Energy in Africa

Conference on Energy in Southern Africa

3 December

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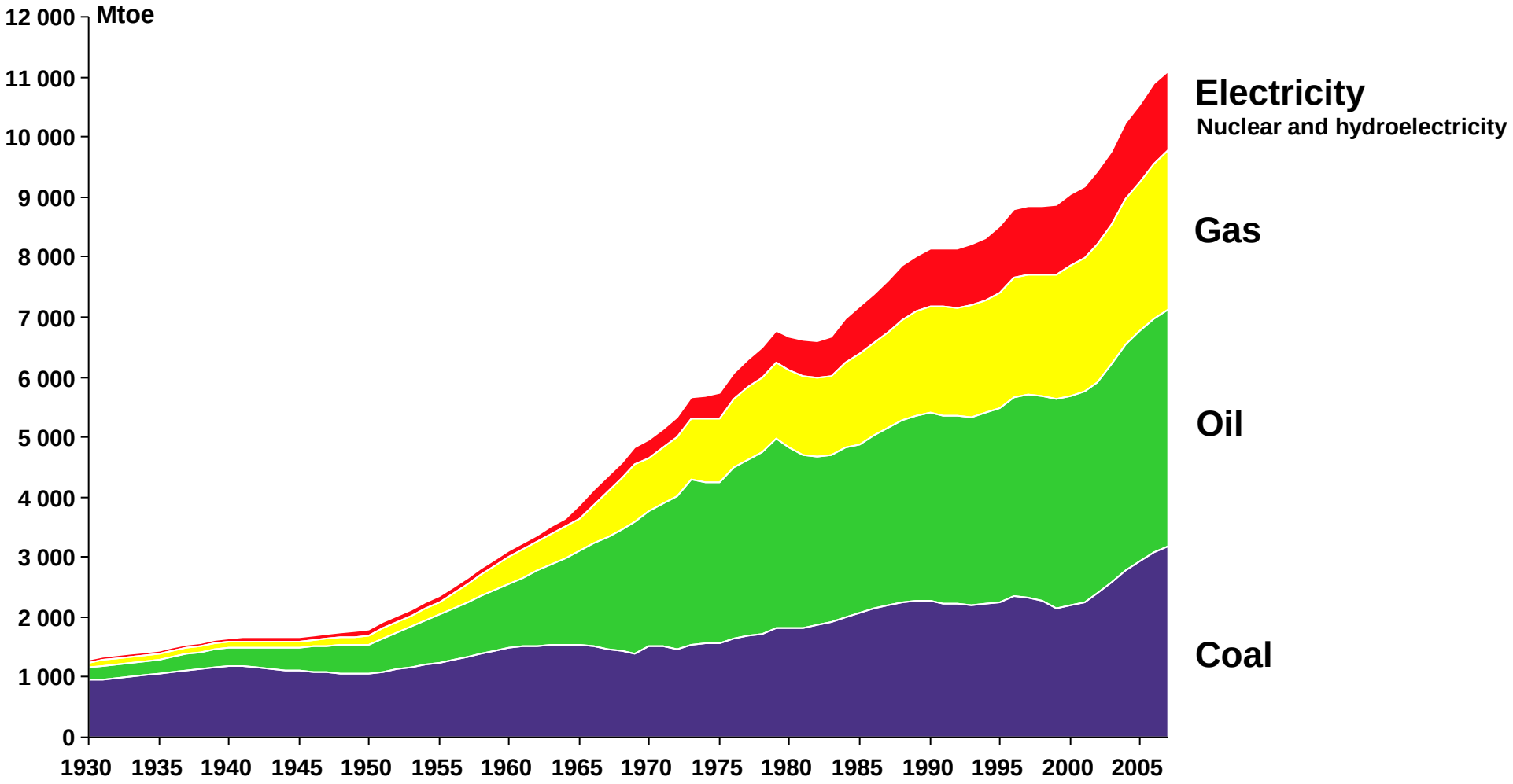
Agenda

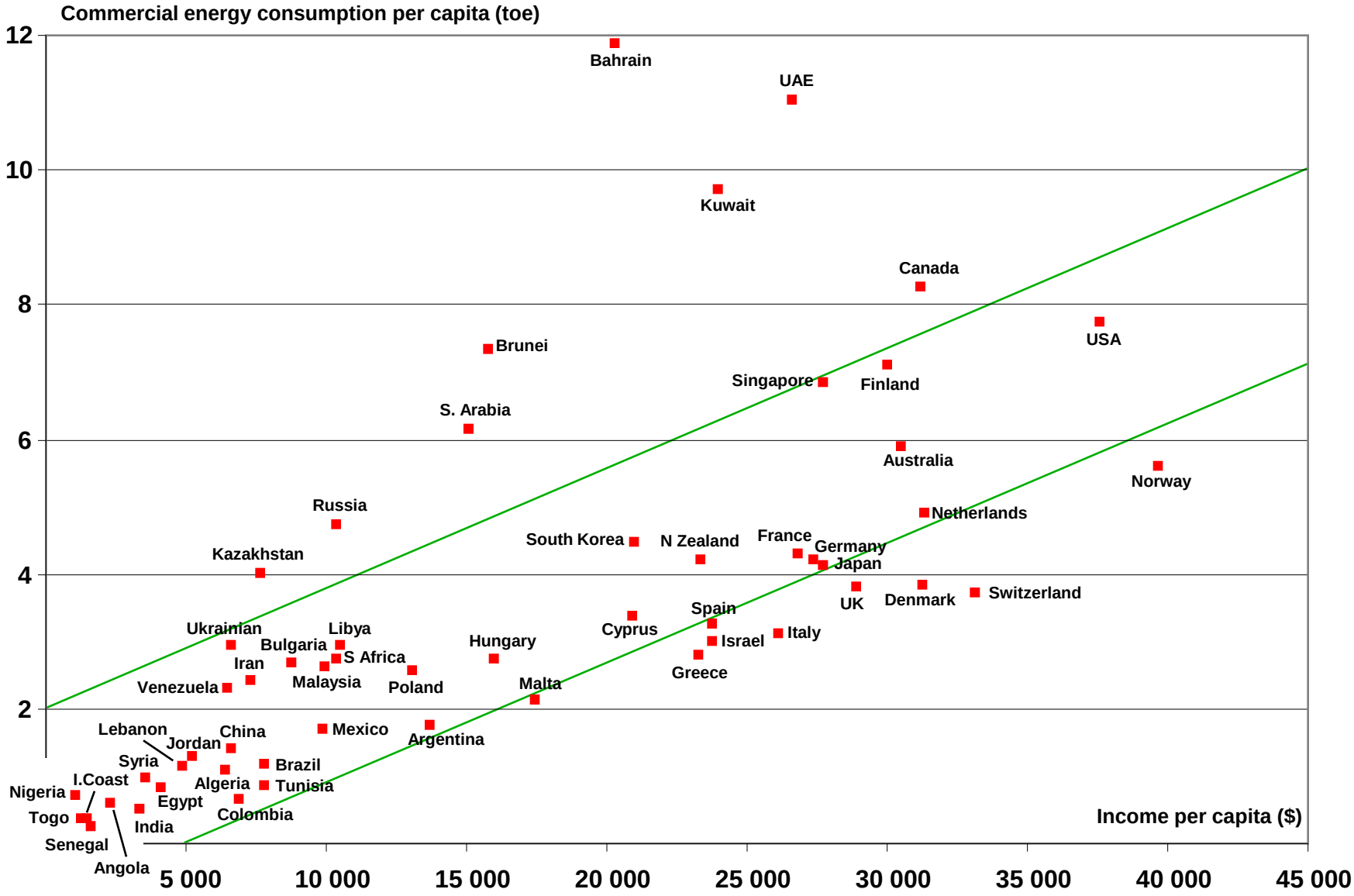
- Energy demand in the world
- The challenge of economic development and energy consumption
- Oil and gas production in Africa
- Competition for African Oil and Gas
- Is “Oil a curse” ?

