

# ENERGY SITUATION IN AFRICA - *Opportunities and Challenges*

By

**ENGR. MUSTAFA B. SHEHU, FNSE**

President,

***FEDERATION OF AFRICAN ENGINEERING ORGANISATIONS***

Delivered at:  
**China National Convention Centre,  
Beijing, China.**

On the occasion of:  
**The World Future Energy Forum,  
WFEF2016:**

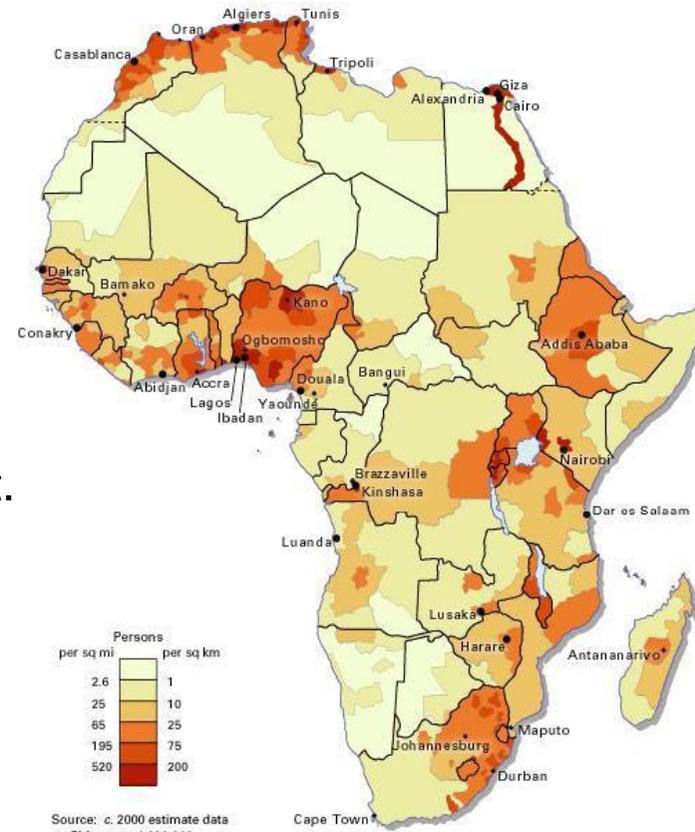
**Affordable, Reliable and Sustainable Energy for the  
Future**

**28-29 June 2016.**



# Introduction

No. of Countries: 55  
Population: 1.15 Billion 2015 est.  
Area: 30.1 million sq km



© 2011 Encyclopedia Britannica, Inc.





