

Africa: Great Frontier: World Hydrocarbons Past, Present, and Future*

Duncan Clarke¹

Search and Discovery Article #70057 (2008)

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Abstract

The oldest and original continent, Africa has been central to the world exploration saga. It has a long track record in the shaping of the industry and its evolution. The various phases of exploratory drilling and hydrocarbon discovery span over a century. Africa remains today's great uncharted frontier in world oil and gas. Sequential scrambles for Africa's endowment embrace a long struggle for oil played out between many Great Powers and inside African states before, during, and after the Cold War. The contemporary corporate oil quest engages over 500 companies drawn from all over the globe, including state oil companies from six continents. Yet Africa is a diverse landmass and island domain containing vast and little known ancient subsistence worlds on which the quest for Africa's oil prize has had only marginal impact. More African countries have today encountered larger acreage leasing, rising discovered reserves, oil and gas development, and fast-expanding production and exports. Corporate, investment, and financial stakes have grown substantially across the oil and energy value chain, including those in gas ventures and LNG, during the dynamic cycles experienced from the 1960s into the 21st century. Yet oil historiography, economics, and fragmented geopolitics have left uneven exploration and social landscapes inside the African oil game. A cast of thousands seeks to arbitrate and capture this large resource that has become the key locomotive for the continent's economic future. Multiple dynamics and strategies drive this unprecedented rush for oil and gas assets as Africa's guardians and gatekeepers, as well as players involved in this epic search, all seek their piece of its lucrative prize. This shifting collage is reshaping modern Africa and its ancient economies. The story sheds new light on myths around Africa's presumed "oil curse" and its 21st century rediscovery in the enduring scramble for the Dark Continent's crude bounty.

Africa: Great World Frontier
Past, Present & Future



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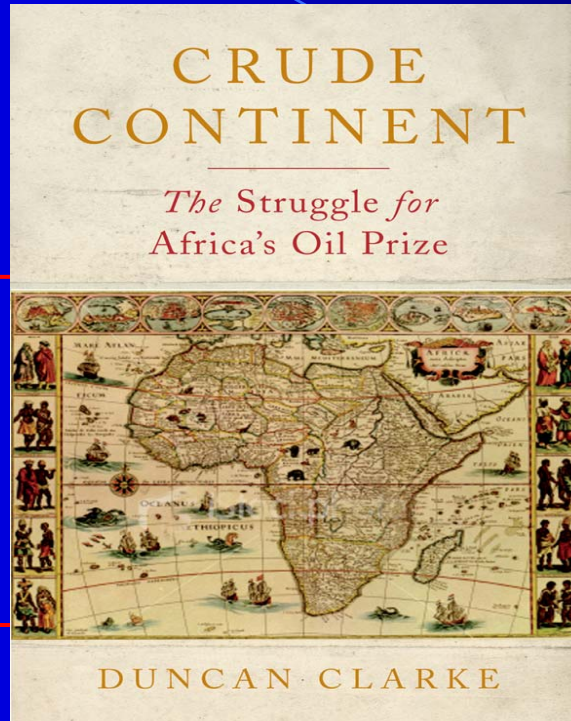
Africa: World's Great Frontier

Africa's Prize

Global Quest Afoot
Rising Oil/Gas Reserves
LNG Growth Potential
Investment Stakes
Great Power Interests

"Medieval Africa"

Challenges Ahead
Pressured States
Africa's Oil Patrimony
Oil Wealth Significance
Darkness or Destiny



"Discovered" Africa

La Longue Duree
Exploration Saga
100 Years Effort
Modern Scramble

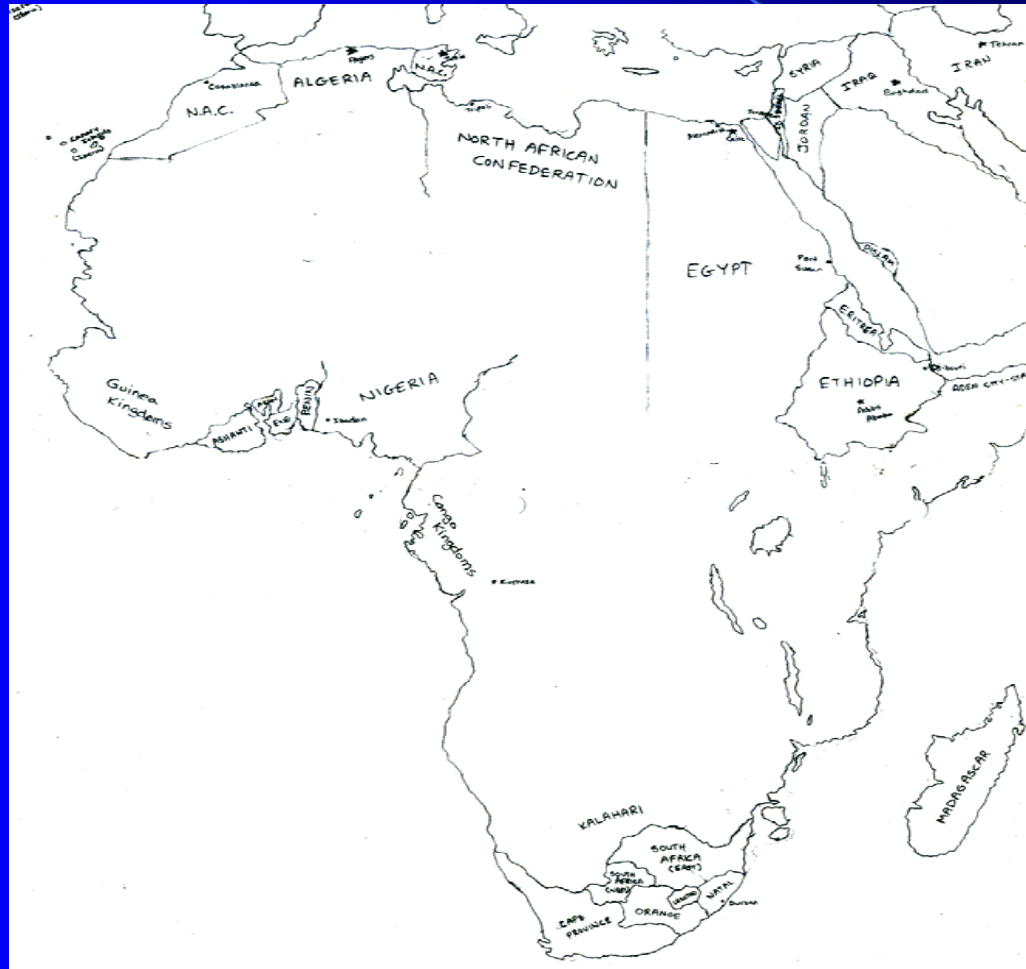
Corporate Impact

Exploration Space
Acreage Uptake
New Frontiers Opened
Company Presence/Growth

State Oil Companies

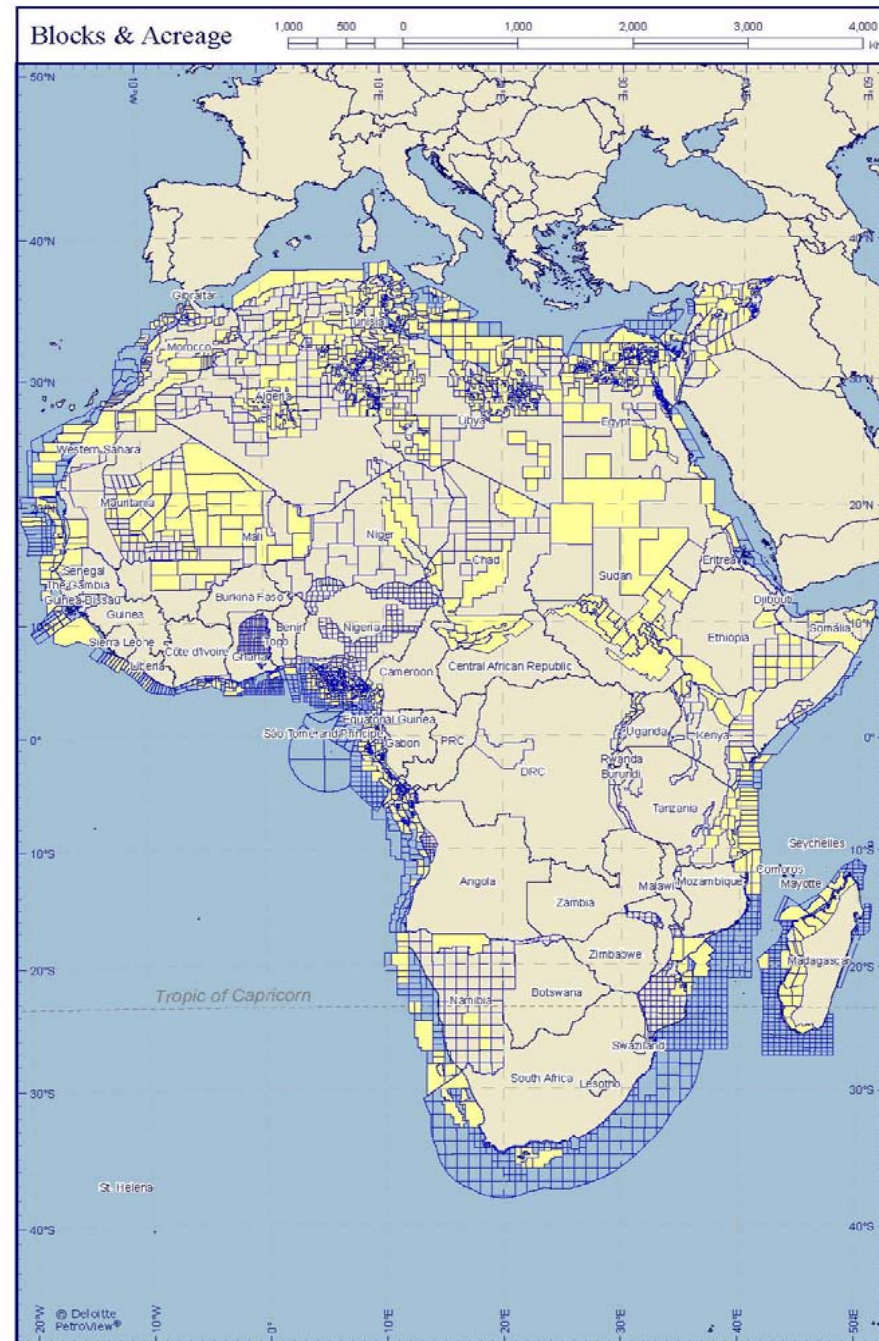
More State Companies
Global Entry To Africa
State Players: Grow

“Discovering Africa” 100 Years Exploration



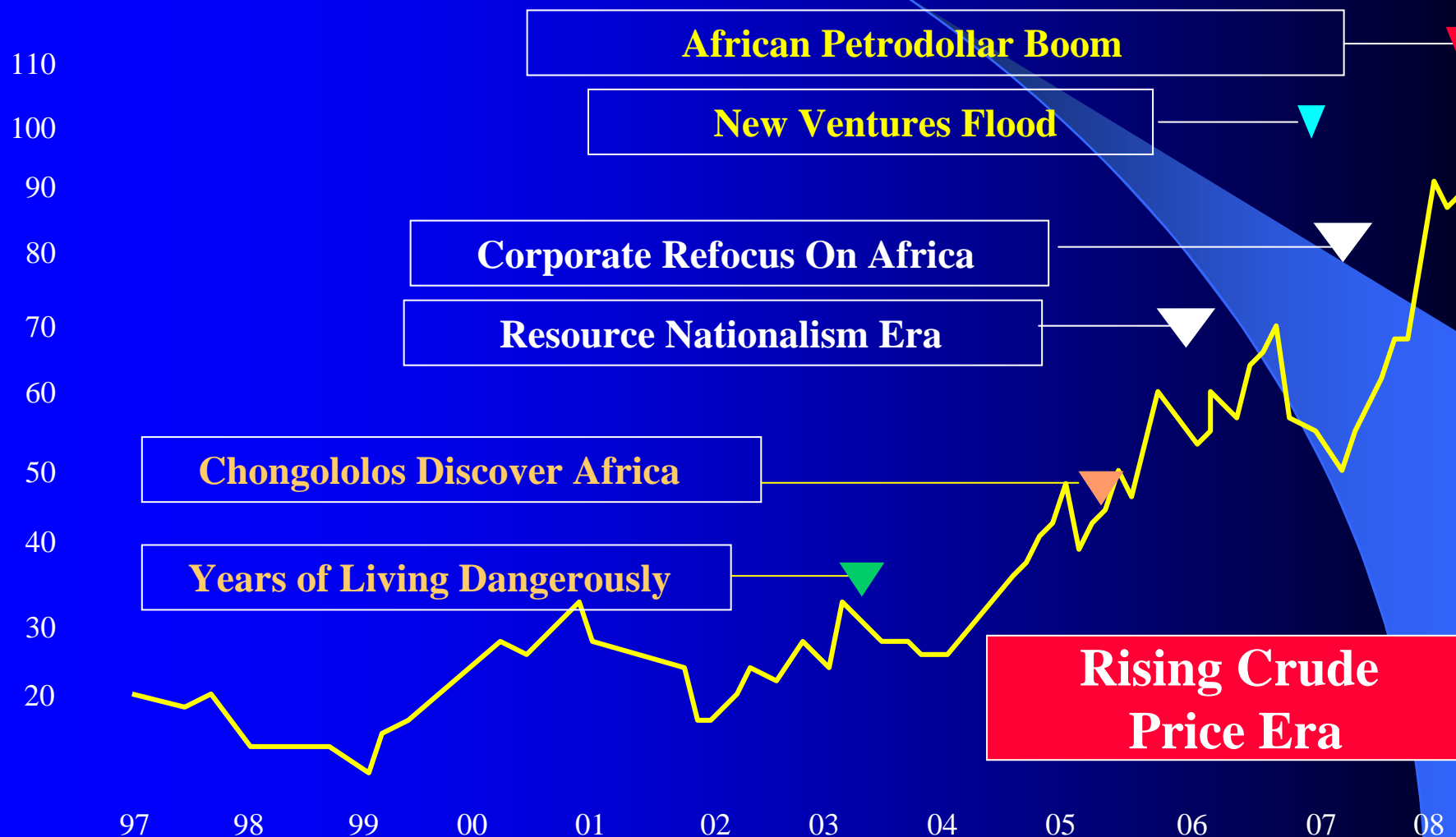
African Landmarks

- 1850s: Portuguese Find Oil Seeps: Angola
- 1884/1900: Onshore Seeps: Gulf of Guinea
- 1900/10: Ghana Shallow Drilling
- 1910/50: Drilling In West Africa
- 1960s: Shift Offshore
- **Century of Exploration**





