Energy for Africa :

New african ressources in gas (and oil…)

What impact on Africa energy outlook ?

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Energy in Africa : View from the demand side

- **Compared to demography, Africa consumes little energy**

  Energy **consumption per capita** is actually the lowest in the world

  But with large **regional disparities** (South and North Africa **Versus** Central Africa)

- **Energy consumption includes significant use of traditional biomass** (wood, charcoal, wastes…) mostly for domestic uses like cooking

  Inconveniences : poor performances, impact on health, deforestation, loss of time…

  In several **subsaharian countries** it is more than 80 % of energy consumption

  Globally for Africa : 45 % traditional biomass, 55 % modern energy

Energy in Africa : View from the demand side

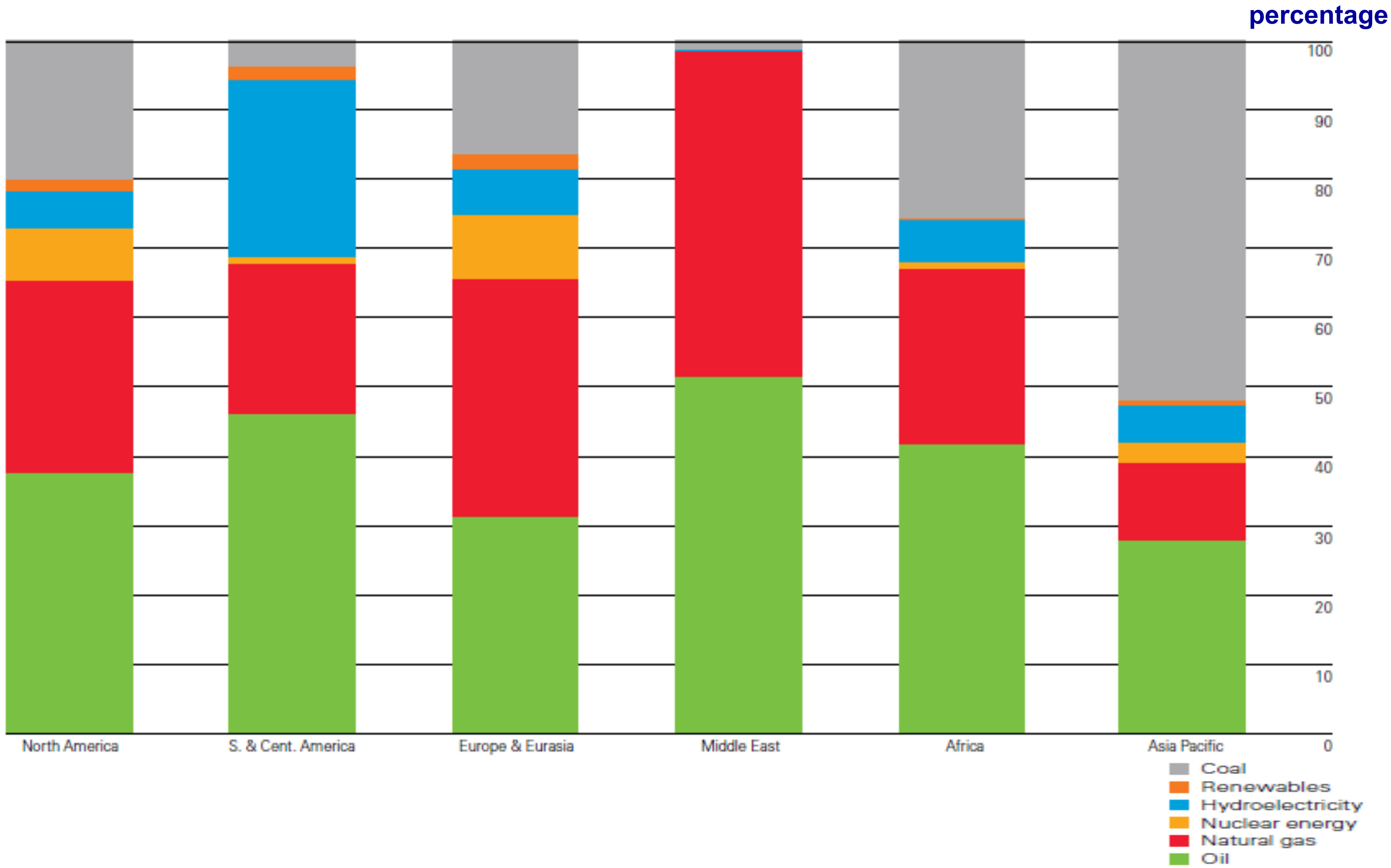
- **Modern energy consumption :**
  375 M toe in 2010 (3 % of world)