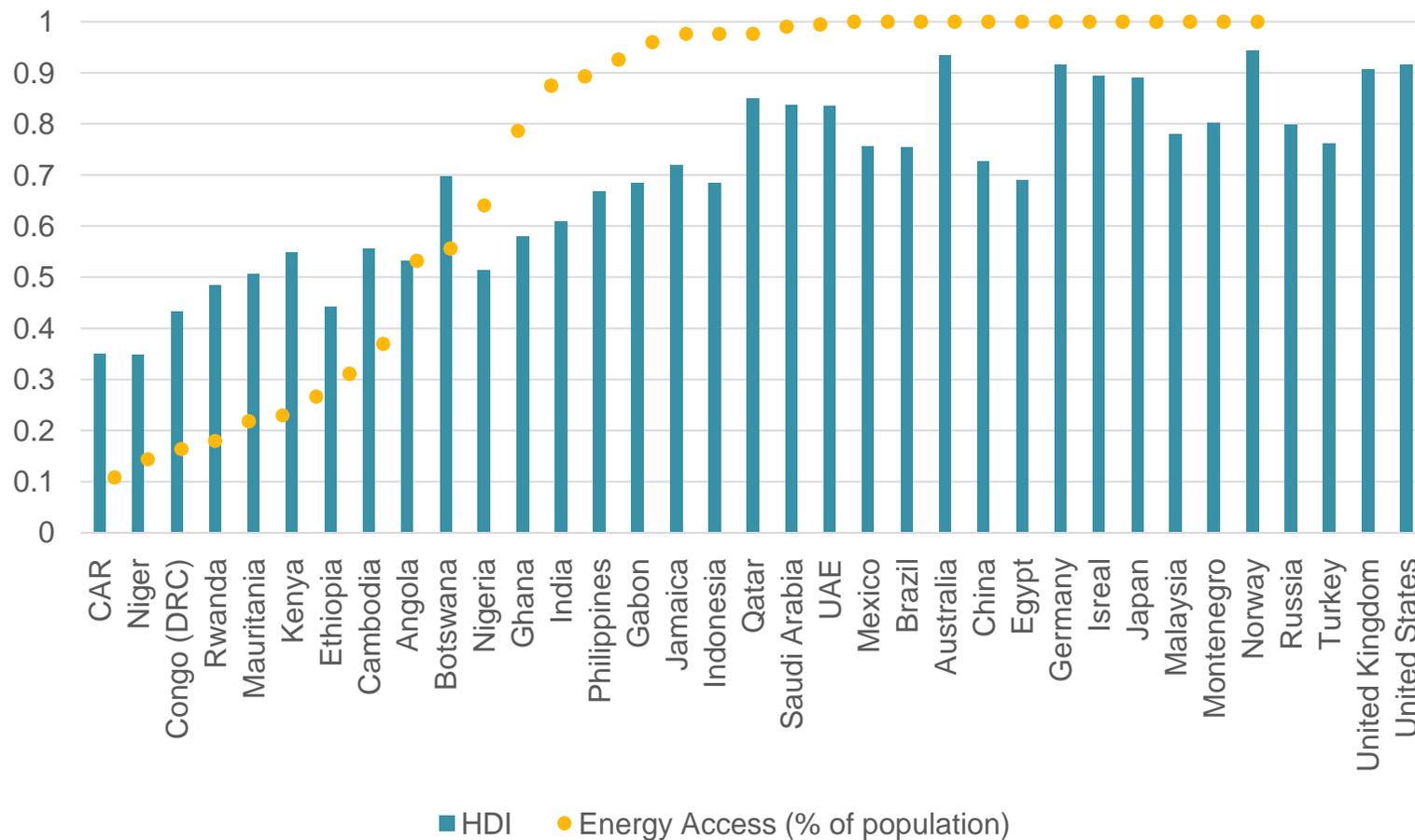
## INTRODUCTION

- Energy is fundamental to every developed economy and indeed is the bedrock of modern civilisation.
- Energy use per capita is one of the most accurate indicators of prosperity and happiness.
- SDG No. 7: Ensure access to affordable, reliable and sustainable modern energy for all.
- The United Nations has developed a measure of quality of life called the Human Development Index (UN HDI).
- HDI values fall between zero and one: one is perfectly happy and zero is very miserable
- This index rises as access to energy rises.



# INTRODUCTION Contd

## Energy Access Vs Human Development Index (HDI)



# ELECTRICITY ACCESS/DEFICIT: Global



Electricity access in 2013 - Regional aggregates

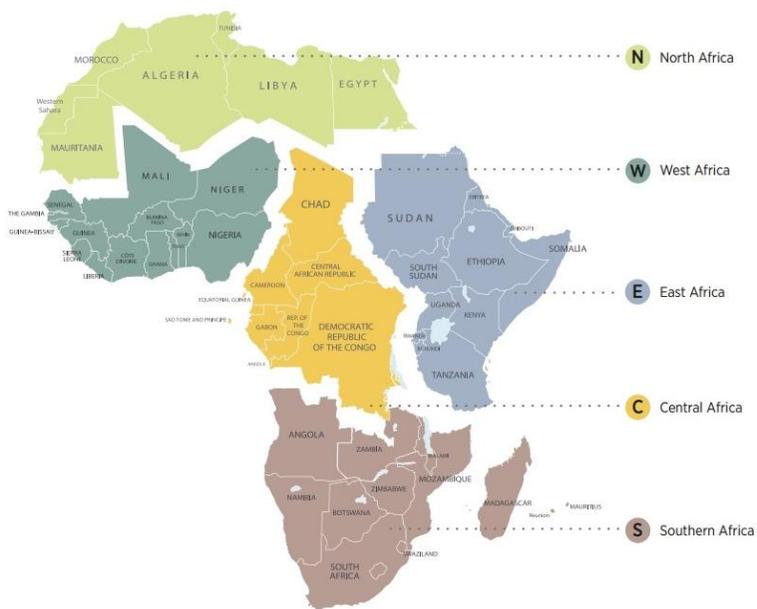
Region	Population without electricity millions	Electrification rate %	Urban electrification rate %	Rural electrification rate %
Developing countries	1,200	78%	92%	67%
Africa	635	43%	68%	26%
<i>North Africa</i>	1	99%	100%	99%
<i>Sub-Saharan Africa</i>	634	32%	59%	17%
Developing Asia	526	86%	96%	78%
<i>China</i>	1	100%	100%	100%
<i>India</i>	237	81%	96%	74%
Latin America	22	95%	98%	85%
Middle East	17	92%	98%	79%
Transition economies & OECD	1	100%	100%	100%
<b>WORLD</b>	1,201	83%	95%	70%

SOURCE: IEA, World Energy Outlook 2014



# ELECTRICITY ACCESS/DEFICIT: Africa

Africa's energy landscape



Population (million people)	GDP billion/yr (current international \$)	Access to electricity (% population)	Electricity (KWh per capita)
175	1936	98%	1574
327	1310	47%	188
303	646	23%	91
115	227	25%	167
177	1100	43%	2061

\* Note: statistics refer to 2013, except for access to electricity which refers to 2012.