World commercial primary energy consumption



Source : BP Statistical Review

Commercial energy consumption and income in 2006



Source : AIE – Energy balances of OECD & Non OECD countries


to Europe
Tunisia
Morocco
to Middle East
Algeria
Libya
Egypt
Western Sahara
Cape Verde
Mauritania
Mali
Niger
Chad
Sudan
Eritrea
Djibouti
Senegal
Burkina Faso
Guinea
Nigeria
Cote d'Ivoire
Ethiopia
Cent Afr Rep
Ghana
Cameroon
Somalia
Togo
Uganda
Benin
Gabon
D. R. Congo
Kenya
Rwanda
Sao Tome & Principe
Congo
Burundi
Equatorial Guinea
Tanzania
Seychelles
Liberia
Sierra Leone
Comoro Is.
Guinea-Bissau
Angola
Malawi
The Gambia
Zambia
St. Helena
Mozambique
Zimbabwe
Namibia
Madagascar
Botswana
Reunion
Swaziland
South Africa
Lesotho
Mauritius
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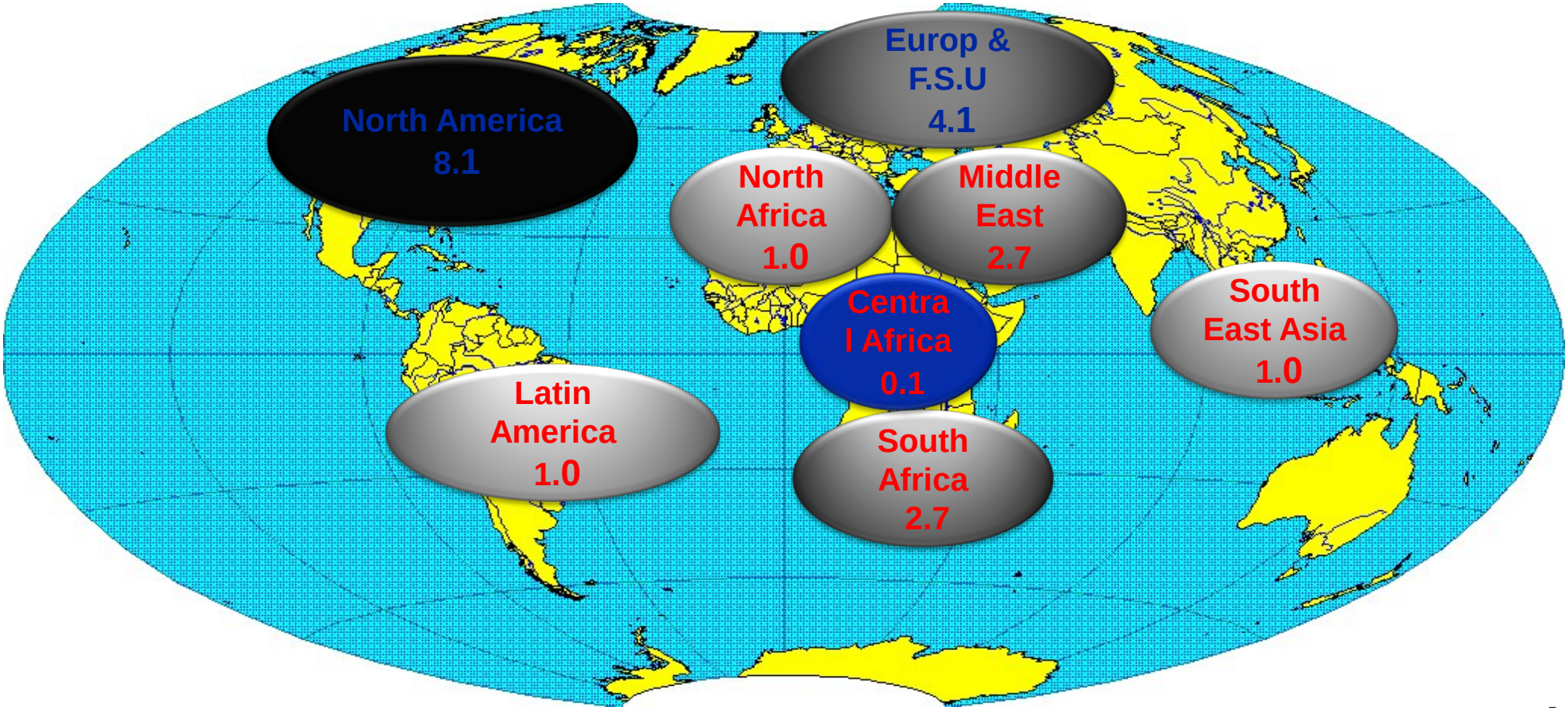
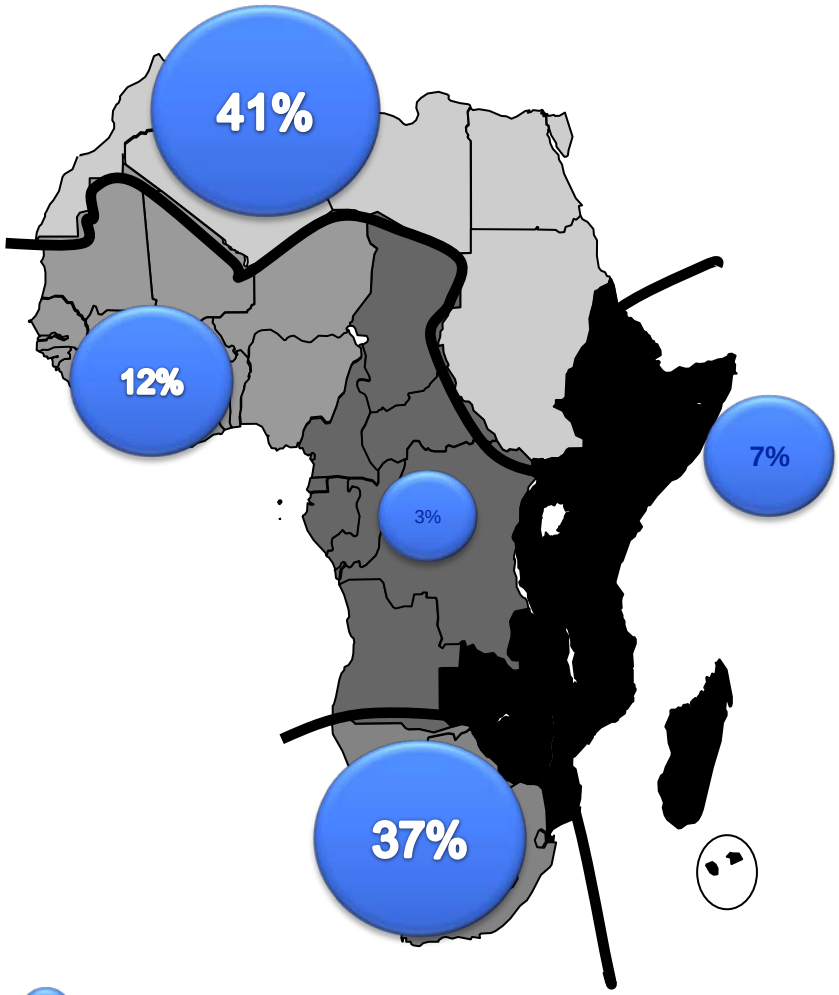
World energy consumption (toe/capita)