  - South Africa 121 M toe **Oil 155 M toe**
  - Algeria + Egypt 122 M toe **Gas 95 M toe**
  - Others 133 M toe **Others 125 M toe**

  - **End use sectors** :
    - Residential/commercial
    - Industry
    - Transports

  - Power generation
    A limited access to electricity

Regional Consumption pattern in the world 2010



Energy in Africa : View from the supply side

- **Oil and gas** form the dominant component (80 %) of commercial energy supply in Africa (excluding traditionnal biomass)
- **Coal and nuclear** => limited to South Africa (for a very long time…)
- Modern **renewable energy** : a potential inderlined since several decades, but always mostly unexploited
  - Hydraulic : a limited development (Egypt, few central africa countries)
  - Geothermy : Kenya
  - Solar, wind : some local productions

So Africa is not in a situation to belittle new oil and gas resources for its economic development

Oil and gas activities in Africa : Key data

	Production		Consumption		Exports	Proven Reserves		
	10^6 toe	% world	10^6 toe	% world		10^6 toe	% world	R/P
Oil	480	12 %	155	4 %	68 %	17 400	9.5 %	36
Gas (in Bcm)	190 (210)	6.5 %	95 (105)	3.3 %	50 %	13 200 (14700)	8 %	70
Coal	145	4 %	95	2.7 %	34 %			
Hydro (primary)	23	3 %	23					

Nota : Nuclear 3 M toe, Modern Renewables : 1 M toe

10^6 toe = millions of tons of oil equivalent
Bcm = milliards of cubic meters

Oil and gas activities in Africa : Key actors

- **<u>Oil</u> :** 5 countries produce today for more than 80 % of African oil
  (Nigeria, Angola, Algeria, Libya, Egypt)
  + about 10 other producing countries
  => most african countries are oil importers

- **<u>Gas</u> :** 4 countries count today for 90 % of African production
  (Algeria, Egypt, Nigeria, Libya)
  Angola + other new producers
  Domestic gas consumption is important in Egypt, Algeria

- **2 dominant producing zones : North Africa, West Africa**

- **But recently exploration activity has moved towards new areas.**

New oil and gas African basins

- **Inland basins : mostly oil discoveries**
  - **Tchad (production)**
  - **South Sudan (production)**
  - **Uganda (near Lake Albert), Kenya (Western part), neighbouring countries**
- **Challenges for producing oil in inland countries :**

- **Infrastructures required to reach the coast : long pipes**
  Tchad, Sudan, Uganda
- **New refining plants : location, size, complexity**
  regional cooperation

Mombasa refinery on Kenyan coast

- **Competition of Middle East refined products on East Africa markets**
- **Environmental issues (natural parks, population)**