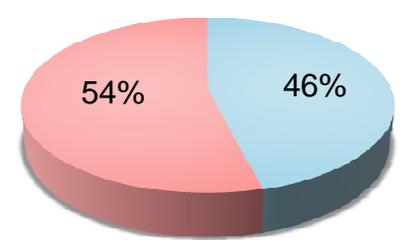
Source: IRENA





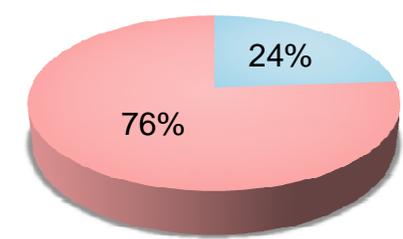
# ELECTRICITY ACCESS/DEFICIT: Sample African Countries

Electrification Rate for **Nigeria**  
(Total Un-electrified Population = 96Million)



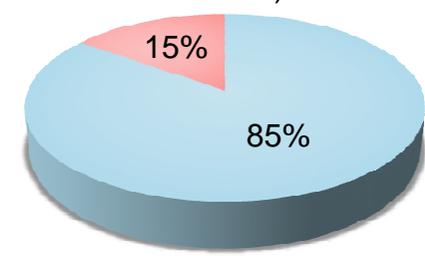
Urban electrification rate – 55%  
Rural electrification rate – 37%

Electrification Rate for **Ethiopia**  
(Total Un-electrified Population = 71Million)



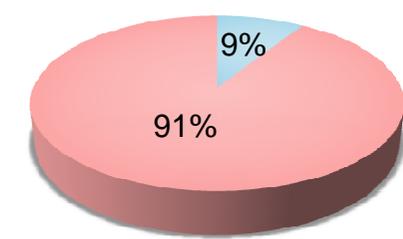
Urban electrification rate – 85%  
Rural electrification rate – 10%

Electrification Rate for **South Africa**  
(Total Un-electrified Population = 8Million)



Urban electrification rate – 90%  
Rural electrification rate – 77%

Electrification Rate for **DRC** (Total Un-electrified Population = 61Million)

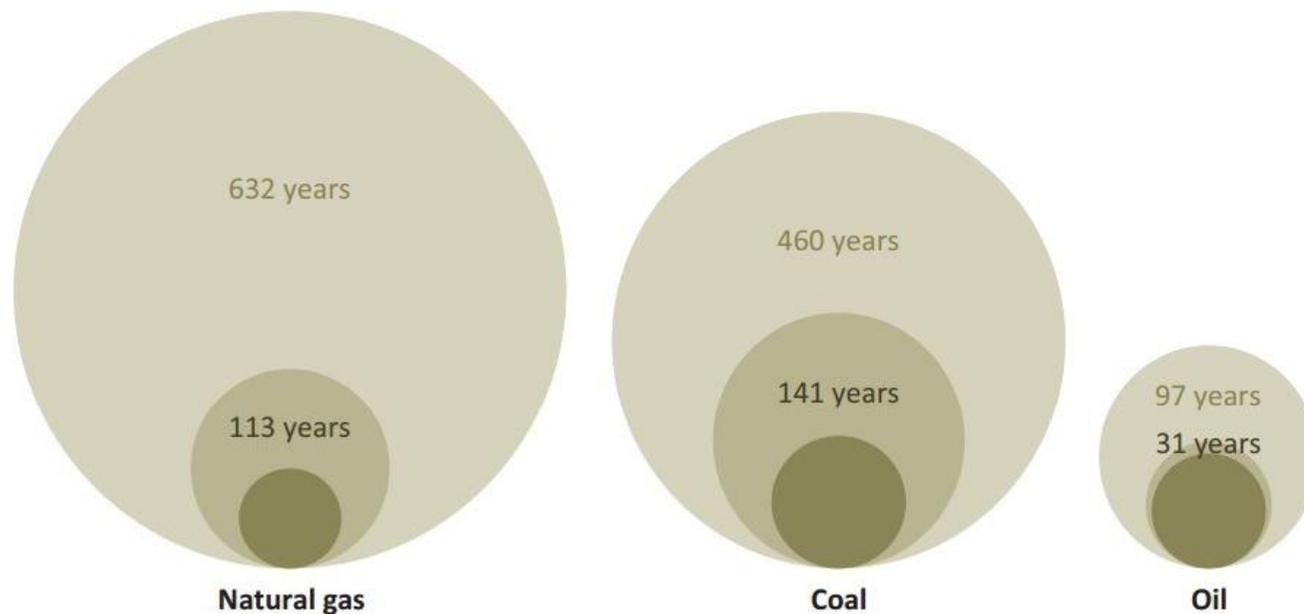


Urban electrification rate – 19%  
Rural electrification rate – 2%





# AFRICA'S ENERGY POTENTIAL: Fossil Fuels



● Cumulative production to date ● Proven reserves ● Total remaining recoverable resources