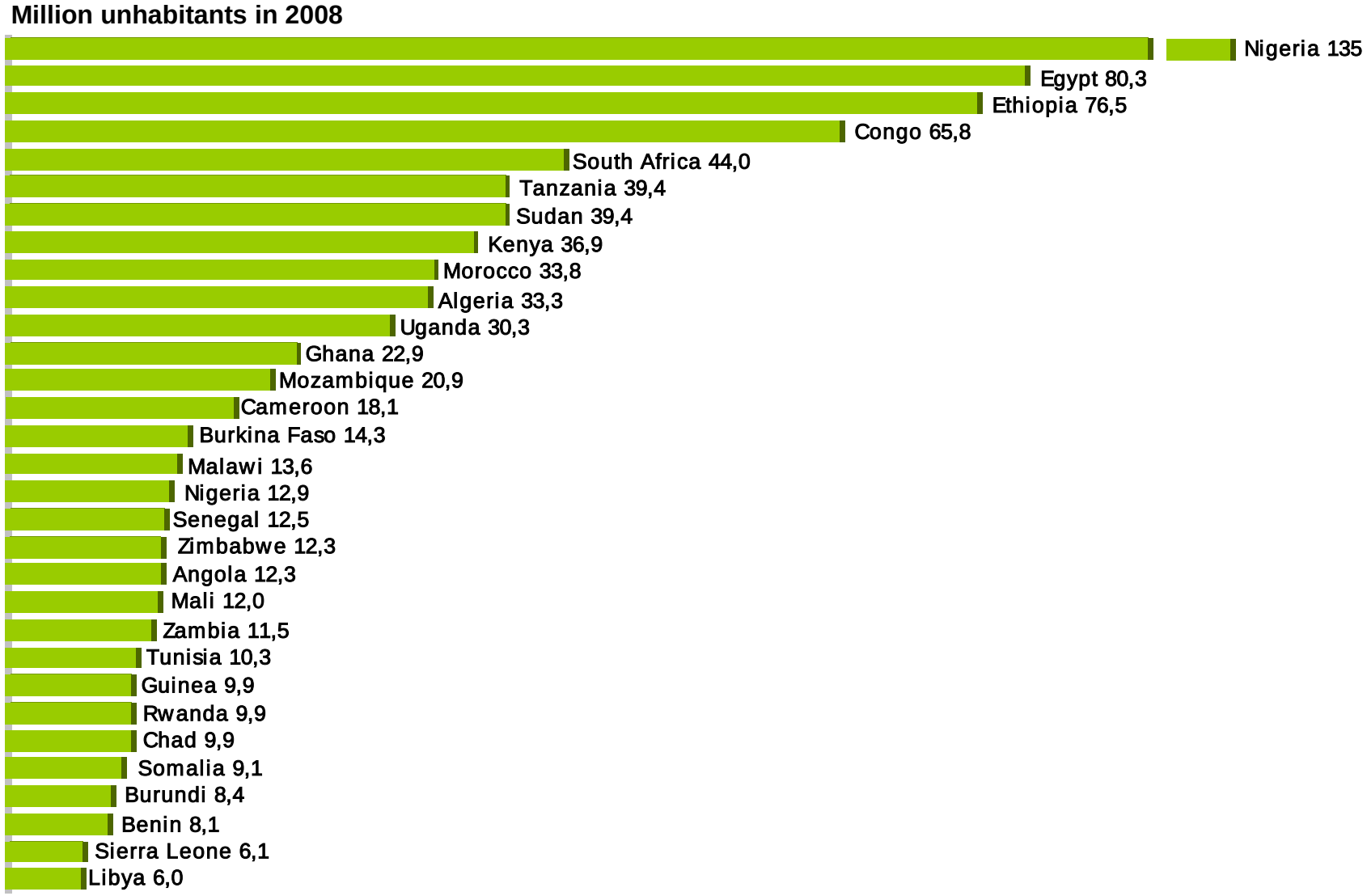


- **Divide between Africa and the rest of the world (15% of world population for 3% of world energy consumption)**
- **Divide between North Africa-South Africa and the rest of Africa**
- **Divide between urban and rural areas: Urban areas look like energy spots**

