fuelled based electricity

- Provide an economical solution to electrification in rural India.
- Higher potential to foster growth than individual systems as they can provide electricity to machineries...

## Hold-up problems

- Entrepreneurs looking to develop mini-grids project to un-electrified rural India control risks such as revenue collection problems, or theft associated risks by tailoring each project's business model...but:
- What happens if the central grid reaches a mini-Grid?
- Customers would switch to the main grid to benefit from lower government subsidized electricity prices.
- Entrepreneurs would be left with stranded assets.
- Need for a regulatory framework

## Still an incredible surge in electricity access in India

- Electricity access as a percentage of overall population stand **today** at **82%**, it almost **doubled** since **2000** where it's rate was of **43%**.
- If India continues on this trend, it will be able to reach universal access **by 2020**.
- In Bangladesh, a supporting program of subsidies and loans for Solar Home Systems increased electricity access by **15%** since 2012.

# Regional interconnections

- **OMVS transmission expansion project**
  - Between Mali, Mauritania, Senegal.
- **OMVG interconnection project**
  - Between Gambia, Guinea, Guinea-Bissau, Senegal
- **Zizabona interconnection project**
  - Between Zimbabwe , Zambia, Botswana, Namibia
- **CLSG interconnection project**
  - Between Ivory Coast, Liberia, Sierra Leone, Guinea
- **NELSAP interconnection project**
  - Between Burundi, Kenya, Uganda, DRC, Rwanda
- **Ethiopia-Kenya Electricity Highway**

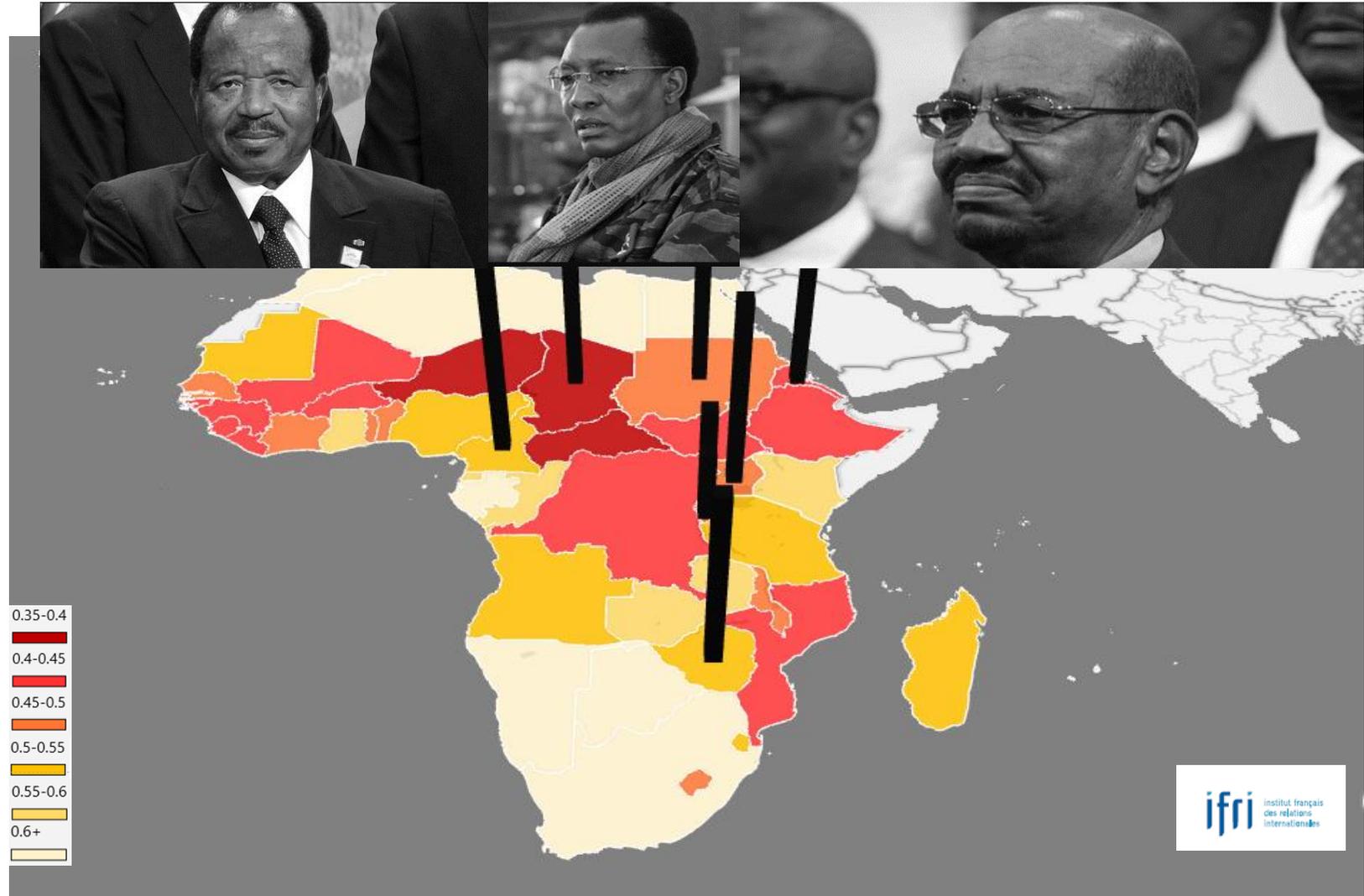
# Hydro has potential

Top 5 African countries by installed hydropower capacity (2016)	MW
Ethiopia	4 054
South Africa	3 583
Egypt	2 800
DR Congo	2 509
Zambia	2 392

- Technical **potential** of hydropower production of about **1 800 TWh/y**
- Total **installed** capacity of about **34 GW**
- **Produced** in 2015 **12 384 TWh** of electricity
- In Africa, **large** hydropower project have an **average LCOE** of about **0,05\$/kWh** and about **0,07-0,08\$/kWh** for **small** project
- Future projects: Ivory coast (Singrobo, Gribo Popoli), Tanzania (Rusumo falls), Uganda, DR Congo (Inga)...

# Bad governance is becoming critical and must be addressed

## African countries' HDI and duration of president's rule



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