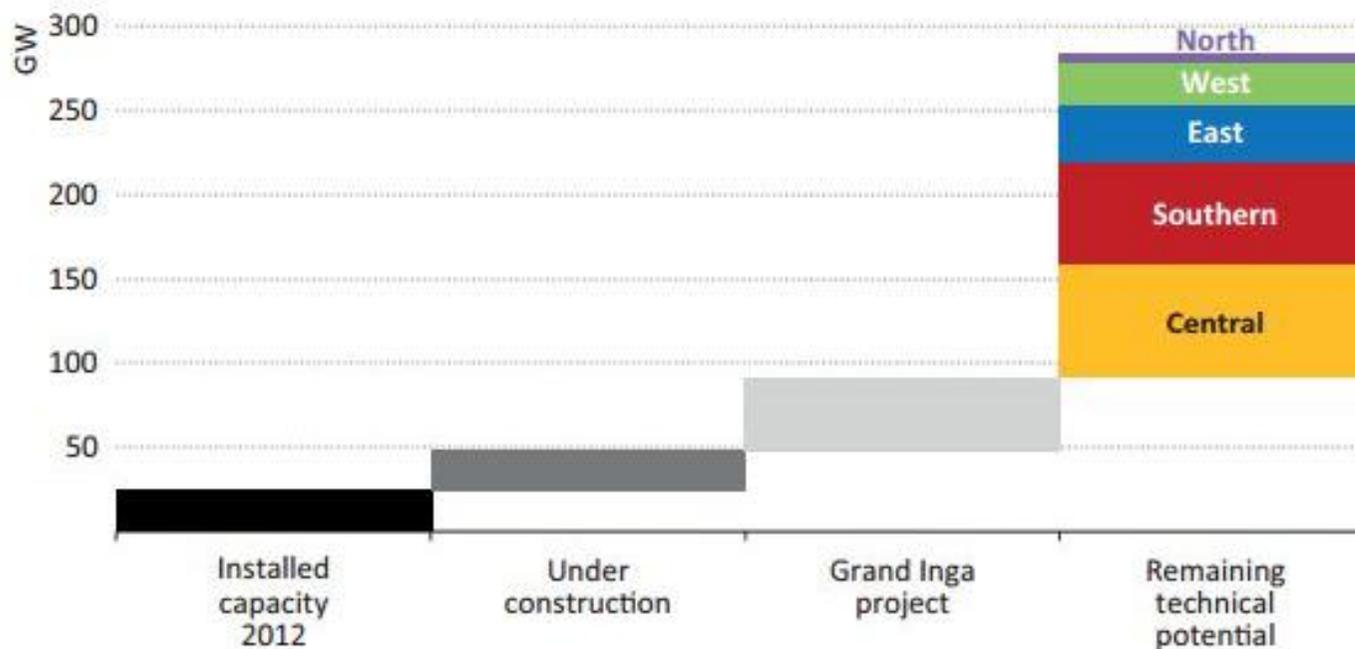
Notes: All bubbles are expressed as a number of years production based on estimated production levels in 2013. Production numbers for gas include flaring – if flaring were to cease today, there would be sufficient resources for around 960 years of production at 2013 production levels. Remaining recoverable oil and gas resource numbers include conventional and unconventional resources.

Sources: USGS (2000); USGS (2012a); USGS (2012b); Cedigaz (2013); BGR (2013); IEA analysis.