Africa: Crude Continent



Exploration Wells 2007/08

COUNTRY	EXP. WELLS	OFF/ON	AVERAGE TD (m)
ALGERIA *	77	-	3,245
EGYPT	165	31 / 134	3,057
LIBYA	104	5 / 99	2,429
ANGOLA	23	15 / 5	3,634
TUNISIA	34	2 / 17	3,029
NIGERIA	10	9 / 1	2,850
GABON	7	2 / 4	2,058
EQ GUINEA	7	6 OFF	2,680
CAMEROON	7	3 OFF	3,924
CONGO BR	7	4 / 3	2,824
UGANDA	4	1 ON*	1,635
GHANA	3	3 OFF	3,924
TANZANIA	3	2 / 1	2,286
SUDAN	3	1 ON	-
GUINEA-BISSAU	2	2 OFF	1,876
BENIN	1	1 OFF	3,809
KENYA	1	1 OFF	4,887
MOZAMBIQUE	1	ON	-
MAURITANIA	1	OFF	4265
NAMIBIA	1	OFF	3627
NIGER	1	1 ON	3,400
SOUTH AFRICA	1	OFF	2856

463 Wells

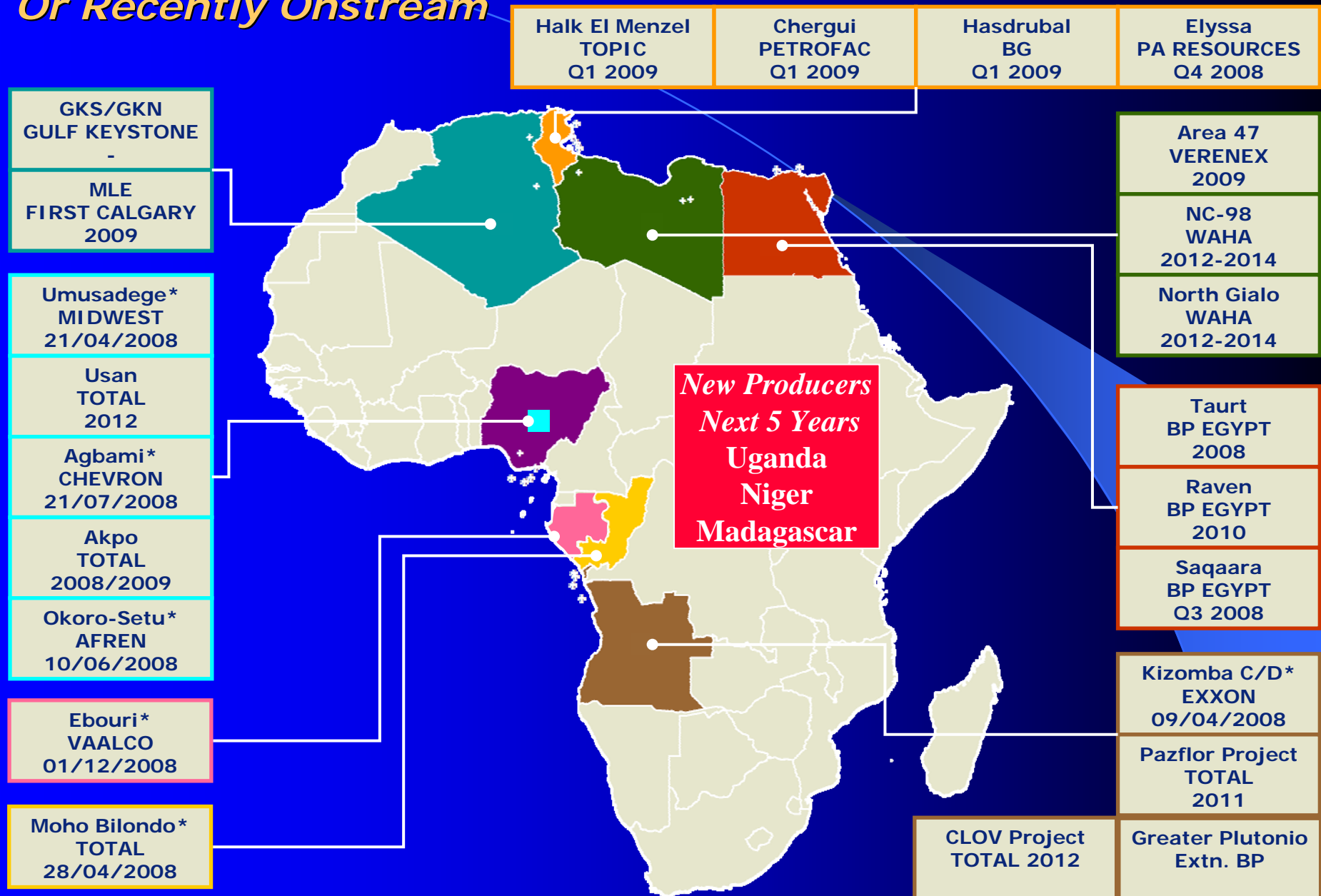
82%

Maghreb

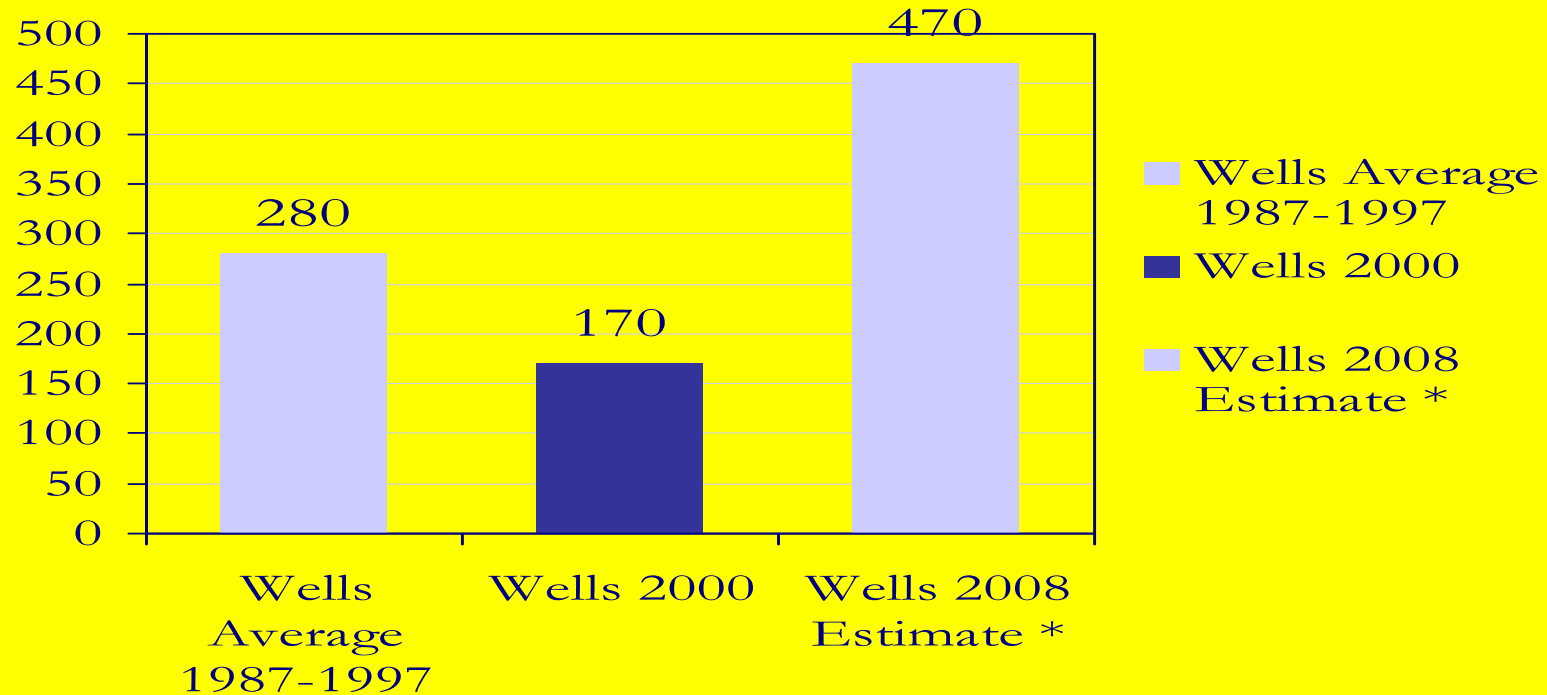
Discoveries: 2007/08

COUNTRY		ANNOUNCED DISCOVERIES
EGYPT	112 Disc 60% Maghreb	31
ALGERIA		26
LIBYA		18
ANGOLA		10
TUNISIA		10
CONGO BRAZZAVILLE		4
EQUATORIAL GUINEA		3
GHANA		3
NIGERIA		3
UGANDA		3
CAMEROON		2
TANZANIA		2
SOUTH AFRICA		1