North and South Africa: two specific areas



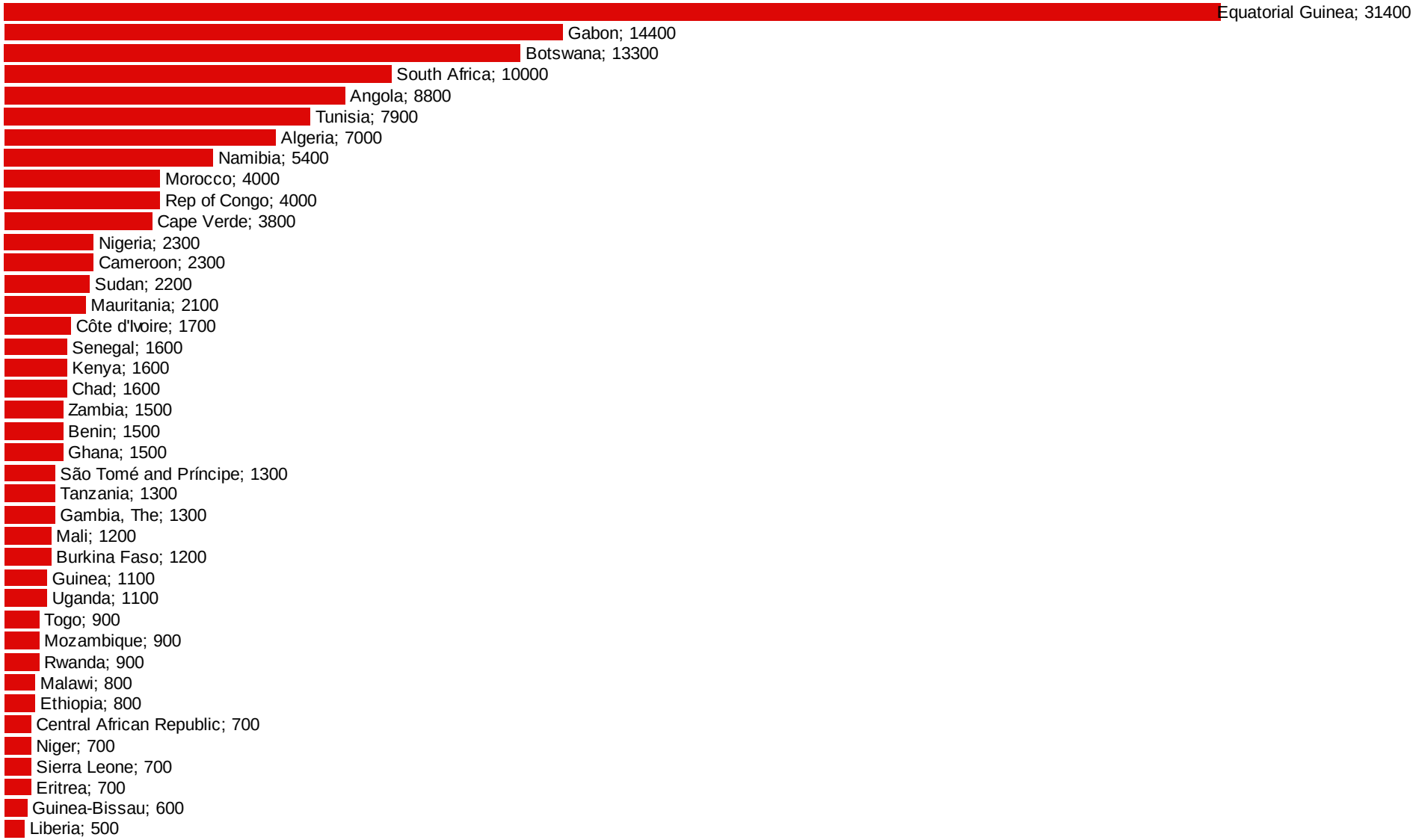
Population in some african countries



Source : CIA World Fact Book

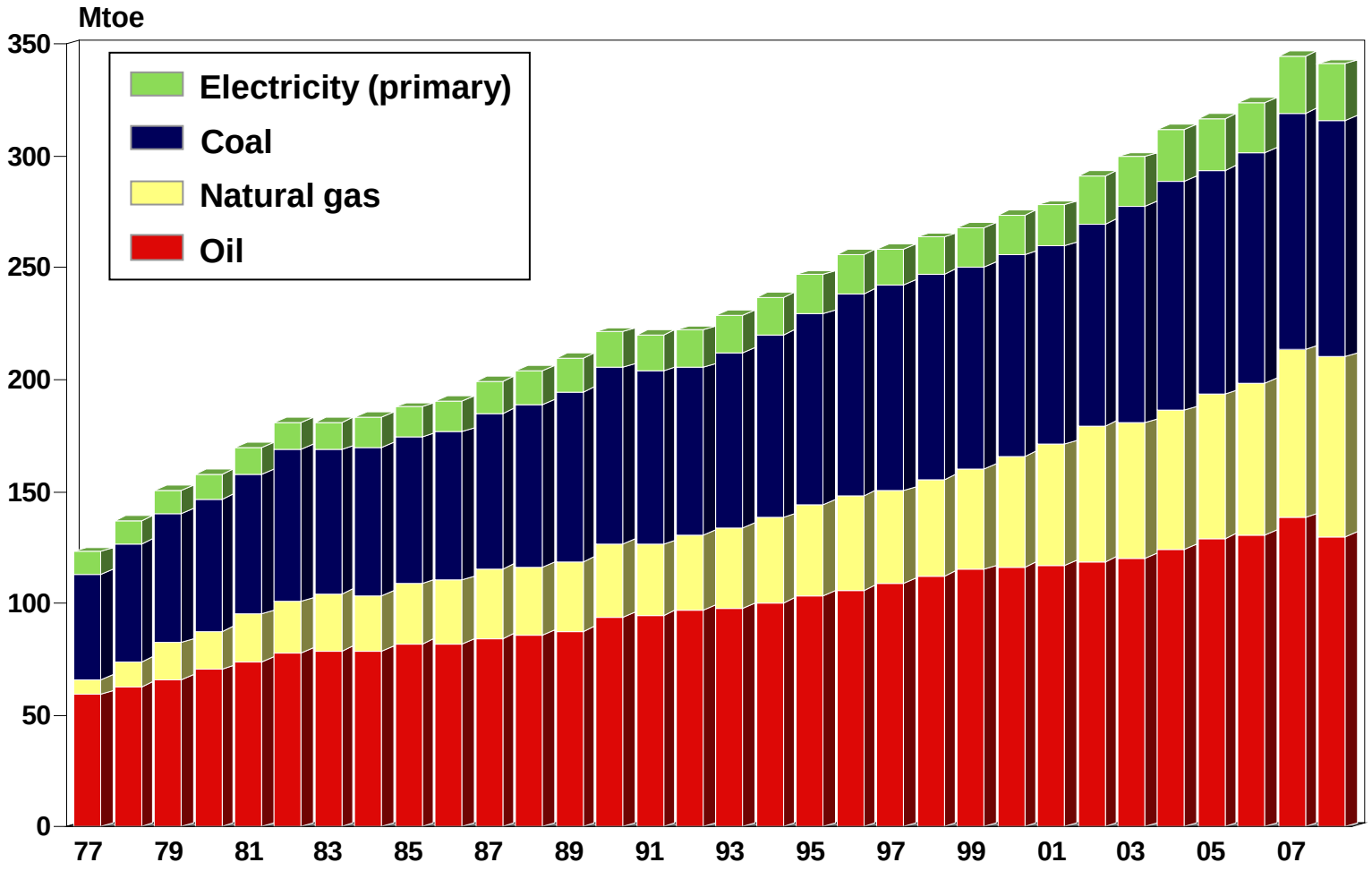
GDP per capita (PPP) in some african countries in 2008

$/Hab.



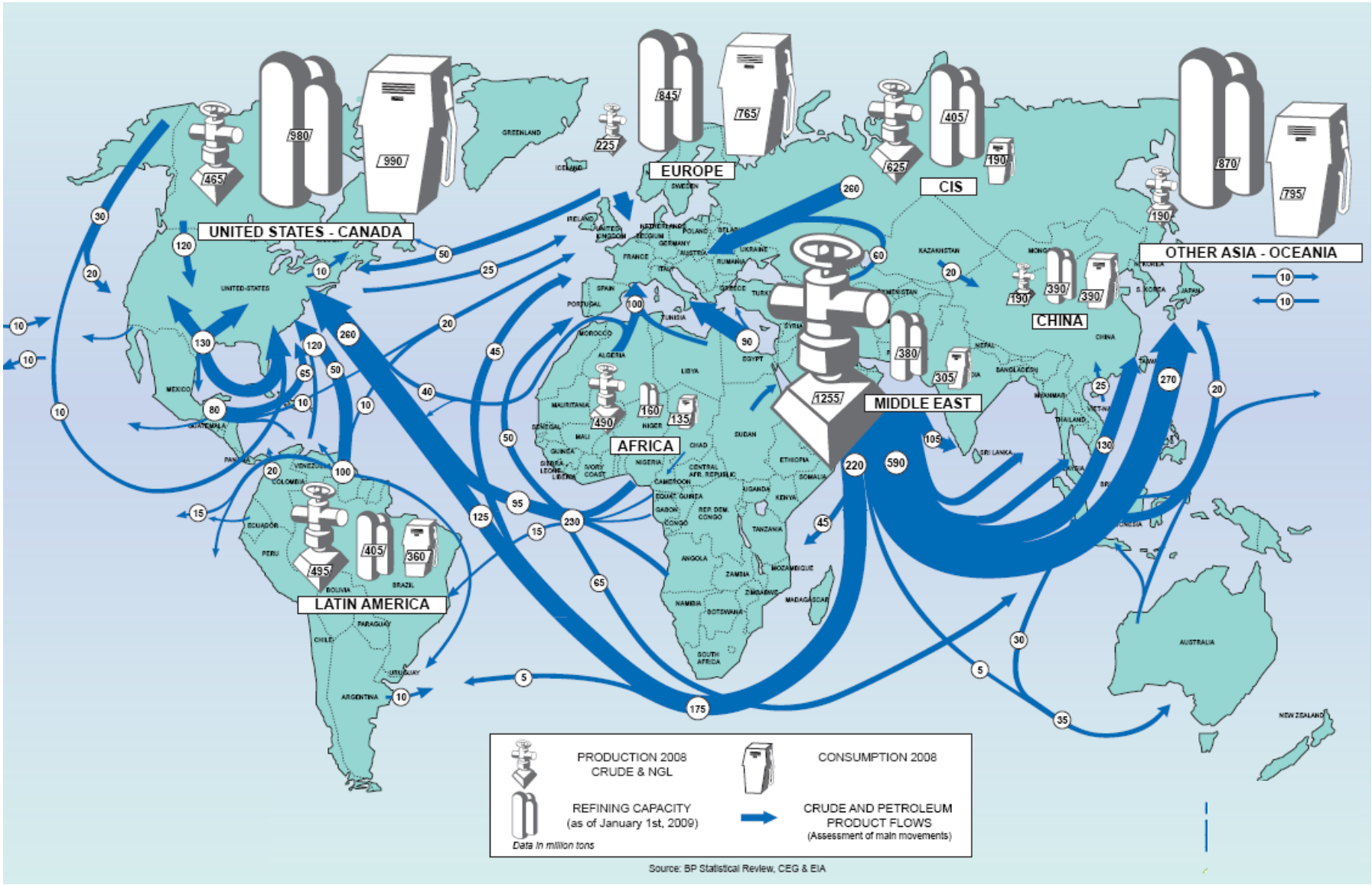
Source : CIA World Factbook

Energy consumption in Africa



Source : BP Statistical Review

Petroleum worldwide in 2008



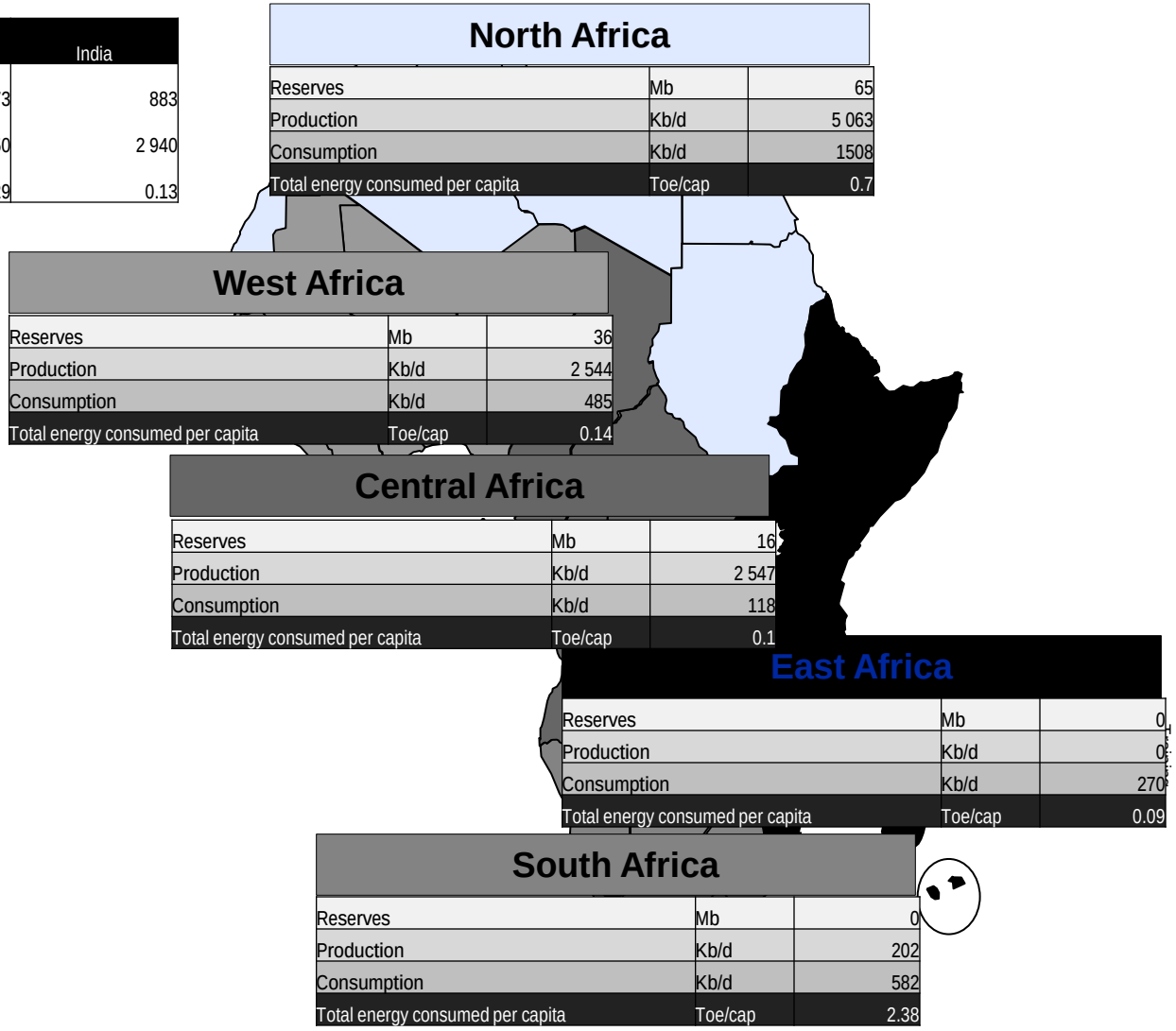
Source : BP Statistical Review, CEG and EIA