# AFRICA'S ENERGY POTENTIAL: Hydropower Potential



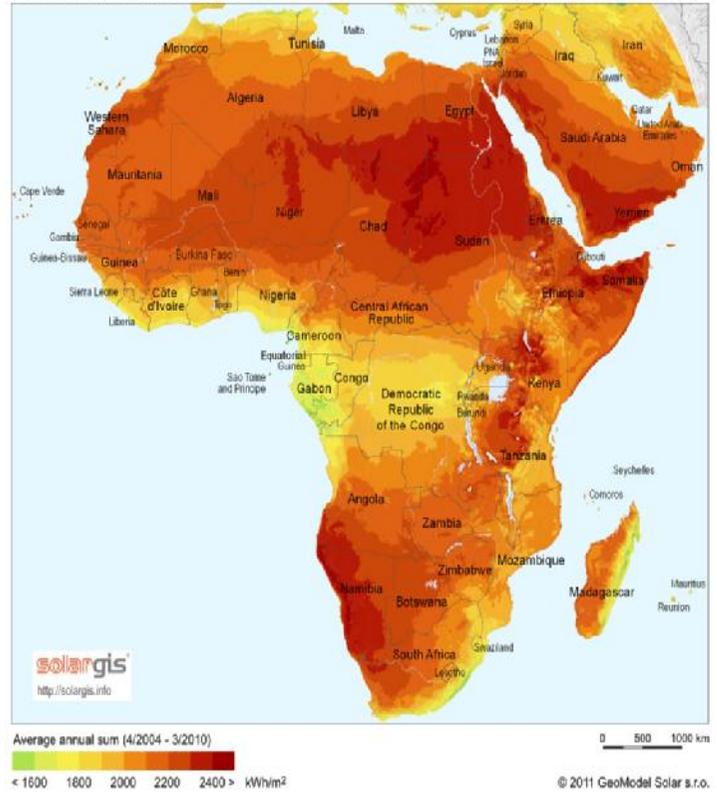
Sources: IPCC (2011); IJHD (2009) and (2010); IEA analysis.