New oil and gas African basins

- **East coast countries :**

  Important gas and oil discoveries in the recent years

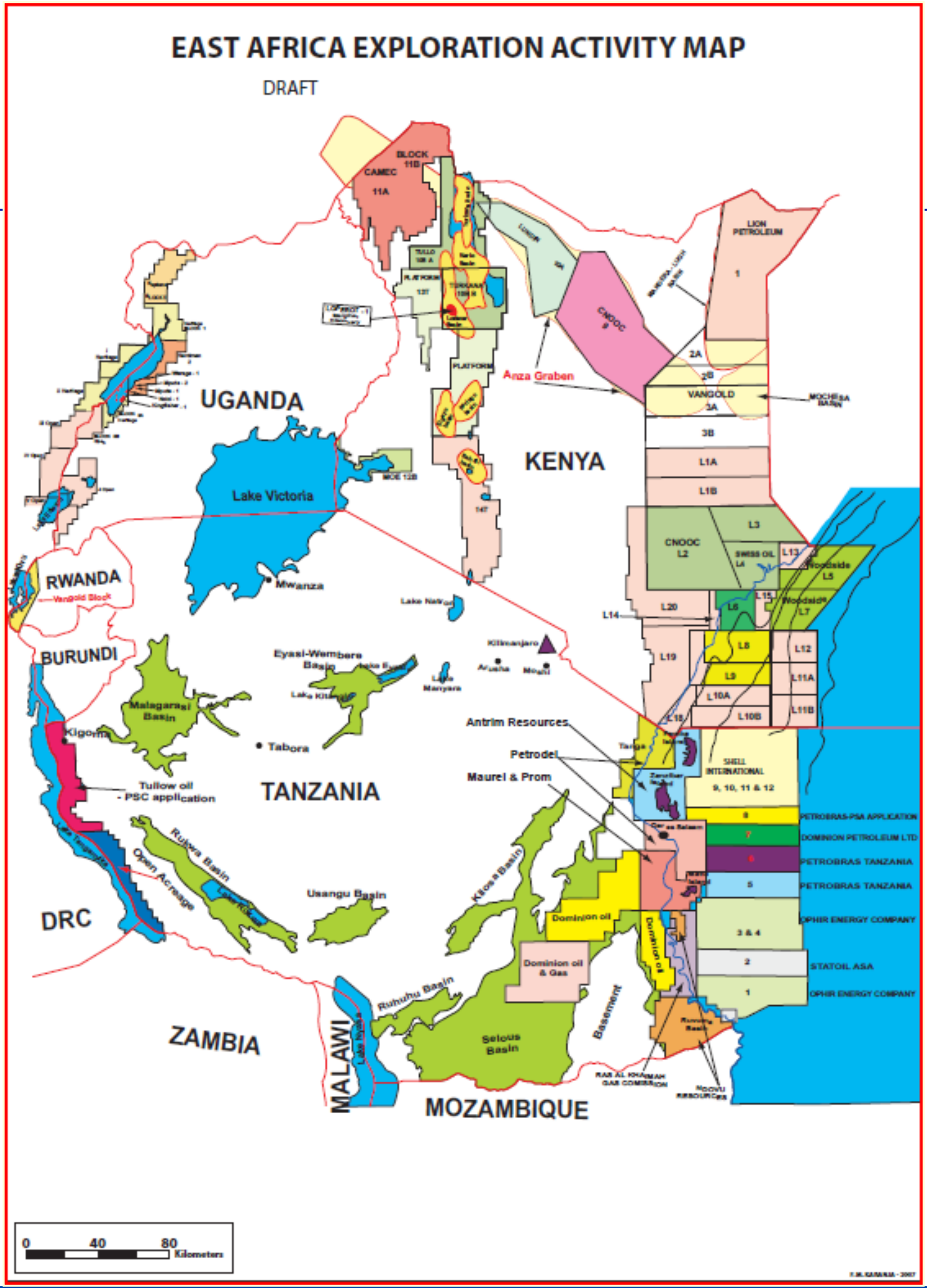
  - **Mozambique : large discoveries (offshore of Capo Delgado province)**
    Nota : former gas finds (pipe to South Africa)
  - **Tanzanie (close to southern border with Mozambique)**
  - **Potential of the Rovuma delta basin : several « Tcms »**
    (African gas proven reserves : 15 Tcm in 2010)

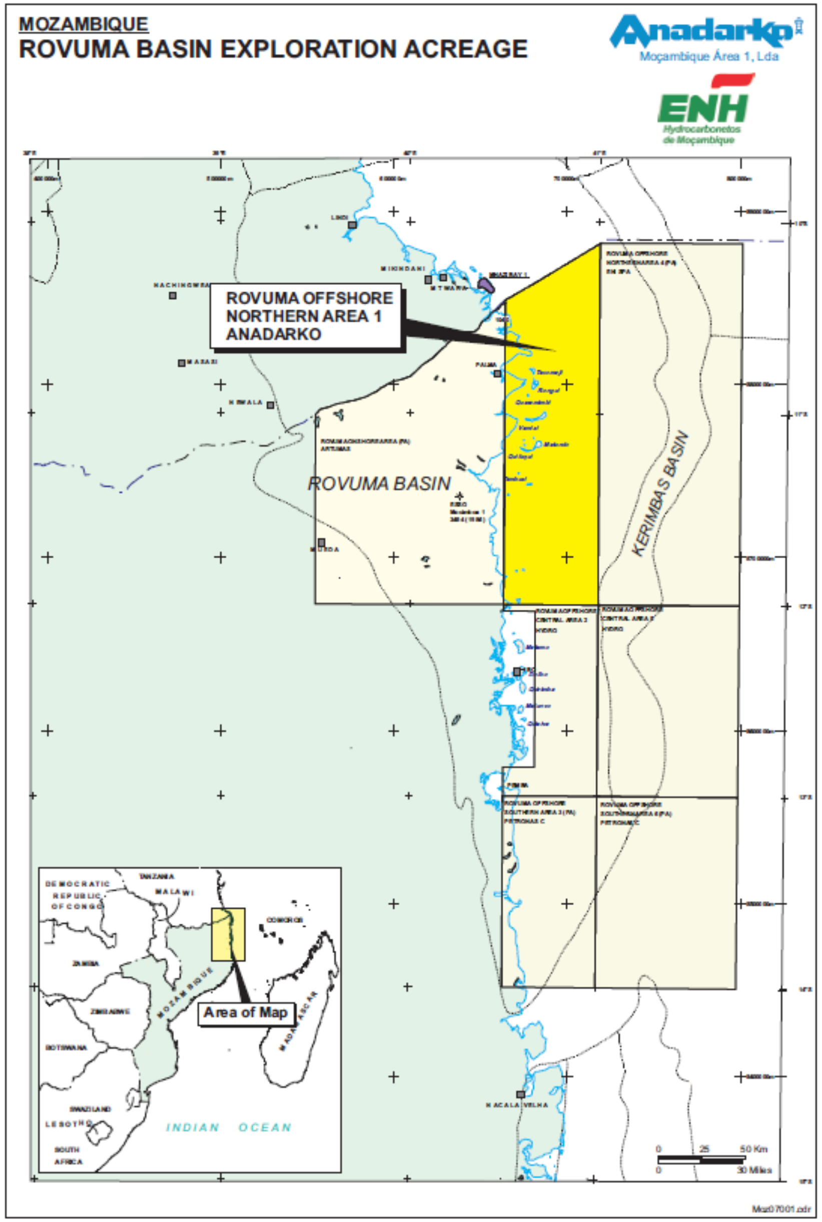
  => Important for new producing countries.
  But it does not change the dominant position of traditional producers