Oil production, consumption and export

		Africa	China	India
Production	(Kb/d)	10 871	3 973	883
Consumption	(Kb/d)	3 078	7 850	2 940
Consumption per capita	(T/cap)	0.16	0.29	0.13

- Even though Africa, China and India have a comparable population profile, they show diffent oil industry pattern

- Two situations in Africa: Oil producing regions (North Africa, Gulf of Guinea) and NOPAC*



*Non Oil Producing African Countries

Oil proven reserves in Africa - 1st January 2009 (Mbbl)

Libya	41 646
Nigeria	36 220
Congo Brazzaville	16 000
Algeria	12 200
Angola	9 035
Sudan	5 000
Egypt	3 700
Gabon	2 000
Chad	1 500
Equatorial Guinea	1 100
Tunisia	400
Cameroon	200
Congo Kinshasa	180
Ivory Coast	100
Mauritania	100
Ghana	15
South Africa	15
Benin	8
Morocco	1

Source : Oil and Gas Journal

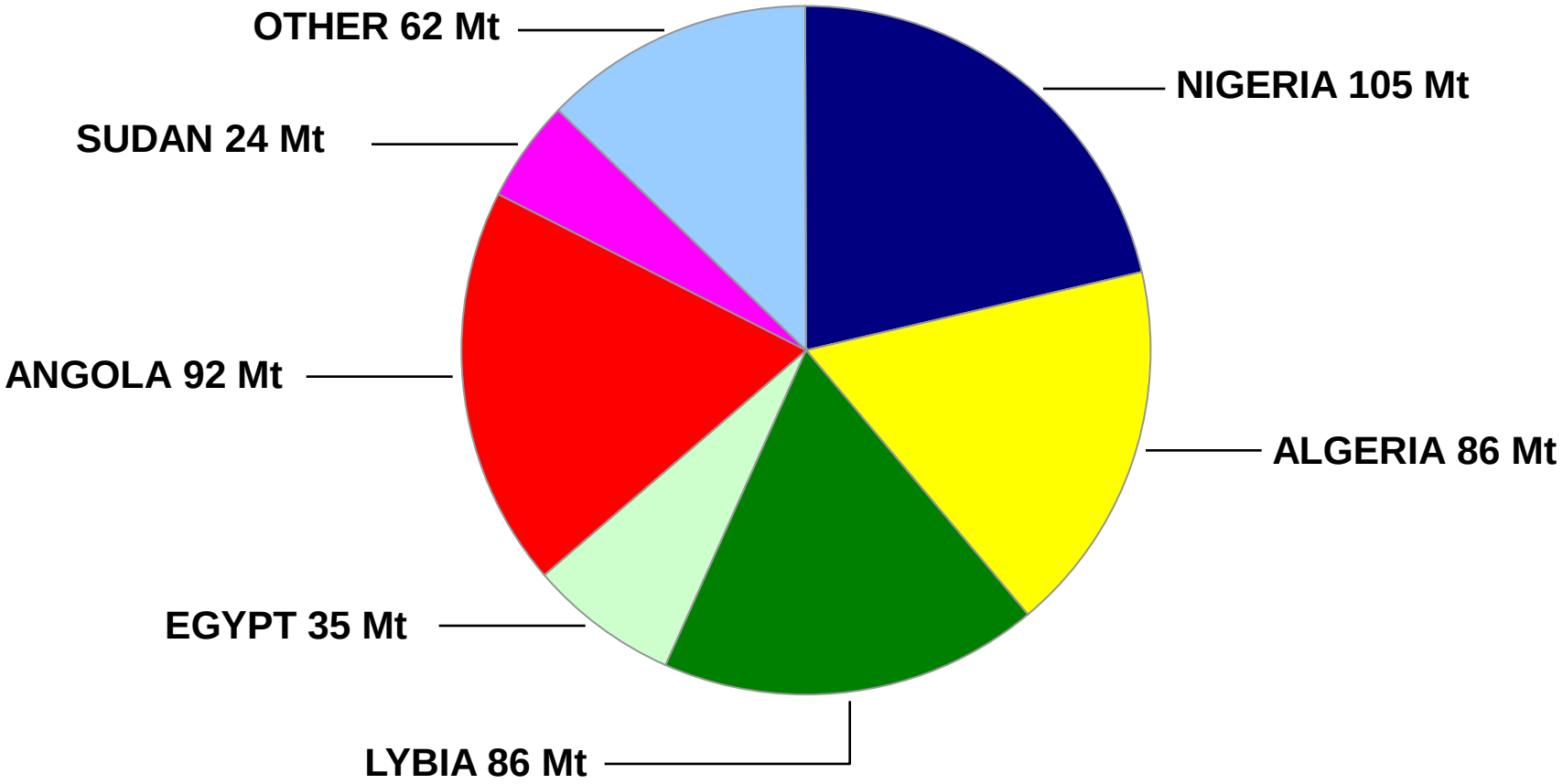
Oil production in Africa in 2008 (Mt)

Nigeria	97,0
Angola	93,5
Libya	86,0
Algeria	68,8
Egypt	34,0
Sudan	24,5
Equatorial Guinea	16,0
Congo Brazzaville	12,0
Gabon	11,8
Chad	7,3
Tunisia	4,3
Cameroon	4,3
Ivory Coast	2,5
Congo Kinshasa	1,3
South Africa	0,7
Ghana	0,3
Mauritania	0,0

Source : OGJ

Oil production in Africa

488 Mt in 2008



Source : BPSR

*** Estimations**

Africa: a marginal oil consumer

- **Even though Africa is a strategic producer, the continent remains a marginal oil consumer (only 3.4% of the world oil consumption)**
- **The continent consumption is concentrated in North Africa, South Africa and Nigeria (78.6% of Africa's consumption)**
- **Oil is used not only for transportation (like anywhere else) but also for power production (West, Central and East Africa)**

World annual oil consumption

Regions	Share (%)	(b/cap)
Africa	3.4	1.1
Central and South America	6.9	3.7
North America	27.4	26.6
Asia Pacific	30.1	2.2
Europe and Former Soviet Union	24.3	10.1
Middle East	7.8	8.4

Africa's annual oil consumption

Regions	Share (%)	(b/cap)
North Africa	3.4	2.7
West Africa	6.9	0.6
East Africa	27.4	0.3
Central Africa	30.1	0.4
South Africa	24.3	4