# AFRICA'S ENERGY POTENTIAL: Renewable Energy

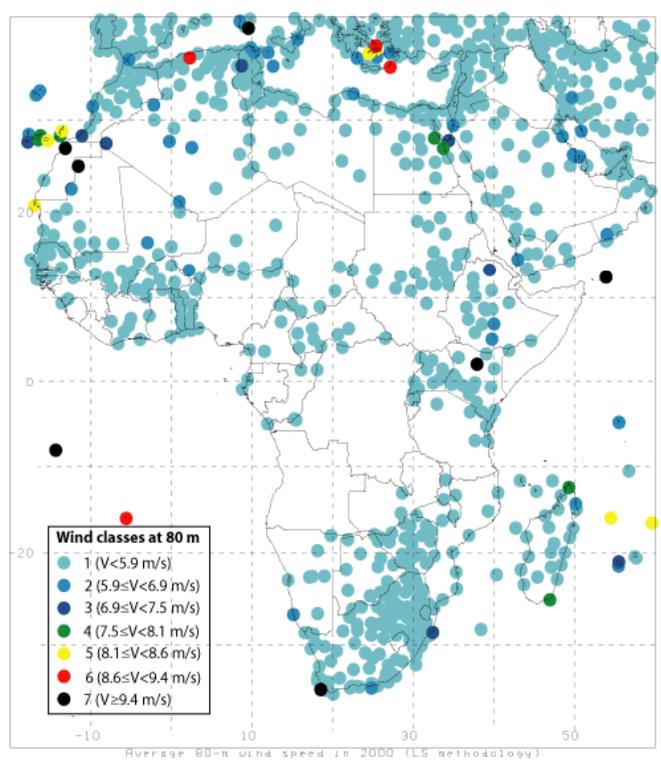
## Solar Energy Potential

Global horizontal irradiation Africa and Middle East



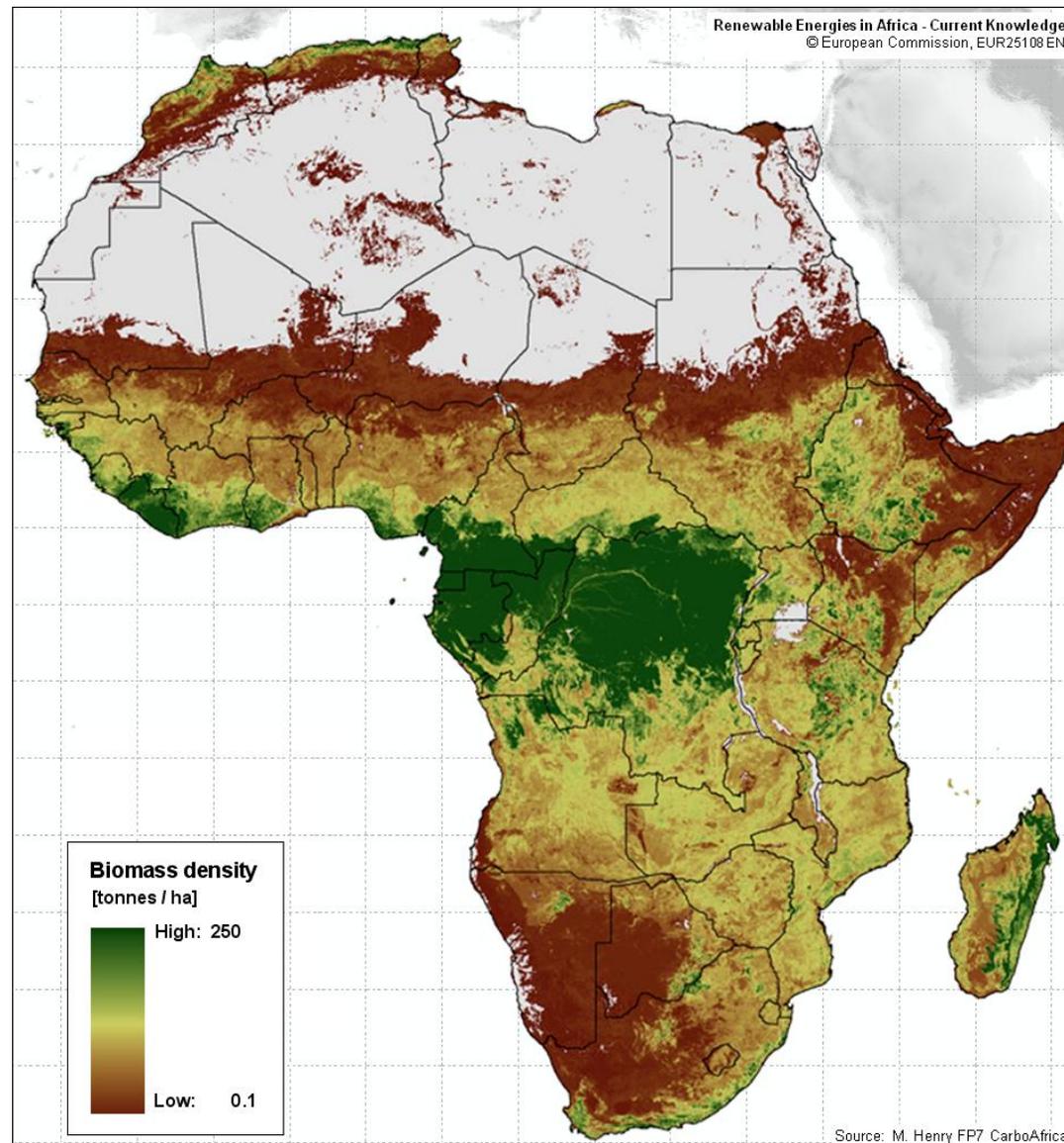
Source: SolarGIS

## Wind Energy Potential



Source: Global Energy Network Institute (GENI)