Fields In Development Or Recently Onstream

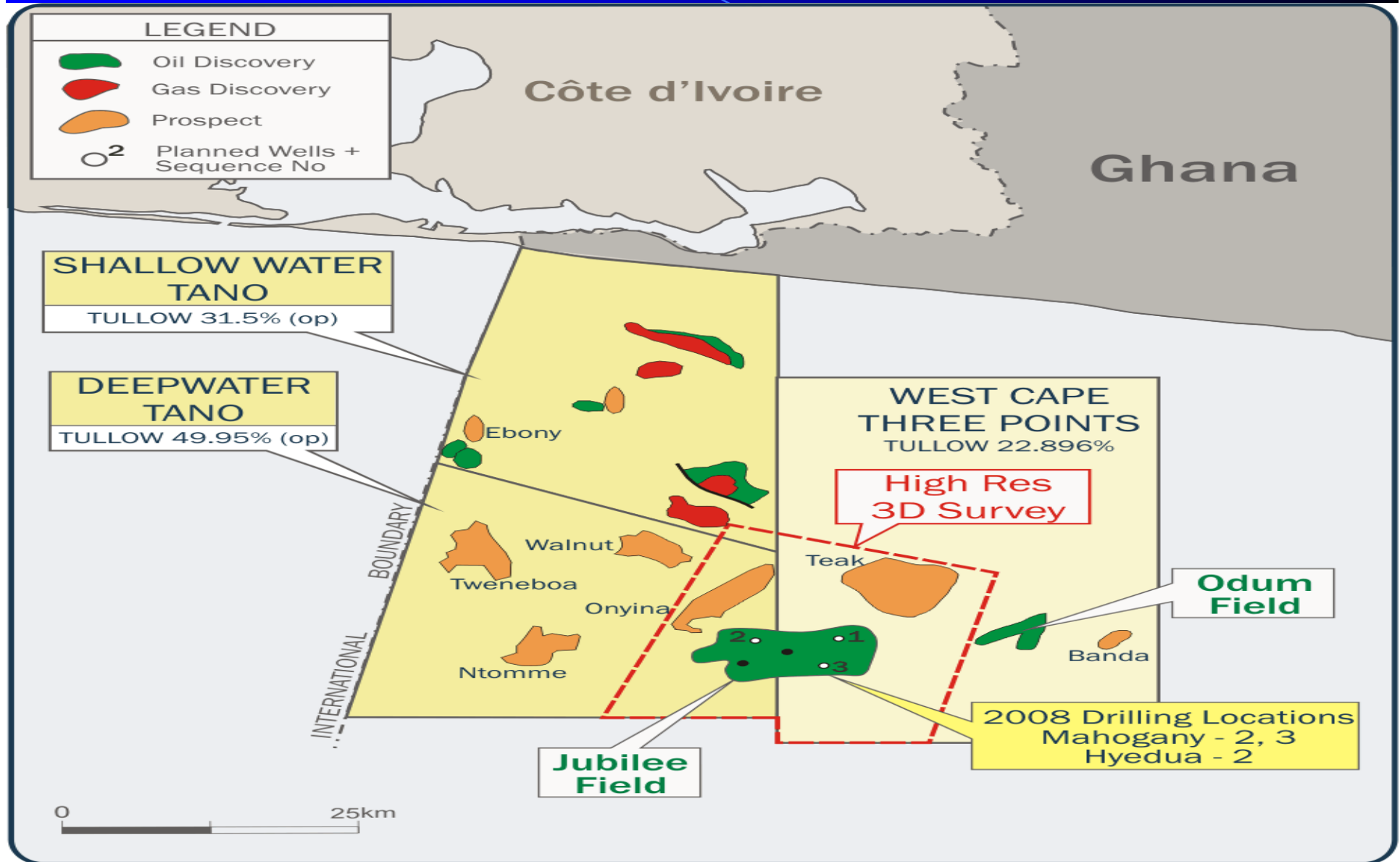


Africa: Exploration Wells



Major Exploration Drive: 21st Century

Ghana: World Class Discoveries



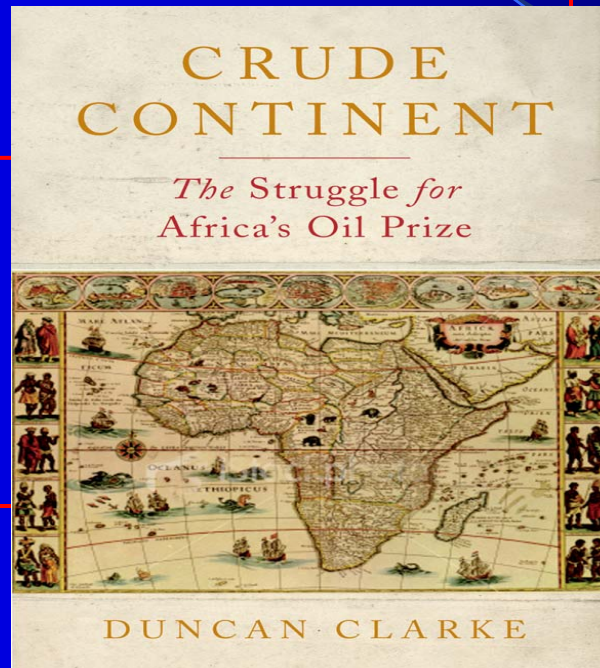
Corporate Quest For Africa

Top Ten: Super Majors

ExxonMobil, BP, Shell,
Chevron, Total
ENI, COP, Repsol YPF
Lukoil, StatoilHydro

Foreign State Players

Grand Strategy
CNPC, Sinopec, CNOOC
ONGC, TPAO
Petrovietnam, PTTEP
Pertamina, Gazprom
African State Players



"Super Independents"

"Top 25" Players
Growing Portfolio

Minnows in Africa

500 Juniors
Chongololos
Quoted & Unlisted
Foreign Domiciled
Mixed Morphologies
"Born In Africa"
Corporate Quest

Worldwide Independents

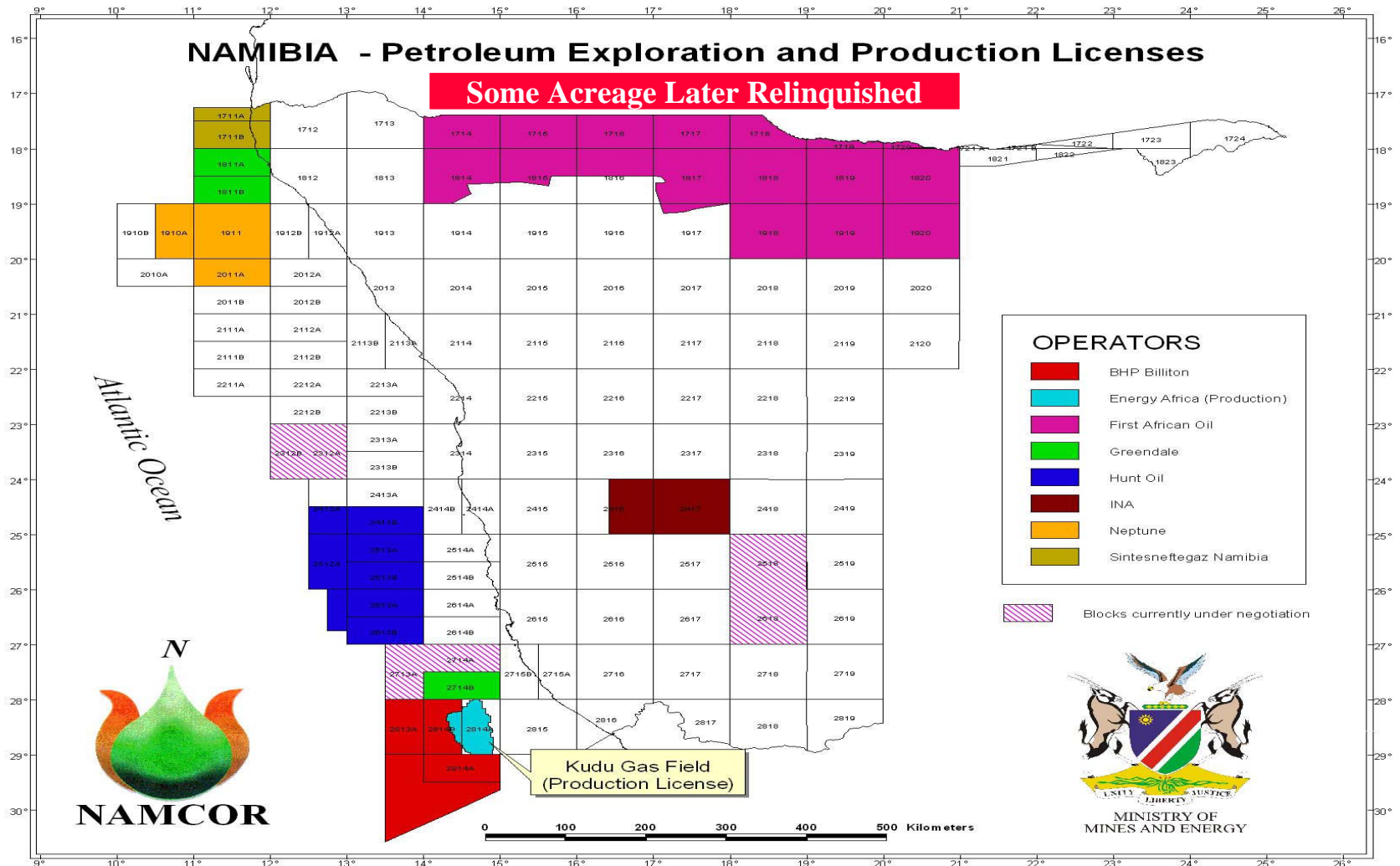
50+ Key Companies
Producers: Explorers

Corporate Oil

Africa Impact

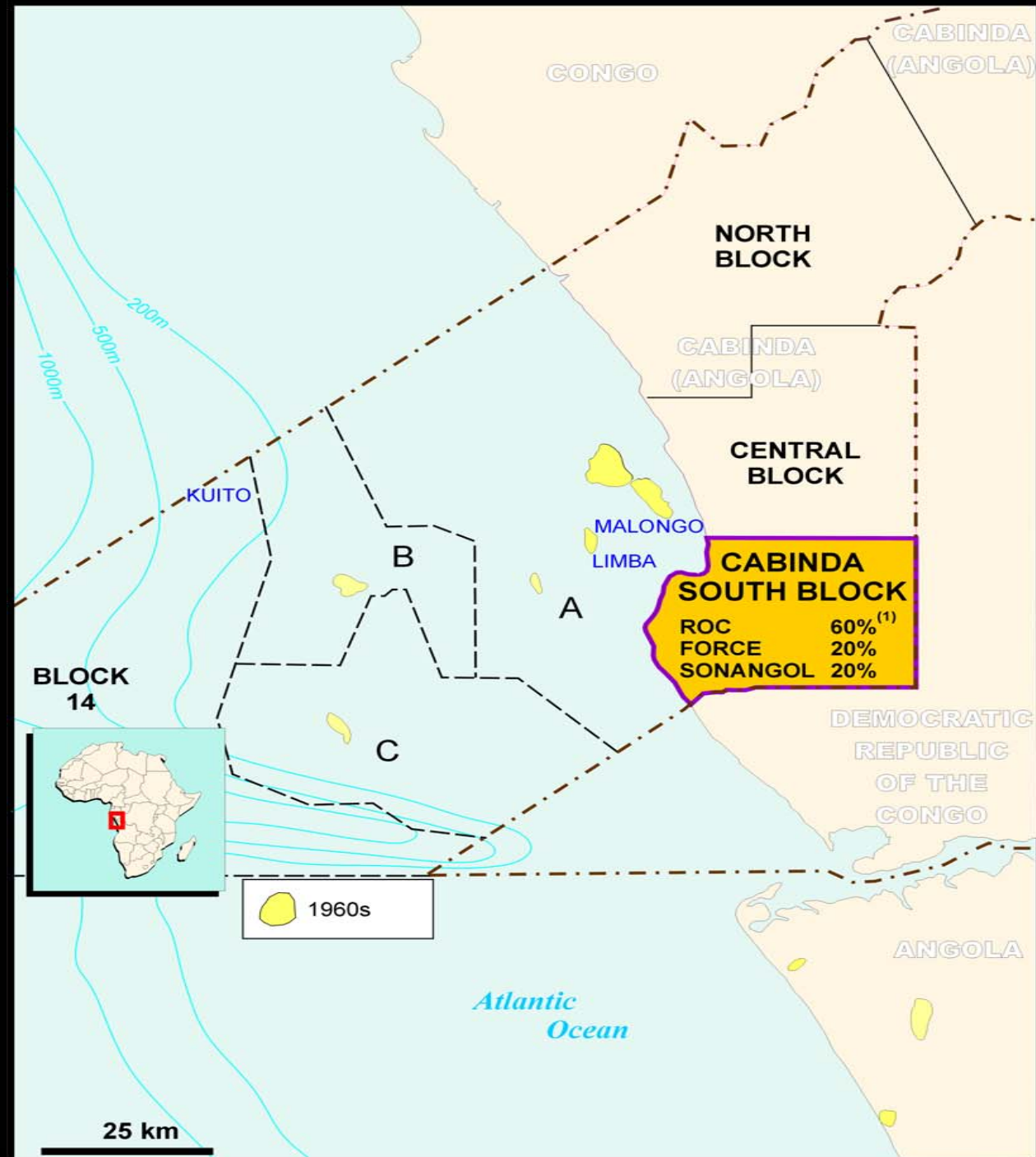
- **Exploration Frontiers**
- **Oil Prize Search: Stakes**
- **Unexploited Potential**
- **Corporate Presence**

Namibia: Players



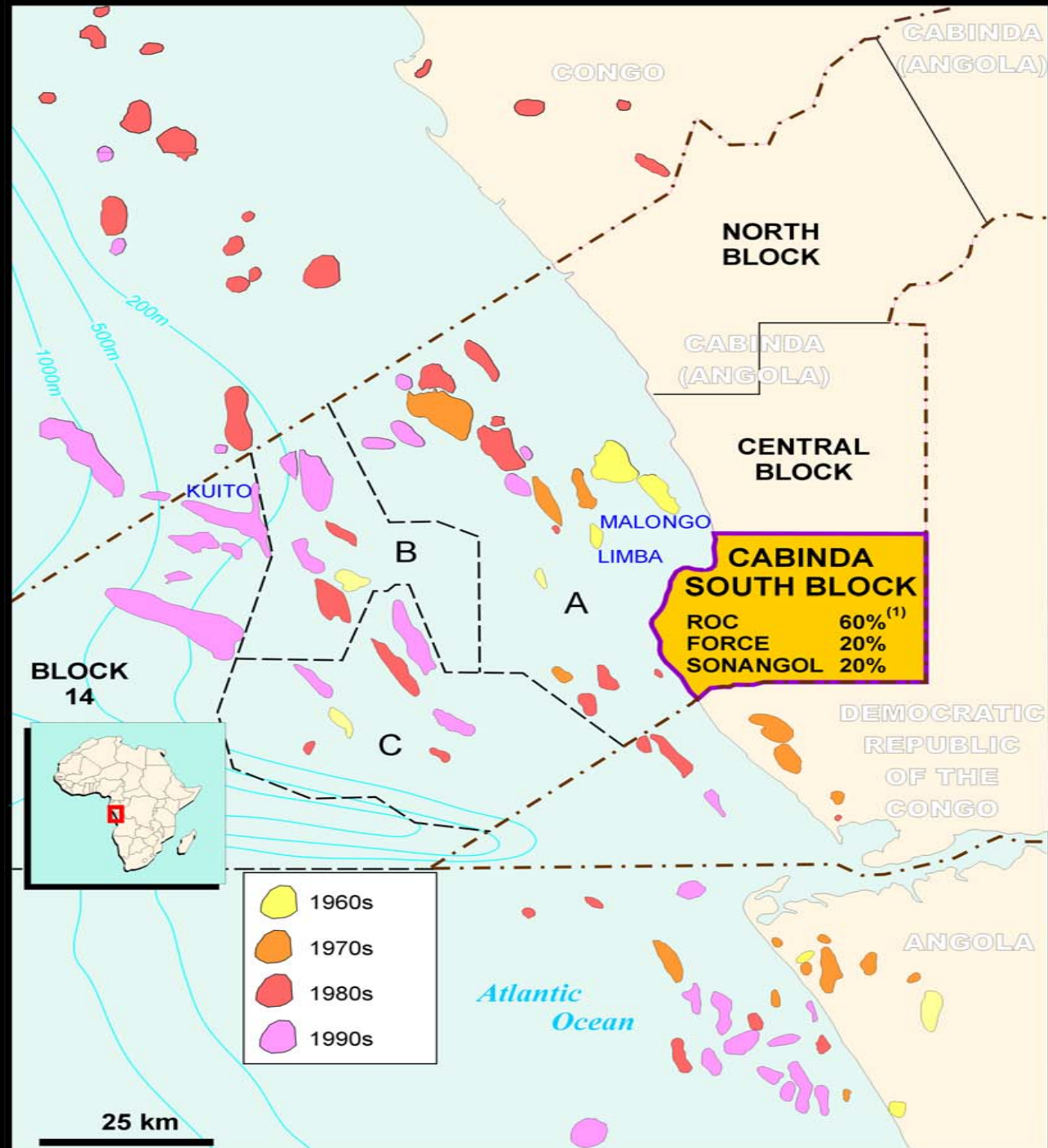


OFFSHORE ANGOLA: FIELDS 1960S





OFFSHORE ANGOLA: FIELDS 1990s



1978 "The Majors"