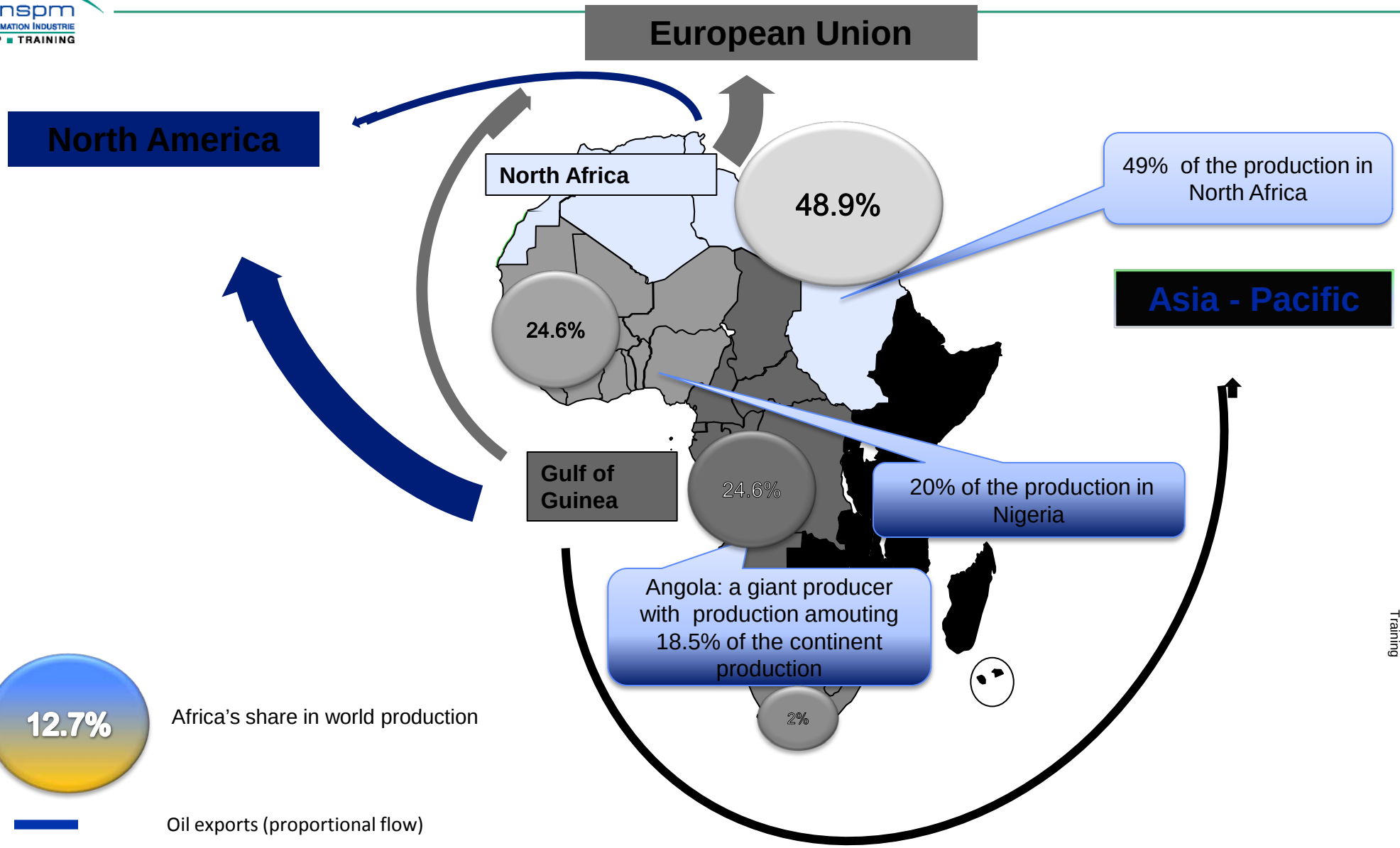
(b/cap): barrel per capita

Prospects for Oil in West Africa : a proposed classification

- **Countries in (long term) decline**
  - **Cameroon, Congo (formerly Zaire), Gabon**
- **Countries that have reversed their decline**
  - **Congo-Brazzaville**
- **Countries where output is increasing**
  - **Angola , Equatorial Guinea , Ivory Coast, Nigeria, Algeria, Libya, Sudan**
- **Countries with uncertain prospects**
  - **Chad, Gabon , Mauritania**
- **Countries that may produce oil by 2015**
  - **non-producing countries that are attracting attention from IOCs : Niger, Sao Tome e Principe**
- **New Frontiers**
  - **Ghana, Uganda, Sierra Leone**

Source : Oil and Energy Trends - Global Energy Review

Africa: a strategic oil producer



Share of hydrocarbons in the economy of African countries 2006

Country	% of GDP	% of exports	% of revenues
ANGOLA	56	94	83
CAMEROON	8	47	20
CONGO	64	85	82
GABON	51	80	63
NIGERIA	39	90	82
EQUAT. GUINEA	92	97	88
ALGERIA	30	97	60
LIBYA	50	95	60
EGYPT	4	40	10

Source : CRS, World Bank, IMF, CIA World Factbook, EIA, OECD

- Upstream:

- Limited refining infrastructure

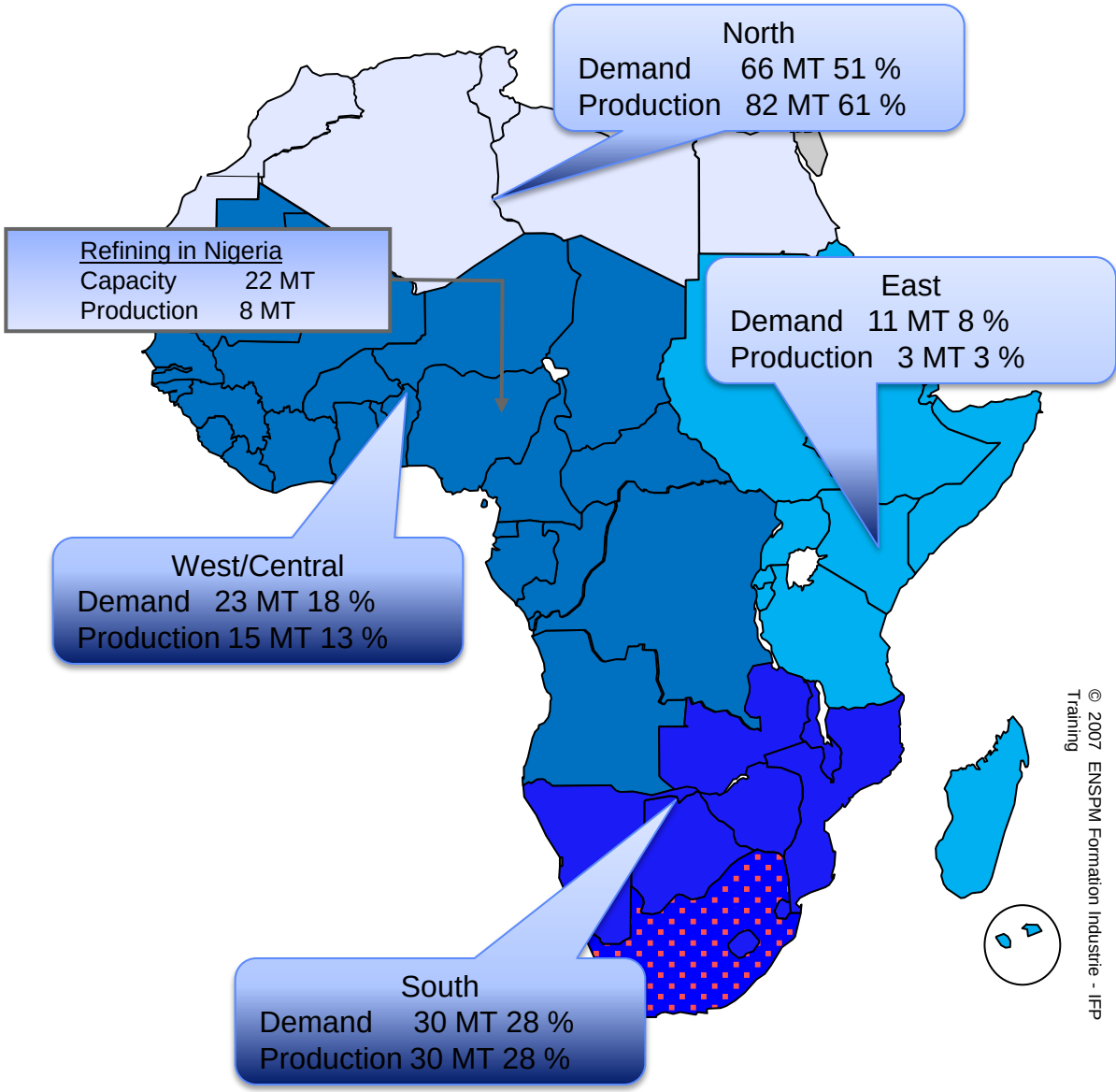
- Existing refineries are very often obsolete