# AFRICA'S ENERGY POTENTIAL: Biomass

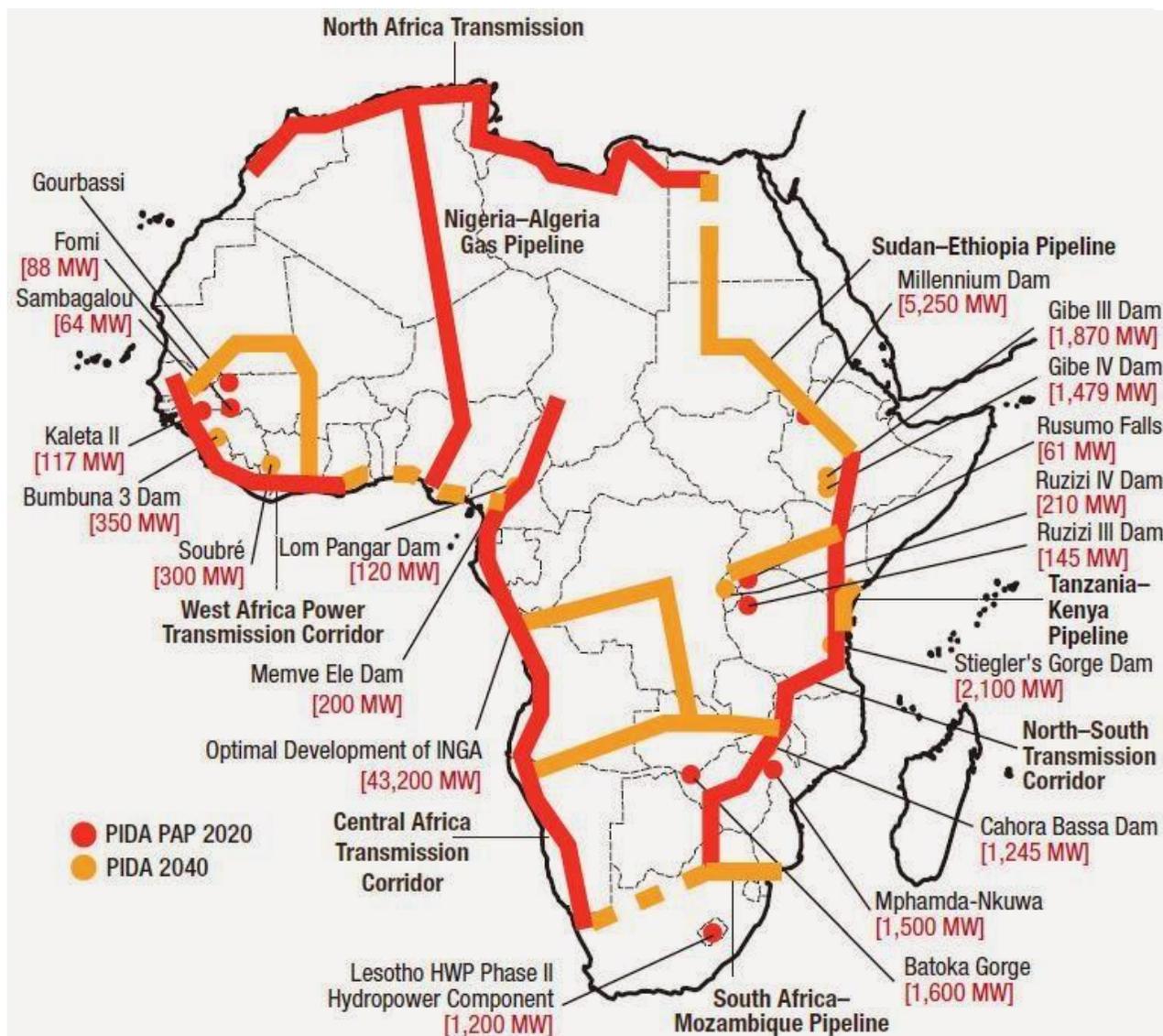




# Initiatives towards sufficient Power Supply

- At National Regional and Continental levels, some energy masterplans have been set to address energy deficits and cater for the projected growth over time.
  - Programme for Infrastructure Development in Africa (2012–2040)
  - East African Power Master Plan (2003 – 2024)
  - Nigeria’s Integrated Infrastructure Master Plan (2006 – 2030)
  - South Africa’s Energy Security Master Plan (2007 – 2025)

# TARGET SITUATION: PIDA Priority Action Plan (Energy Masterplan)



## 15 ENERGY SECTOR PROJECTS IN PIDA PRIORITY ACTION PLAN PROJECTS AT A TOTAL COST OF US\$40.3 billion (excluding the Nigeria-Algeria Gas Pipeline)

	Project Title	Cost (USD m)	Countries	RECs
EN01	Great Millennium Renaissance Dam	8,000	Nile Basin (Burundi, DRC, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda)	COMESA/IGAD
EN02	North South Power Transmission Corridor	6,000	Kenya, Ethiopia, Tanzania, Malawi, Mozambique, Zambia, Zimbabwe, South Africa	COMESA/EAC/SADC/IGAD
EN03	Mphamda – Nkuwa	2,400	Zambezi Basin (Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe)	SADC
EN04	Lesotho HWP Phase II – hydropower component	800	Orange-Senqu River Basin (Botswana, Lesotho, Namibia, South Africa)	SADC
EN05	Inga III Hydro	6,000	Congo River (Angola, Cameroon, Congo, DRC, Tanzania, Zambia)	ECCAS
EN06	Central African Interconnection	10,500	South Africa, Angola, Gabon, Namibia, Ethiopia	ECCAS
EN07	Sambagalou	300	OMVG (Gambia, Guinea, Guinea Bissau, Senegal)	ECOWAS
EN08	West African Power Transmission Corridor	1,200	Guinea, Guinea Bissau, Gambia, Sierra Leone, Liberia, Côte d'Ivoire, Ghana	ECOWAS
EN09	North Africa Transmission	1,200	Tunisia, Libya, Egypt Morocco, Algeria,	AMU
EN10	Kaleta	179	OMVG (Gambia, Guinea, Guinea Bissau, Senegal)	ECOWAS
EN11	Batoka	2,800	Zambezi Basin (Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe)	COMESA/EAC
EN12	Ruzizi III	450	Burundi, Rwanda, DRC	COMESA/EAC
EN13	Rusumo Falls	360	Nile River Basin (Burundi, Rwanda, Tanzania)	COMESA/EAC
EN14	Uganda-Kenya Petroleum Products Pipeline	150	Uganda, Kenya	COMESA/EAC
EN15	Nigeria – Algeria Pipeline	13,000	Nigeria, Niger, Algeria	UMA/ECOWAS





## TARGET SITUATION

- Power demand is expected to increase six-fold between 2010 and 2040, an average annual growth of nearly 6%. To keep pace, installed power generation capacity must rise from present levels of 125 gigawatts to almost 700 gigawatts by 2040.
- This goal of attaining energy sufficiency and security can be achieved by using a diverse range of available options.
  - Fossil fuels
  - Renewable energy
  - Nuclear Power
- With the deployment of all the available potentials to generate adequate power in Africa, the huge deficit will be gradually reducing and thereby increasing access to electricity to the ever-increasing population.
- This will give incentives to industrial growth and support local participation of young entrepreneurs thereby creating wealth across the continent.