1988 "The Doldrums"



1998 "The Entrepreneurs"



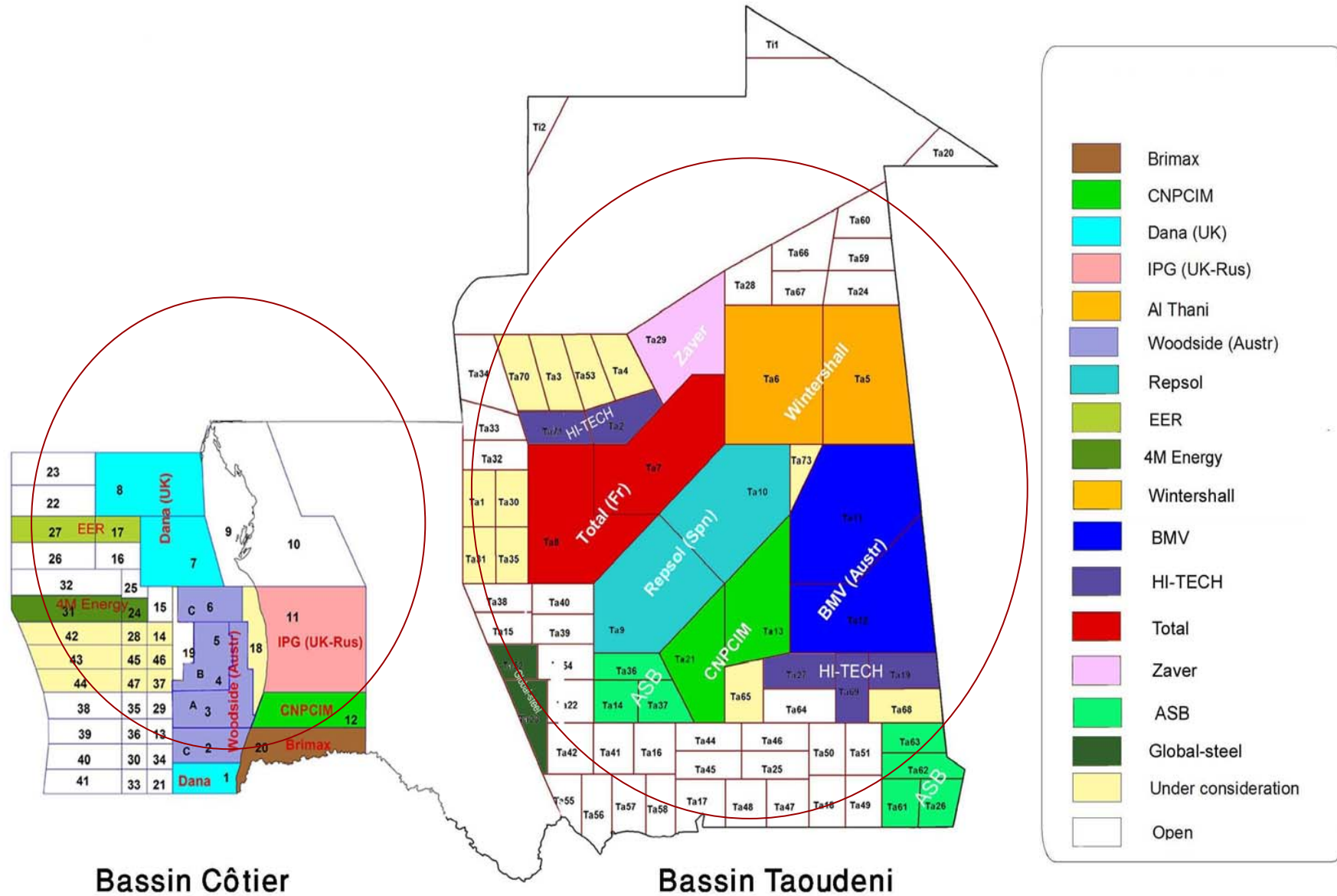
2000 "The Mid Caps"



2004 "Return of the Majors"



CARTE DES BLOCS EN MAURITANIE



REPUBLIQUE DU MALI

MINISTRE DE L'ENERGIE DES MINES ET DE L'EAU

AUTORITE POUR LA PROMOTION DE LA RECHERCHE PETROLIERE

Légende

- Capitale
- Capitale Régionale
- Chef lieu de Cercle
- Limite de Region
- Fleuve
- ★ Forage d'exploration
- Frontière
- Bassin Sedimentaire
- Socle

Operateurs et opportunités d'exploration

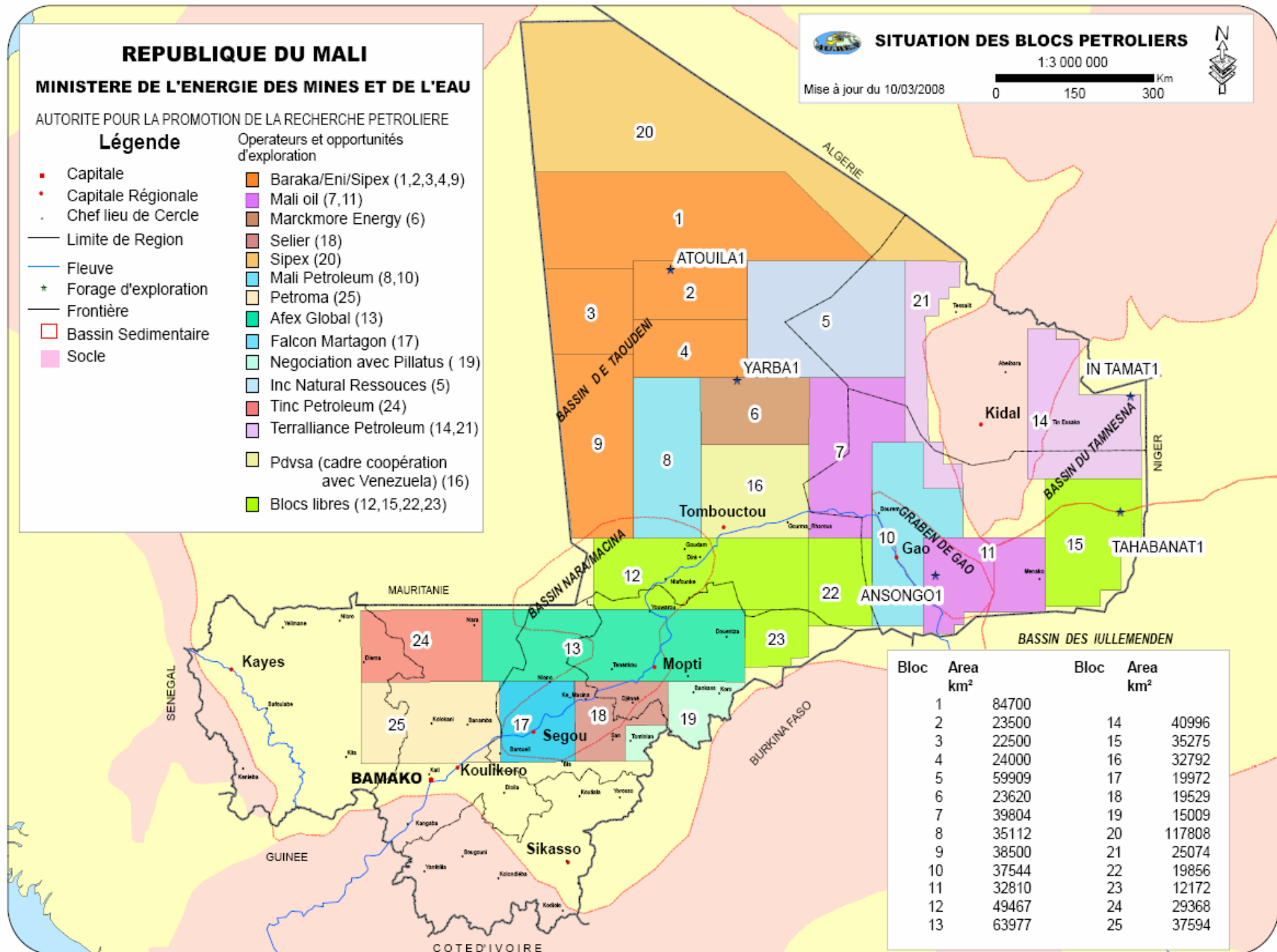
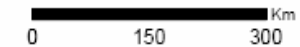
- Baraka/Eni/Sipex (1,2,3,4,9)
- Mali oil (7,11)
- Marckmore Energy (6)
- Selier (18)
- Sipex (20)
- Mali Petroleum (8,10)
- Petroma (25)
- Afex Global (13)
- Falcon Martagon (17)
- Negociation avec Pillatus (19)
- Inc Natural Ressources (5)
- Tinc Petroleum (24)
- Terralliance Petroleum (14,21)
- Pdvsa (cadre coopération avec Venezuela) (16)
- Blocs libres (12,15,22,23)



SITUATION DES BLOCS PETROLIERS

1:3 000 000

Mise à jour du 10/03/2008

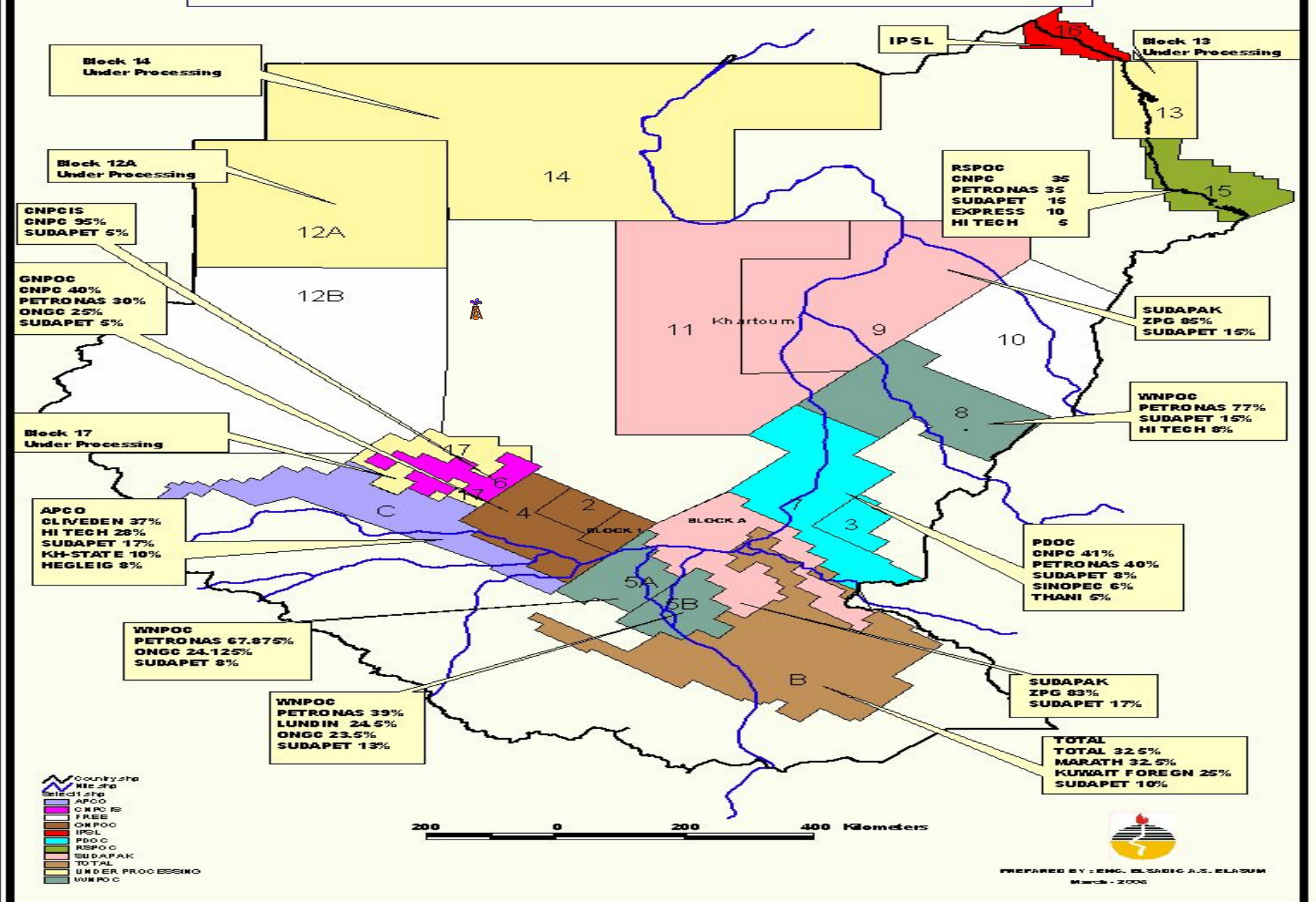


Bloc	Area km ²	Bloc	Area km ²
1	84700	14	40996
2	23500	15	35275
3	22500	16	32792
4	24000	17	19972
5	59909	18	19529
6	23620	19	15009
7	39804	20	117808
8	35112	21	25074
9	38500	22	19856
10	37544	23	12172
11	32810	24	29368
12	49467	25	37594
13	63977		