- African refineries are crippled by costs due to their low capacities

- Downstream:

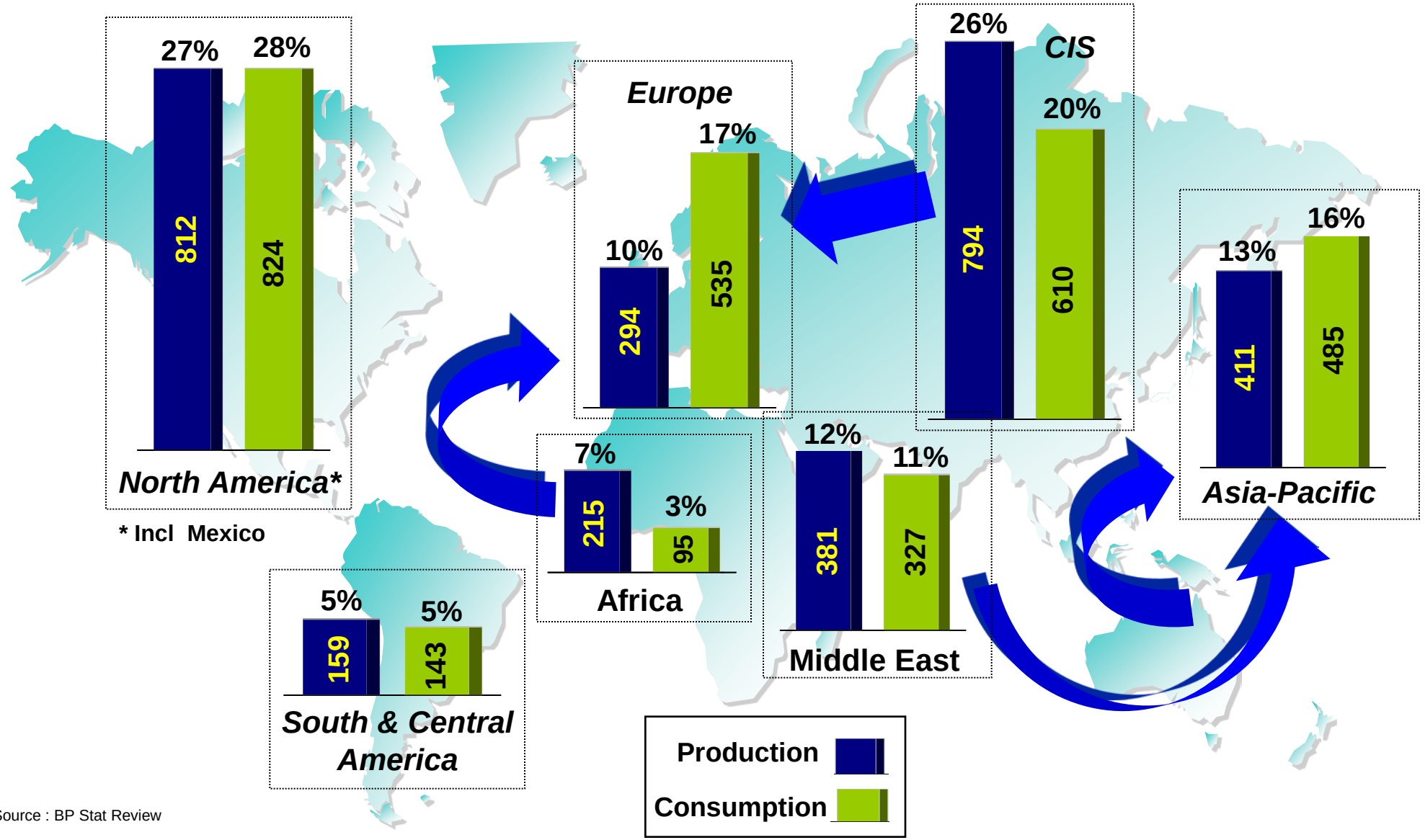
- The low consumption forces a slow and costly distribution by road

- Costs are high and the prices are subsidized.



2008 natural gas supply and demand

World Marketed Production : 3 019 Bcm = 2.7 Gtoe



Source : BP Stat Review

Proved natural gas reserves

	Reserves (Bcm)	%	Ratio R/P
North America	*8 870*	*5*	*11*
United States	**6 730**	**4**	**12**
Canada	**1 630**	**1**	**9**
S. & Cent. America	*7 310*	*4*	*46*
Venezuela	**5 840**	**3**	**>100**
Bolivia	**710**	**0.4**	**51**
Europe	*5 890*	*3*	*20*
Norway	**2 910**	**2**	**29**
Netherlands	**1 390**	**1**	**21**
FSU	*57 000*	*31*	*72*
Russia	**43 300**	**23**	**72**
Turkmenistan	**7 940**	**4**	**>100**
Africa	*14 650*	*8*	*68*
Nigeria	**5 220**	**3**	**>100**
Algeria	**4 500**	**2**	**52**
Middle East	*75 910*	*41*	**>100**
Iran	**29 610**	**16**	**>100**
Qatar	**25 460**	**14**	**>100**
Asia-Pacific	*15 390*	*8*	*37*
Indonesia	**3 180**	**2**	**46**
Australia	**2 510**	**1**	**66**
TOTAL WORLD	***185 020***	***100***	***60***

R/P =
Reserves (1.1.2009) / Production (2008) (gross - re-injected)

Source : BP Stat. Review

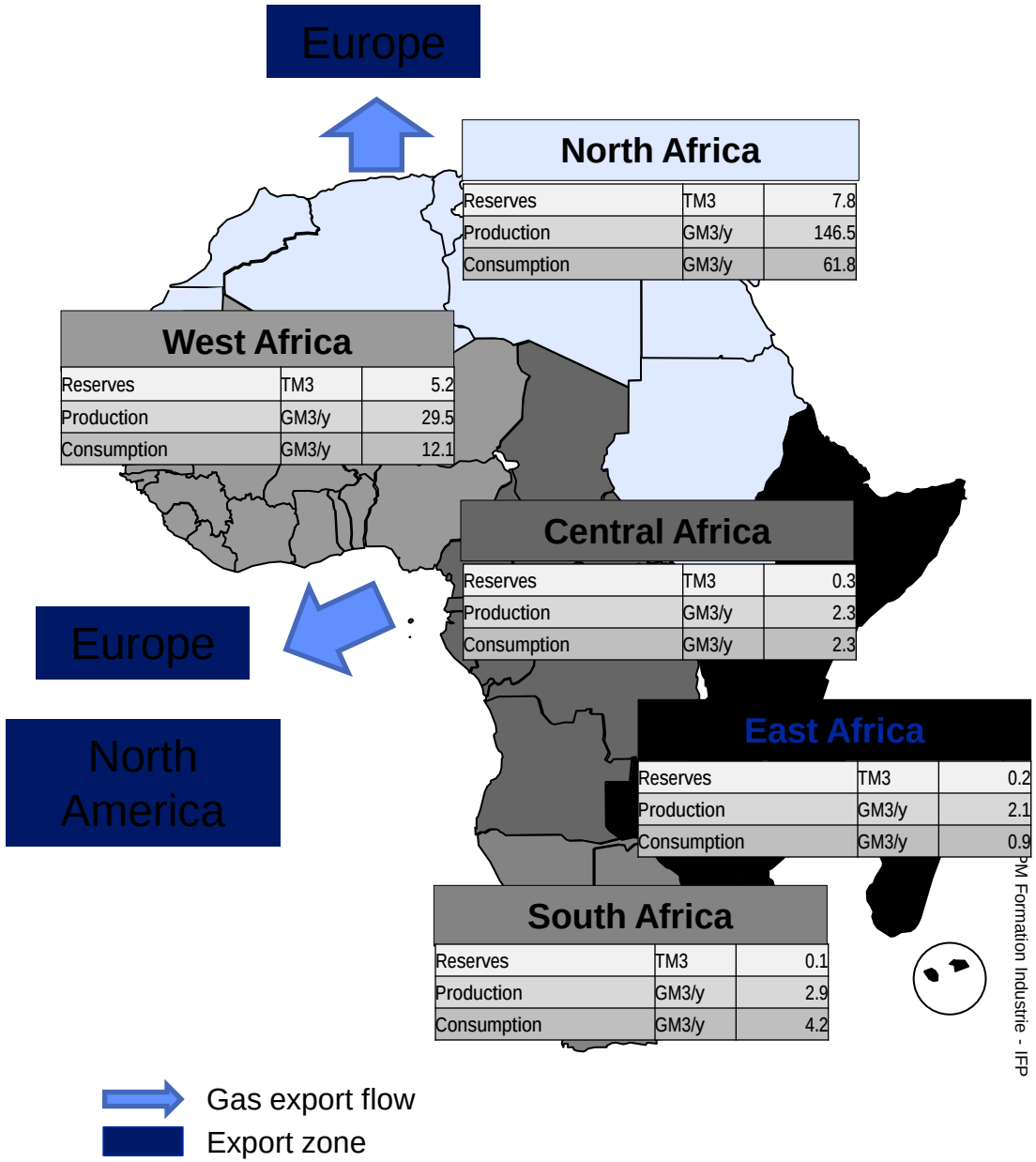
- Africa is an important gas producer (7.9 % of world reserve and 7% of world production)