## CHALLENGES

### – TECHNICAL CHALLENGES

- Shortage of qualified manpower
- Inadequate manufacturing capacity of basic plant and equipment
- Lack of transparency in project delivery

### – FINANCIAL & LEGAL CHALLENGES

- Limitations in sources of finance
- Mono Economies
- Sector regulations and enforcement
- Limited Investor confidence

### – POLITICAL & SOCIAL CHALLENGES

- Frequent changes in Government and the associated changes in priorities of each Government
- Inconsistent Government Policies
- Poor use of energy





## WAY FORWARD

As Africa's energy demand will grow significantly over the coming decades, there must be new power generation and associated infrastructures to bridge the gap between energy supply and demand. In order to achieve this, Africa will require:

- Sustainable and balanced energy mix consisting fossil fuels, renewable and nuclear energy
- The use of modern transmission and distribution systems.
  - Flexible AC Transmission Systems (FACTS)
  - Distributed Generation (DG)
  - Smart grids
- Achievement of Energy efficiency through demand side management.
  - Education on energy usage
  - Adoption of more sustainable technologies
  - Financial incentives
- The use of Public Private Partnerships to fund energy projects to reduce the burden on governments to wholly fund such projects
- A more effective use of the African Union to resolve disputes on energy resources between countries (E.g. Utilization of major rivers for Hydro power and irrigation projects)





## WAY FORWARD Contd

### Review national energy policies to:

- Ensure that remote rural communities are catered for.
- Ensure to reform the energy sectors to make them market oriented with ample encouragement of the organised private sector to invest in the development of the national energy infrastructure.
- Adopt appropriate frameworks to promote the practical adoption of new energy technologies. This will include incentives to users and producers of new energy technologies as well as feed-in-tariffs.
- Strengthen the national energy regulatory frameworks to ensure orderly development of the sector and also to ensure international best practices are adopted on the issue of licences for new plants as well as involvement of both cost-reflective tariffs and practical provisions for indigent groups.
- Ensure that the reviewed energy policies are passed into law by parliaments. This is necessary for the majority of African countries in view of the frequent unnecessary policy changes from one elected administration to the next one.

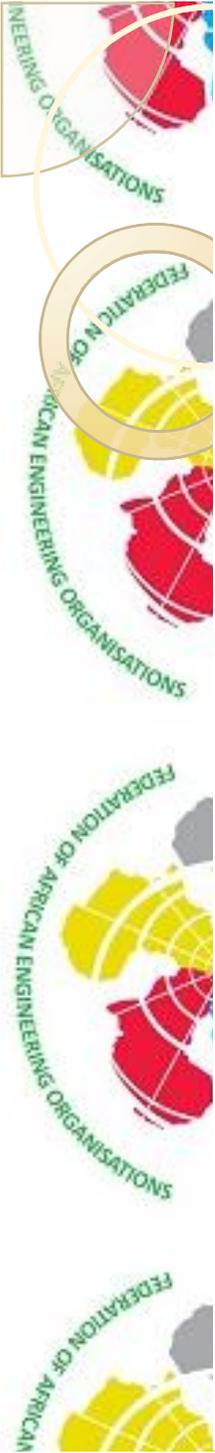


## CONCLUSION

Africa and in particular sub-Saharan Africa has very low energy access and this has not been addressed if the SDG 7 is to be achieved. More than 50% of the world population without access to electricity are in the Sub-Saharan Africa. While the Continent has sufficient potentials in human and natural resources, it really needs support from the international community in terms of technological and financial resources to enable it generate this huge electricity deficit. Therefore there is the need for a global effort that will necessitate:

- Production of scenario-based energy demand projections covering all sectors of national economies and on short, medium and long term time horizons.
- Production of comprehensive energy supply strategies using the demand projections and also using the UN's Sustainable Energy for All Initiative, the AU's PIDA initiatives, the regional projects, WEC's studies as well as other national visions.
- Making national energy policies robust, market oriented but with provisions for the under-privileged and with practical incentives and feed-in-tariffs.
- The reviewed energy policies should be passed into law to minimise disruptions from one elected government to the next.
- There is the need for all African countries to compute their Energy Development Indices so as to know the effectiveness of the energy development strategies and thereby to effect appropriate amendments for future improvements.
- Strict implementation of energy policies and master plans





*Finally, I say*

谢谢

*Thank you*

Na gode

شكرا

Je vous remercie

gracias