**MINISTRY OF ENERGY AND MINING
SUDANESE PETROLEUM CORPORATION
OEPA - Promotion Dep.**

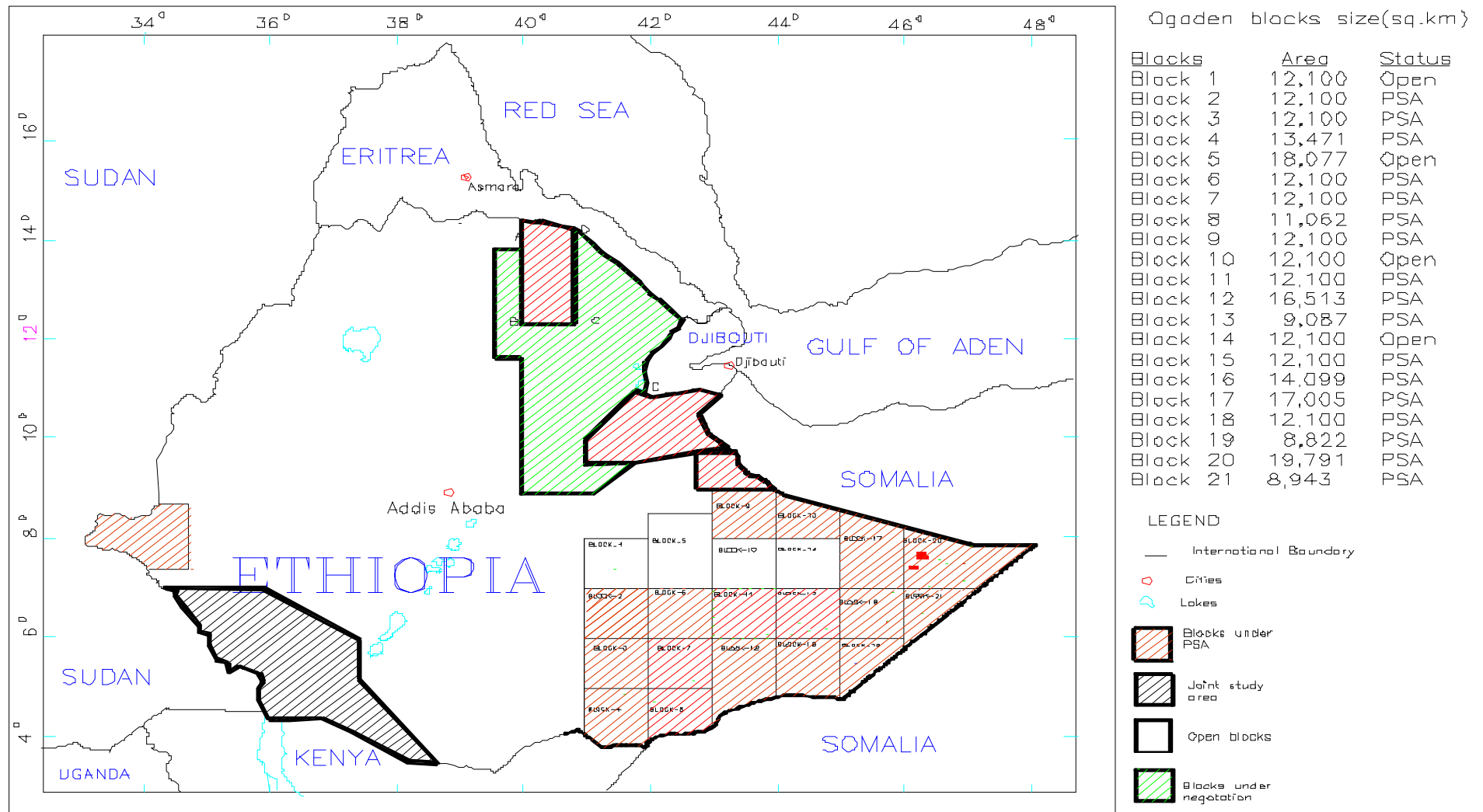
SUDAN HYDROCARBON CONCESSION BLOCKS



Ethiopia

21 Blocks Leased: 2008

Only 4 Open: Ogaden

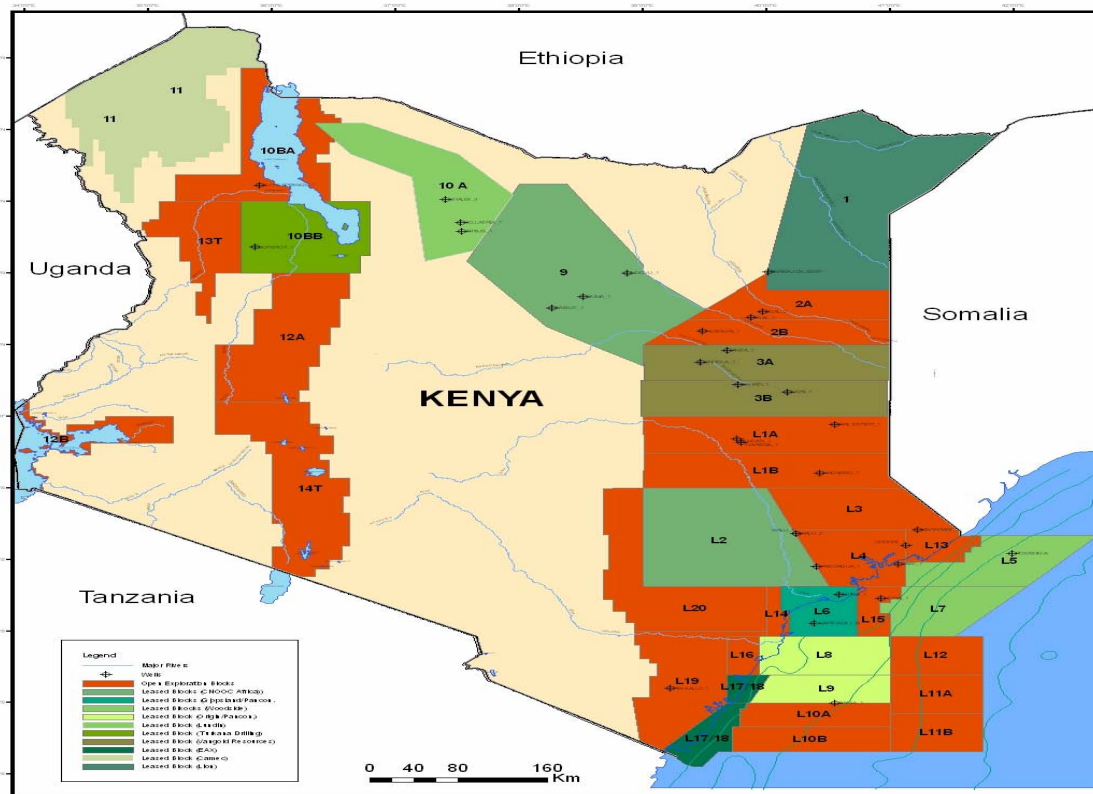


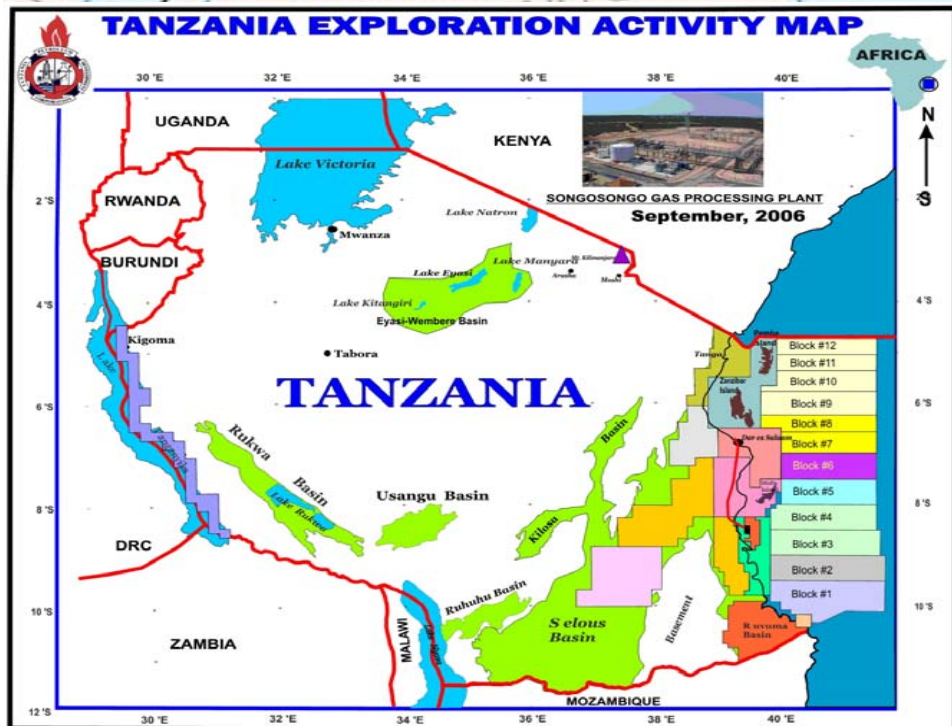
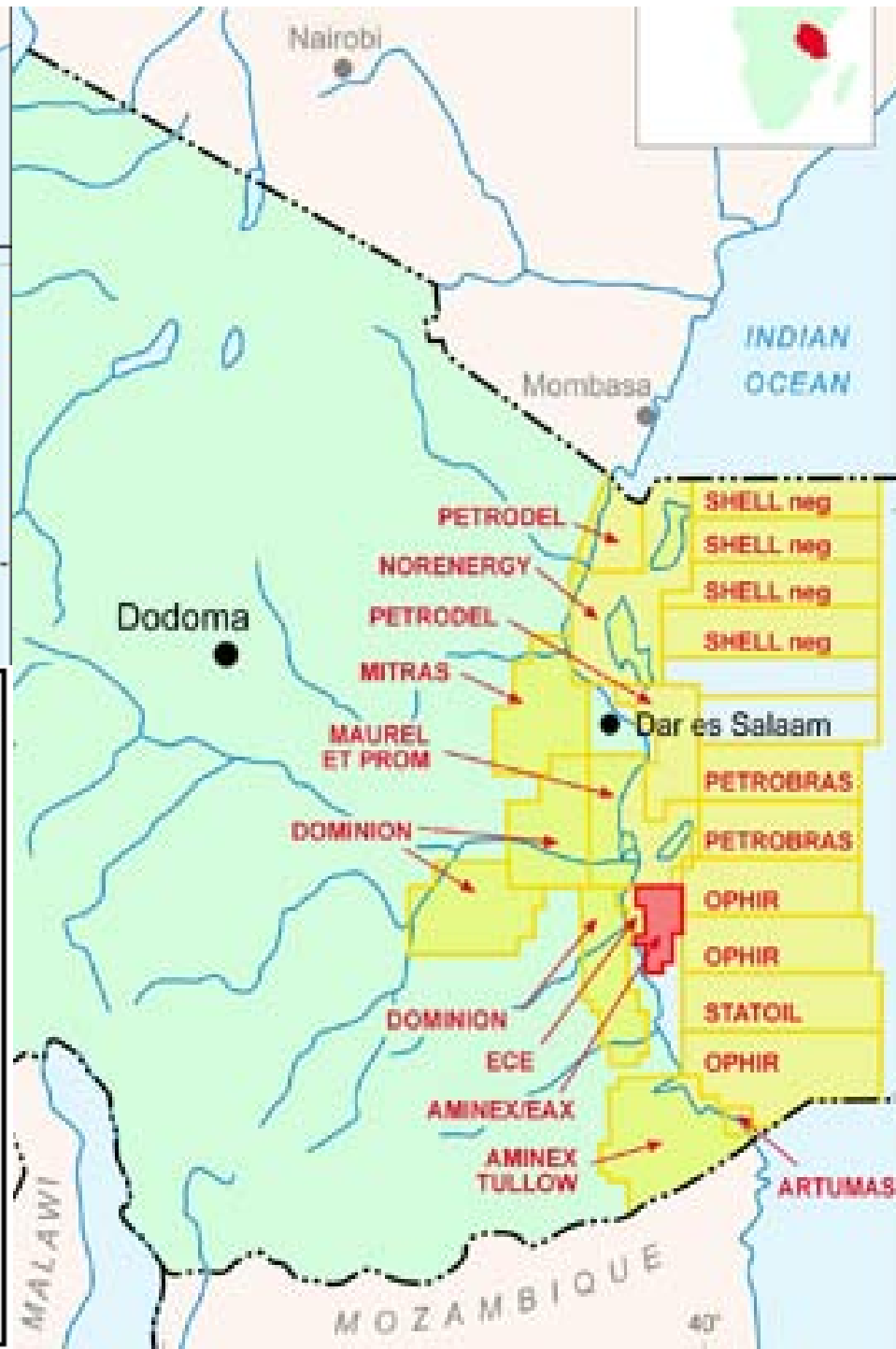
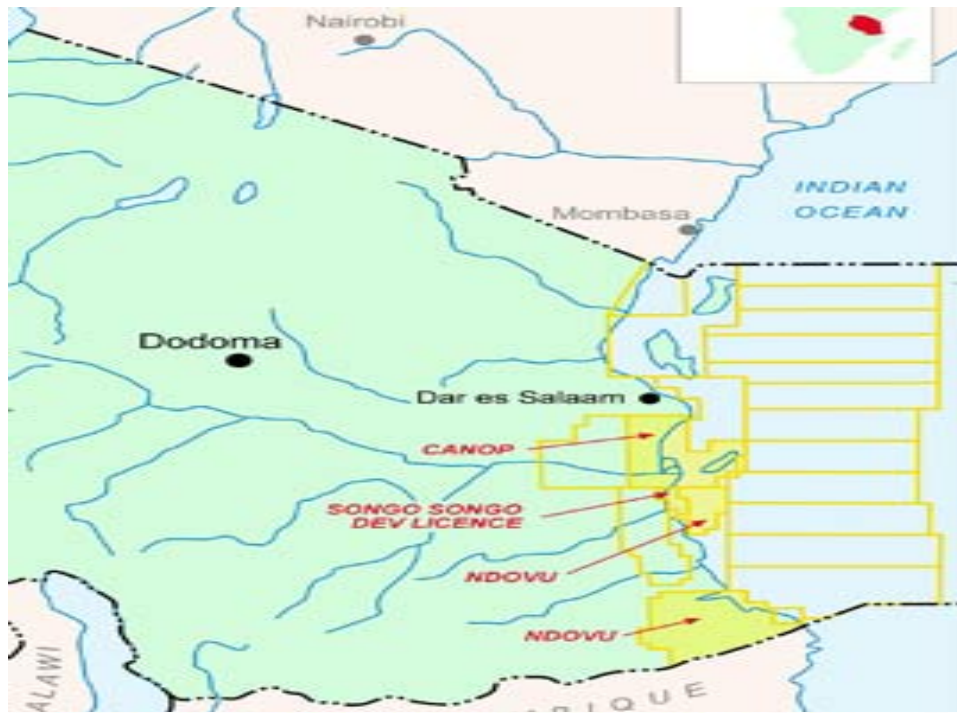
Kenya