- **Challenges for producing gas in East Africa**

External markets pipes
LNG plants (minimum volumes required stability of supply)

Domestic markets power generation (gas better solution than oil)
industry / fertilisers / petrochemicals
domestic uses : lack of marketing infrastructures
transportation (CNG)


EAST AFRICA EXPLORATION ACTIVITY MAP
DRAFT
UGANDA
KENYA
TANZANIA
RWANDA
BURUNDI
DRC
ZAMBIA
MALAWI
MOZAMBIQUE
Lake Victoria
Mwanza
Tabora
Kigoma
Anza Graben
Antrim Resources
Petrodel
Maurel & Prom
Tullow oil - PSC application
Malagarasi Basin
Eyasi-Wembere Basin
Rukwa Basin
Open Acreage
Usangu Basin
Kilosa Basin
Ruhuhu Basin
Selous Basin
Dominion oil
Dominion oil & Gas
Basement
Kilimanjaro
SHELL INTERNATIONAL 9, 10, 11 & 12
PETROBRAS-PSA APPLICATION
DOMINION PETROLEUM LTD
PETROBRAS TANZANIA
OPHIR ENERGY COMPANY
STATOIL ASA
CNOOC
VANGOLD
LION PETROLEUM
Woodside
0 40 80 Kilometers


MOZAMBIQUE
ROVUMA BASIN EXPLORATION ACREAGE
Anadarko
Moçambique Área 1, Lda
ENH
Hydrocarbonetos de Moçambique
ROVUMA OFFSHORE NORTHERN AREA 1 ANADARKO
ROVUMA BASIN
KERIMBAS BASIN
DEMOCRATIC REPUBLIC OF CONGO
TANZANIA
MALAWI
ZAMBIA
ZIMBABWE
BOTSWANA
MOZAMBIQUE
COMOROS
MADAGASCAR
Area of Map
INDIAN OCEAN
0 25 50 Km
0 30 Miles

The actors : a lot of oil and gas companies

- Independant (often small) : Anadarko, Tullow, Heritage, Kosmos, Devon, Cove.
- Western majors (Exxon, ENI, Statoil, Total)
- Asiatic companies (Petronas, Chinese)
- National companies

Unconventional gases

- Coal Bed Methane (CBM), shale gas
- 2 potential zones : North Africa, South Africa
- Huge constraints (water, expertise, equipment, infrastructures, legal framework,…)

Access to electricity : a key issue in Africa

A very limited access to electricity in Central Africa
Poor quality (shortages…)

Is power generation a potential market for gas ?

- **Markets :** 3 different situations
  - **Huge urban centers and basic industries**
  - **Suburban poor populations**
  - **Isolated inland communities**
- **Production :**
  - **Today : Oil, Hydro, Coal in South Africa**
  - **The gas option**
  - **Renewables**

  (centralized versus decentralized options)
- **Infrastructures :** few regional interconnections

Africa : Mid term oil and gas outlook

- **Drivers**

  Population (expected trends)

  Economic growth rate (4 % per year ?)

- **Demand**

	2010	2035
Oil (Mt)	155	200
Gas (M toe)	85	153
(Bcm)	95	170

- **Supply**

	2010	2035
Oil (Mt)	480	465
Gas (M toe)	190	395
(Bcm)	215	440

Key issues for energy in Africa

- **Global Governance :** Transparency (EITI)
  Good management, long term energy policy
- **Rules for companies :** Regulatory framework, Respect of contracts,
  Satisfactory profitability
- **Economics :** Solvability of consumers
  Financing huge capital expenditures
- **Expertise – Education**
- **Regional cooperations**

The End