- Nevertheless all the regions don't display the same gas profile:

- West and North Africa are the main gas producing areas

- South Africa is a net gas importer

Gas consumption and production in Africa



Gas reserves – 1/1/2009 (billions c.m.)

Nigeria	5156
Algeria	4452
Egypt	1638
Libya	1403
Angola	267
Cameroon	134
Mozambique	126
Congo Kinshasa	90
Sudan	84
Tunisia	64
Namibia	62
Rwanda	56
Equatorial Guinea	36
Gabon	28
Ivory Coast	28
Mauritania	28
Ethiopia	25
Ghana	22
Tanzania	6
Somalia	6
Morocco	2
Benin	1
Congo Brazzaville	1

Source : Oil and Gas Journal

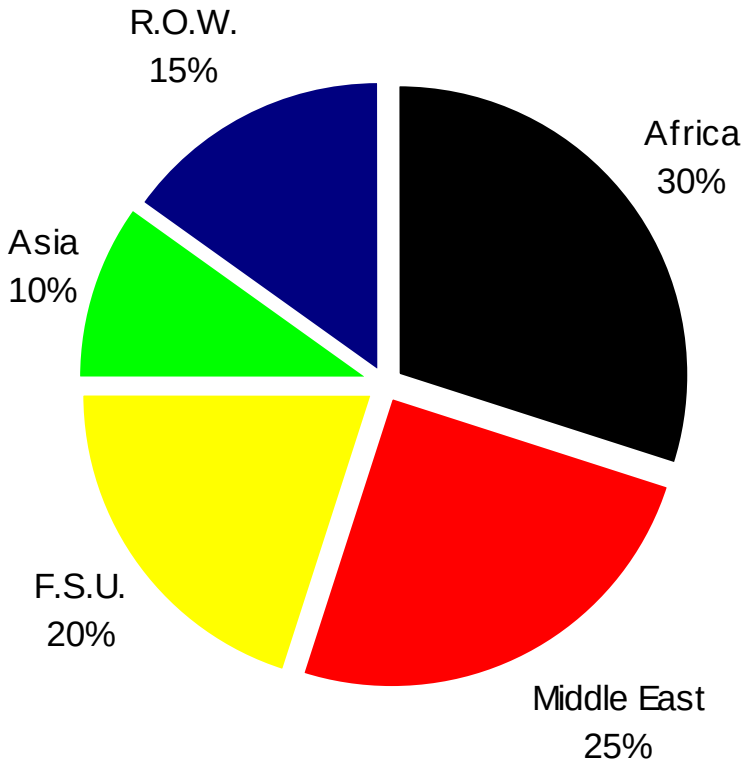
The “Global Gas Flaring reduction” initiative

- **Around 150 Bcm/y of natural gas are flared every year.**

- **The “Global Gas Flaring reduction”: a global initiative led by the World Bank with the aim to reduce significantly the CO_2 emissions of due to flaring.**
  - there is a strong commitment of many actors to improve the impact of E&P activities in this area.

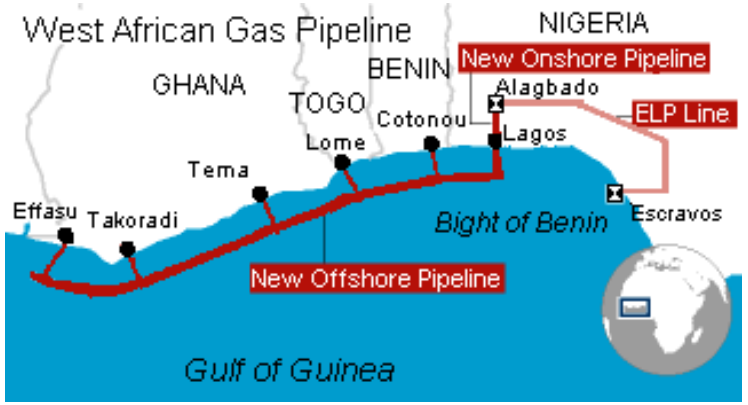
- **As a consequence, significant quantities of natural gas should be available for new projects.**

Natural gas flaring in the World



Source : World Bank

- **Large local projects are now considered:**
  - **The West African Gas Pipeline (WAGP)**
    - a solution to energy shortage in Benin, Togo and Ghana
    - a key infrastructure that will
      - enhance energy cooperation and integration
      - bring new industrial investments



  - **Power production**
    - **The development of local electricity generation using natural gas**
      - **Ghana - expansion of the Aboadze thermal power plant**
        - The upgrade would convert the plant from burning oil to natural gas, which it would receive from Nigeria through the WAGP.
        - The cost of the expansion project is estimated at $215 million. World Bank had given approval for negotiations on financing the project.
      - **Mauritania**
        - Building a thermal power plant could improve the economics of LNG exports.

Source : DOE, Nigeria LNG, SasolChevron

- **Many future plans include converting flared natural gas to LNG. Possible project list includes:**
  - **Nigeria**
    - **In 2005, Nigerian gas production reached 21.8 Bcm, only 12 Bcm were exported**
      - Current capacity : 18 MTPA. With upcoming train 6 and possible train 7, capacity could be lifted to over 30 MTPA by 2011.
  - **Equatorial Guinea**
    - **The Bioko Island project to export LNG from Alba field**
      - May 2007: Train 1 delivered its first First LNG Cargo. This train has a nameplate capacity of 3.7 MTPA.
      - A possible second 4.4 MTPA train is currently undergoing feasibility studies.
  - **Angola**
    - **ANGOLA LNG**
      - a single 4.0 - 5.0 MTPA train with the option for additional trains is currently under study. However, the facility is not expected to come online before 2010.

X-To-Liquids : an African technology

- The **South African** example...
  - **Two firms supply approximately 40% of the local fuels market.**
    - **Sasol and CTL**
      - a **160,000 bbl/d** capacity
      - the world's only manufacturer of oil from coal (Sasol has produced more than 700 million boe since the early 1980s)
    - **PetroSA :**
      - the Mossel Bay plant: a capacity of **45,000 bbl/d** from gas to liquids (GTL)

- **New African GTL projects are also considered:**
  - **NIGERIA :**
    - **The Escravos project (EGTL)**
      - Partners: Chevron, Sasol and NNPC
      - a **34,000 bbl/d** plant that will benefit from the infrastructure already in place for nearby oil and gas production and export facilities.
    - The **Syntroleum's project:**
      - a GTL barge concept with a **20,000 bbl/d** nominal capacity
      - a useful way of monetizing small and isolated gas deposits in the absence of any gas transmission network.

Source : DOE, Nigeria LNG, SasolChevron

Is Oil a curse?

- **Very often, development slower if there are oil/mineral resources**
- **Problem of corruption**
- **Facilitation of wars**

- From Mosop to MEND
- An important loss of production
- Two concerns : control of the rent, conditions of production
- Is the present relief for long

Sudan and Chad

- Two countries with strong internal tensions
- In Sudan, production in the hands of Chinese companies
- In Chad the end of the "model"
- Will oil succeed in ensuring the development of these countries ?

Conclusions

- Oil and gas produstion will develop, especially in West Africa
- Oil demand to increase, most of gas still exported
- Need to use oil money for development