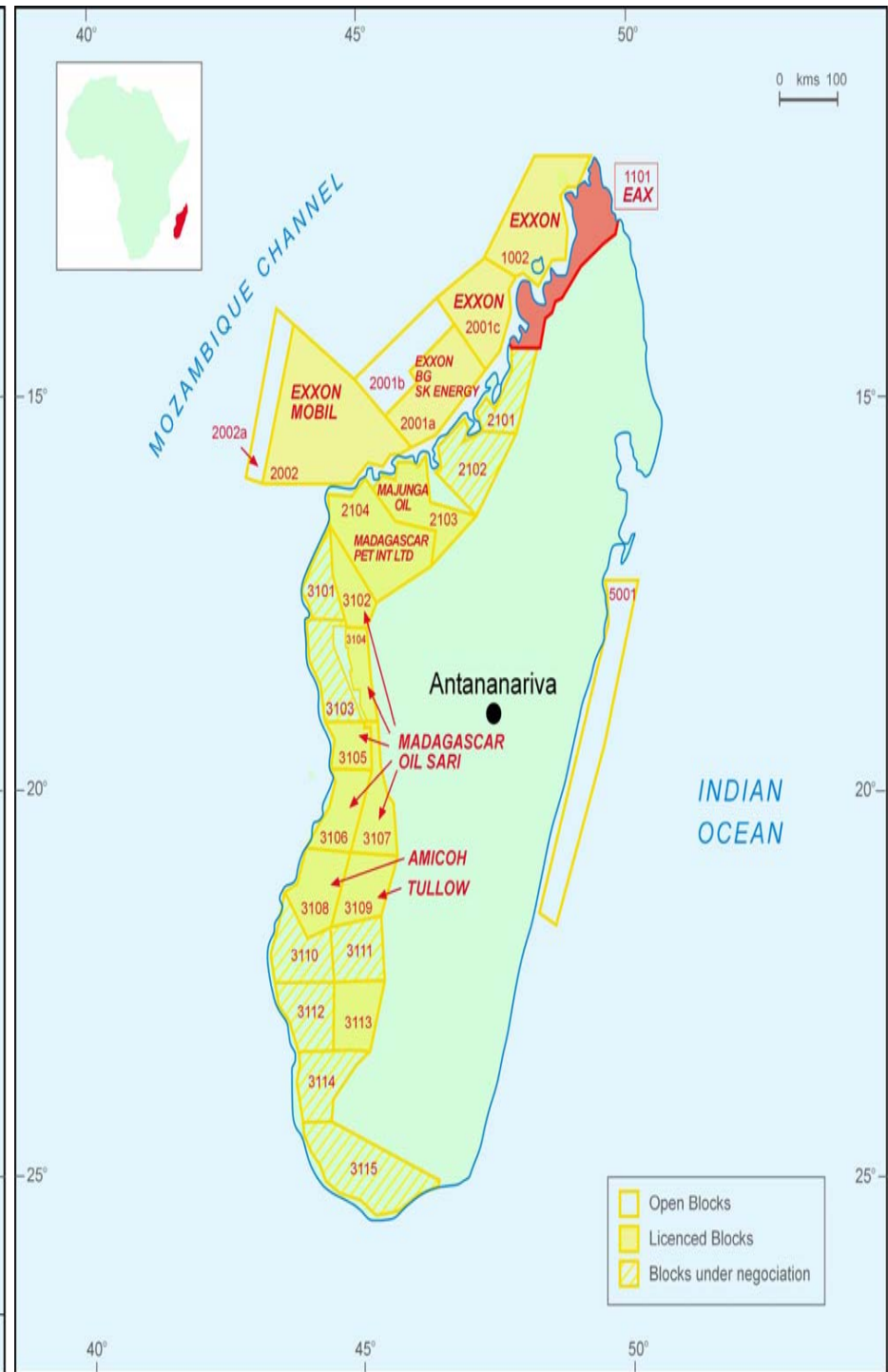
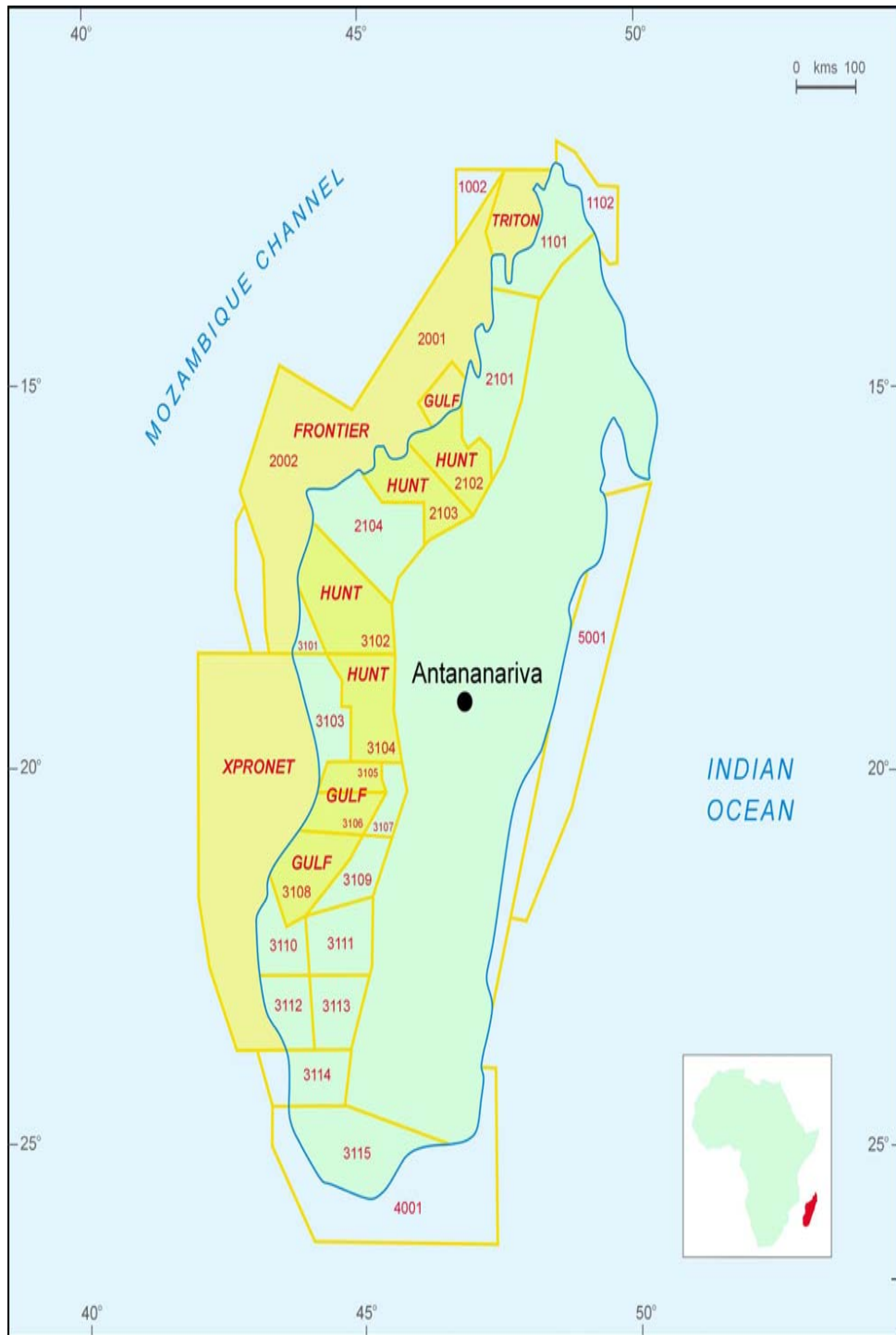
14 Blocks Leased: 2008

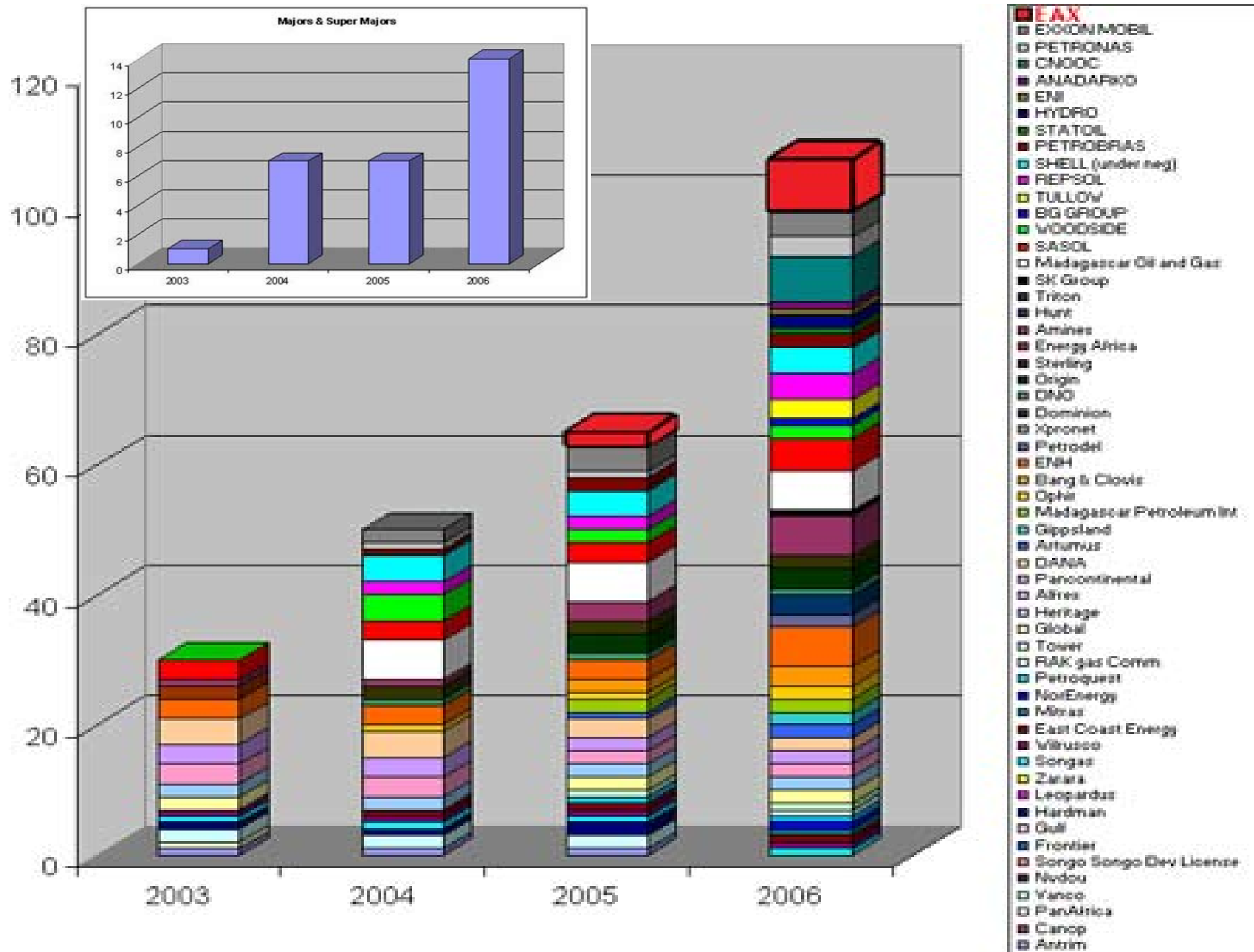
Now 20 Open

Kenya Exploration Block Lease Status - January 2008

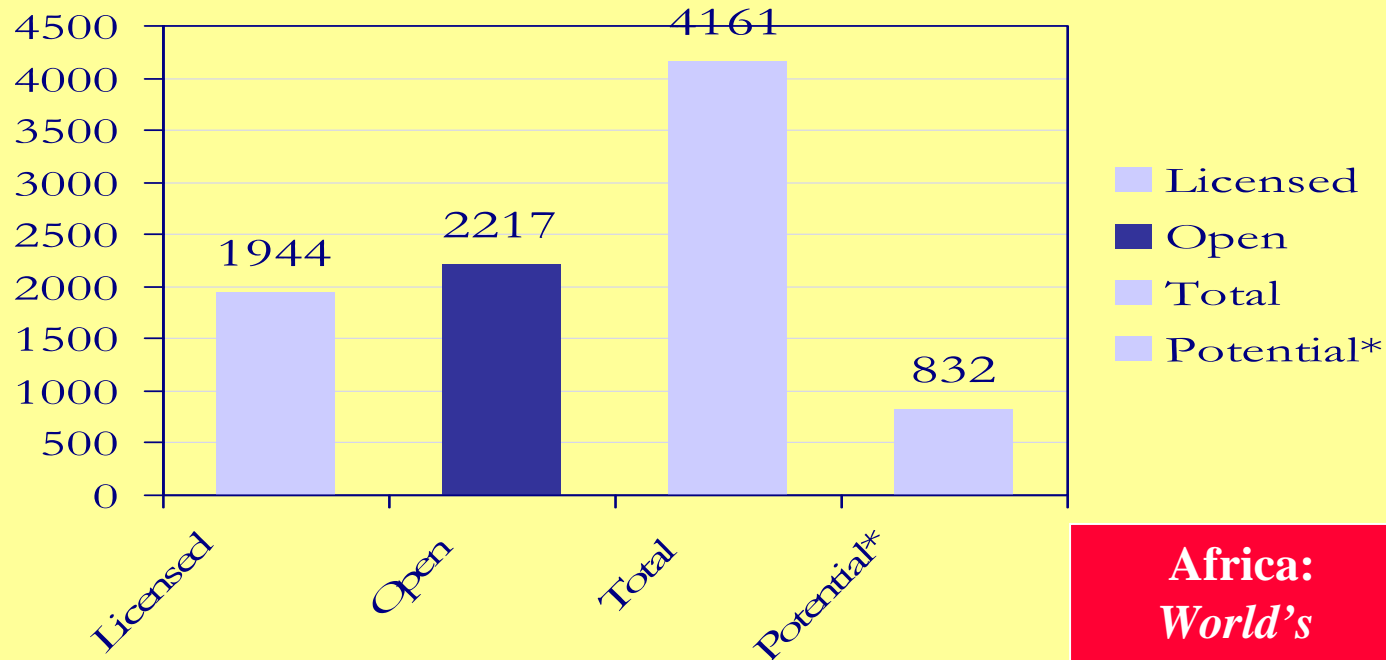








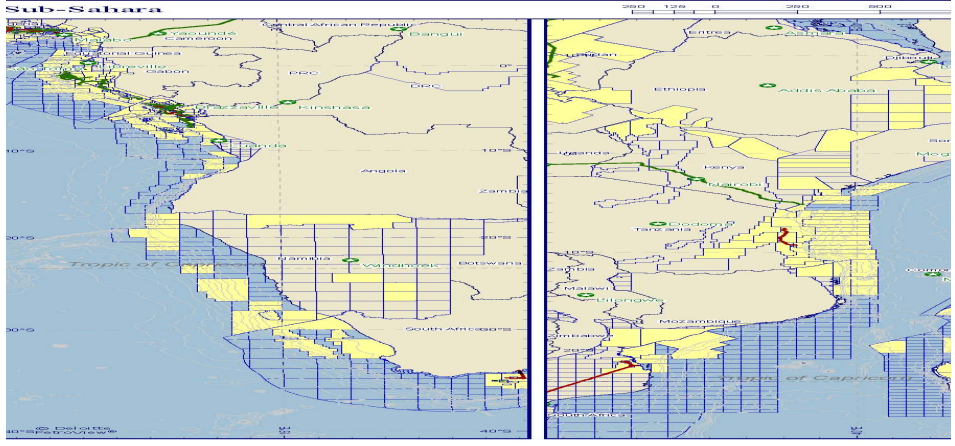
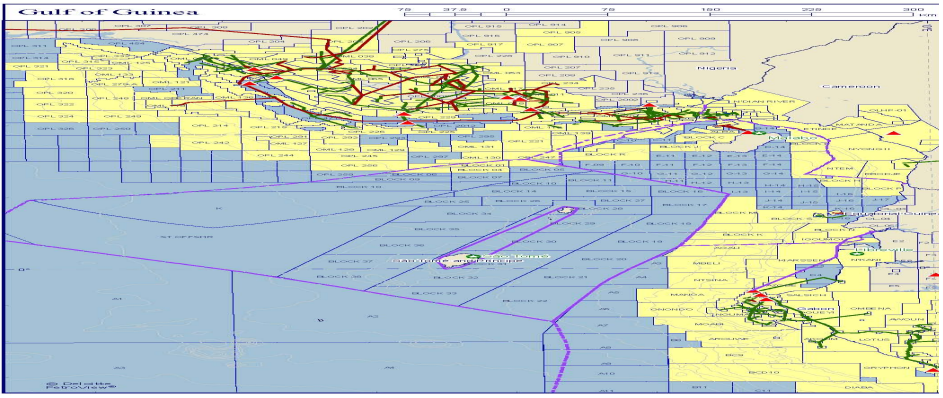
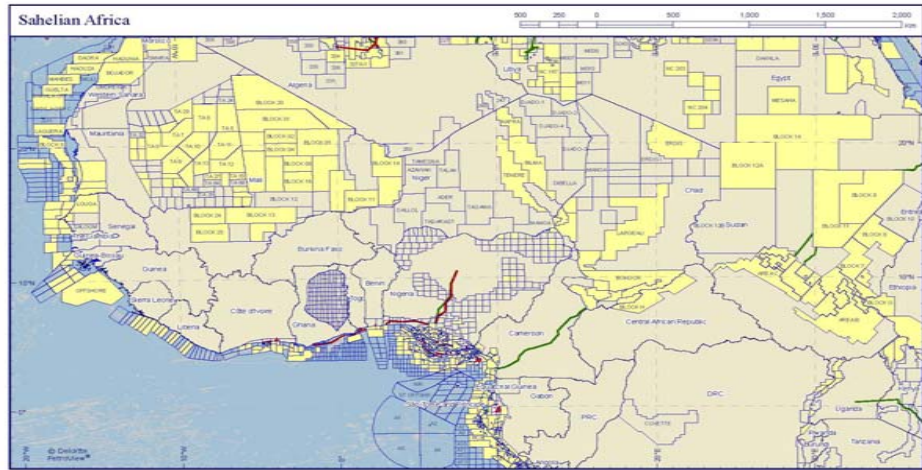
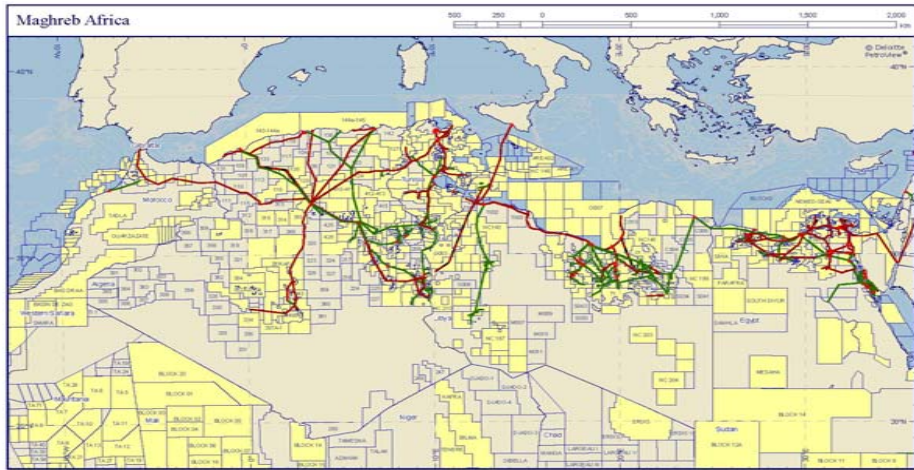
Africa: Acreage Licensed/Open



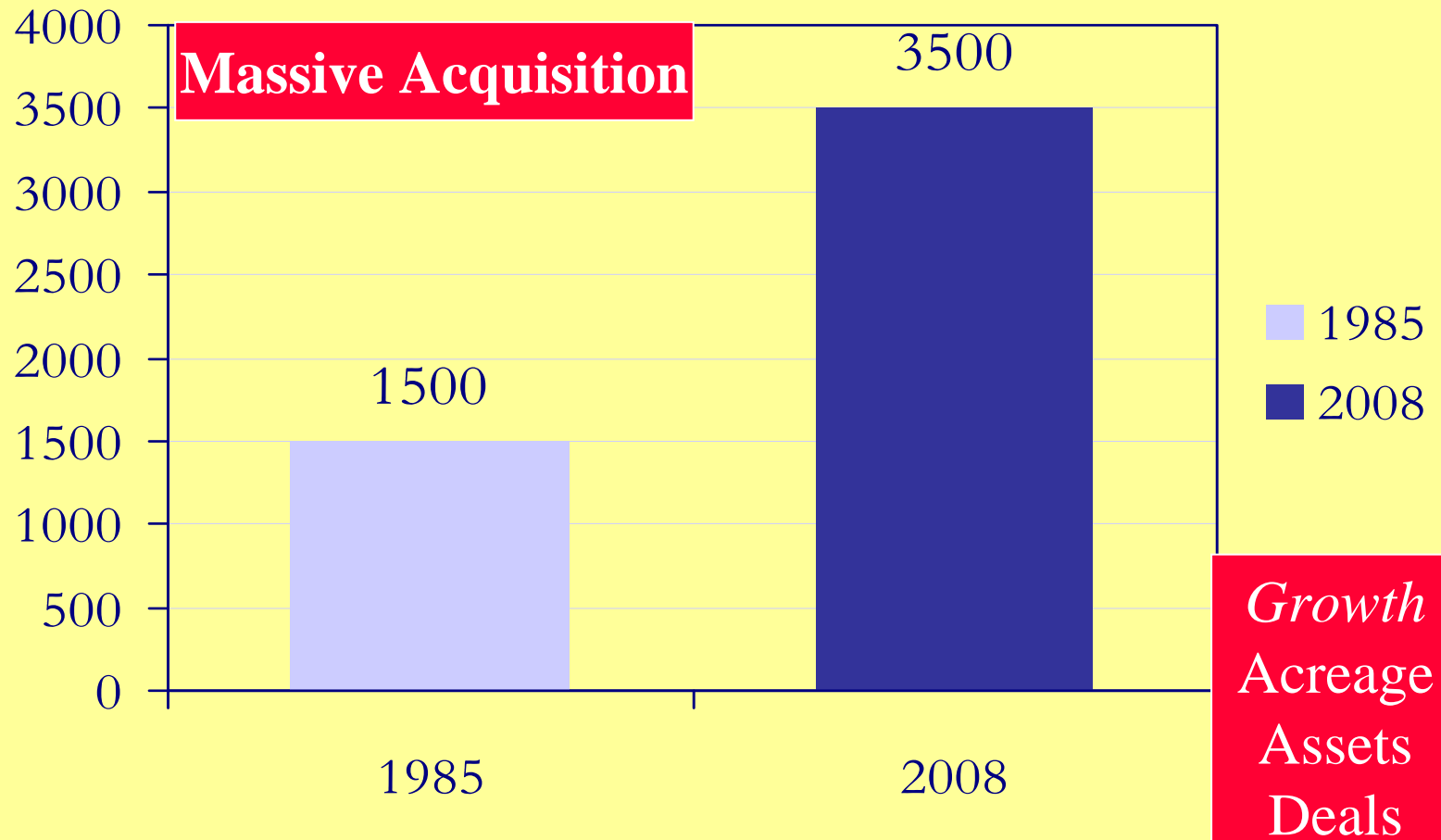
**Africa:
World's
Great Frontier**

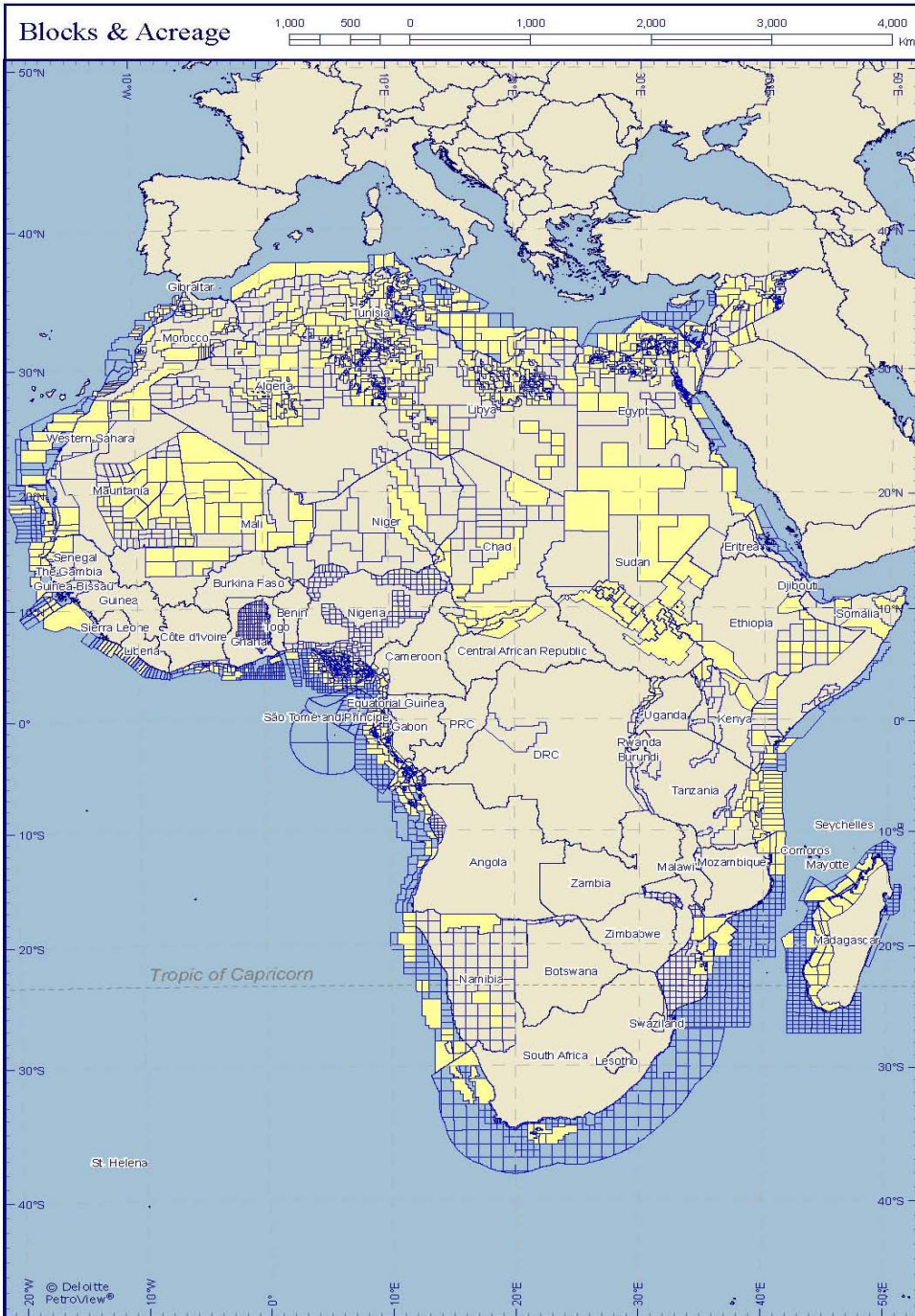
Estimates: Sept 2008: Deloitte

1. **North Africa: 1076 Licensed, 220 Open Blocks**
2. **Sub Saharan: 868 Licensed, 1997 Open Blocks**
3. **Open: Includes Applications + Force Majeure**
4. **Potential: Eventual EEZ + Demarcations + New**



Company Interests: Held Across Africa





Africa

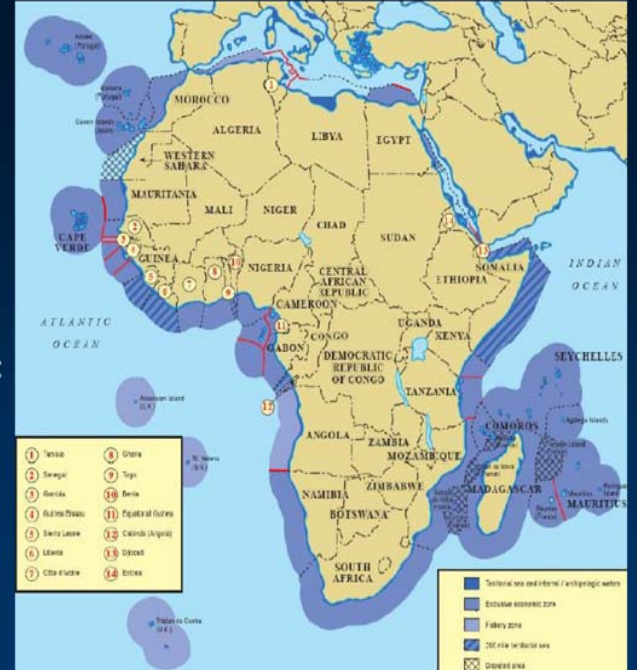
Coastal states: 43
(world = 155)

Potential maritime boundaries: c. 79
(c. 365)

Boundary agreements: 22 (28%)
(160 – 44%)

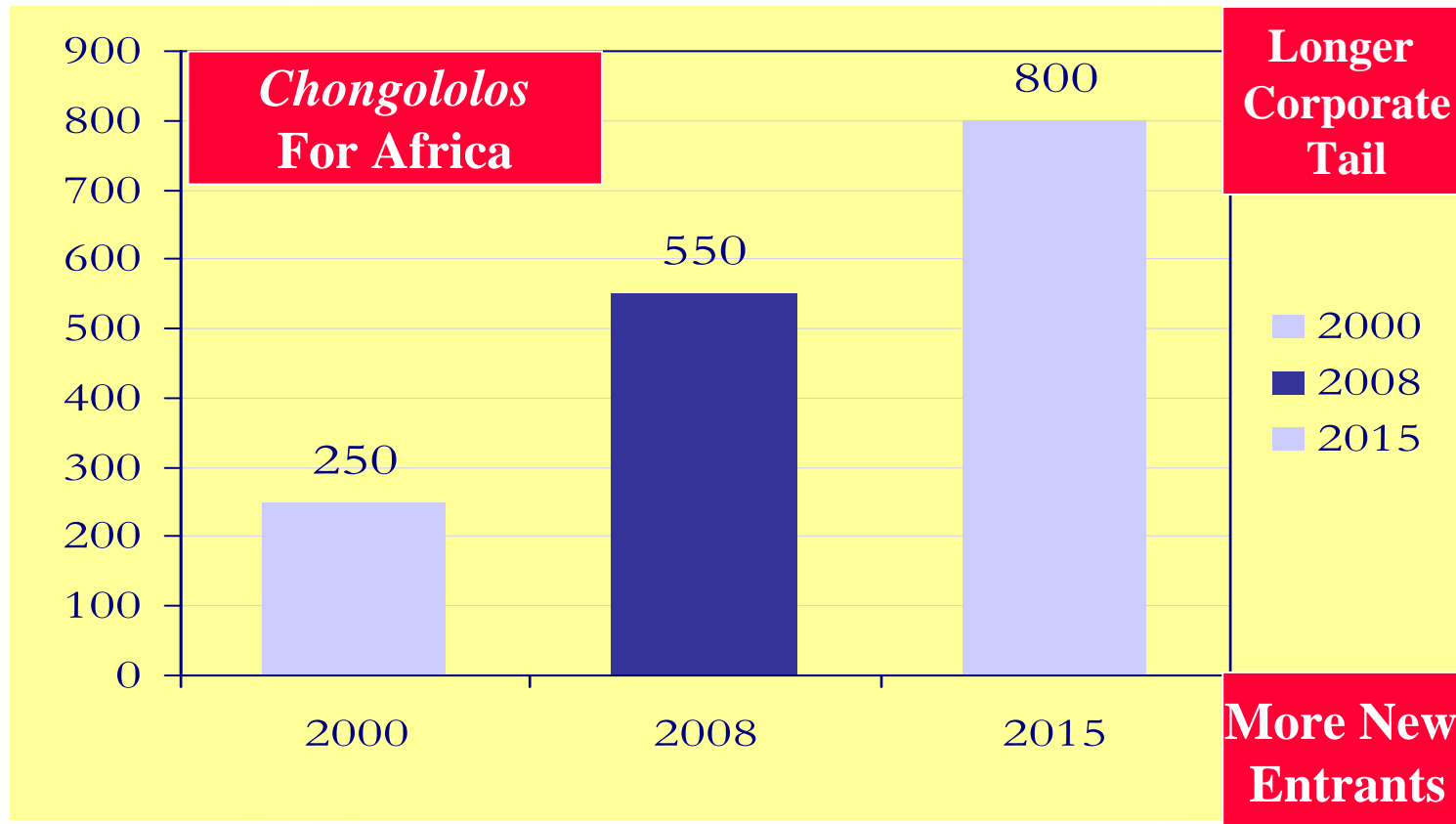
200 nm territorial sea claims:

- Congo
- Liberia
- Somalia



Companies: Africa *

*Minnows, Independents, Super Majors
Foreign State Players, African State Companies*



** Projection: Global Pacific & Partners*

“Born in Africa”

- *Nigerians*

- Allied
- Amni
- Atlas: Oranto
- Camac
- Equinox
- Fruitex
- Moni Pulo
- Nigerian Express
- Oando plc
- Sahara Group
- Sapetro
- Transcorp

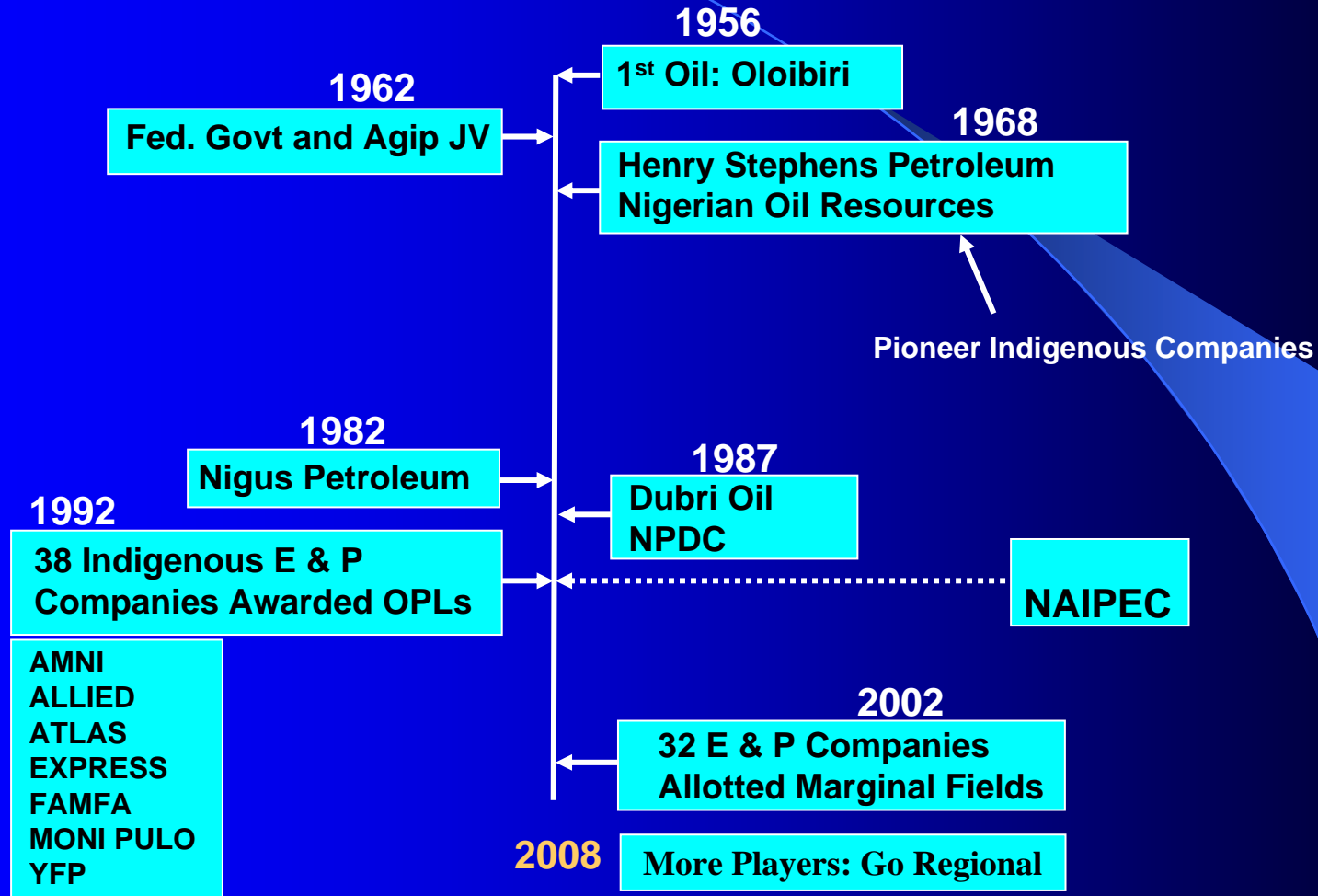
- High Tech: Sudan
- IPG: Mauritania
- Kalahari Gas: Botswana
- Lushan: Ghana
- Mvela, IDG: South Africa
- Mwana Africa, Energetic
- Pamue: Namibia
- Somoil, Falcon, ACR: Angola

- *Plus In:*

*Congo, Kenya, Gabon,
Mocambique, Ethiopia, DRC,
Tunisia, Egypt*

**African Independents
From 15 Countries**

Nigerian Independents



National Oil Companies

Africa, Asia, Latin America, MidEast



Africa: Foreign State Players

MidEast & Russian

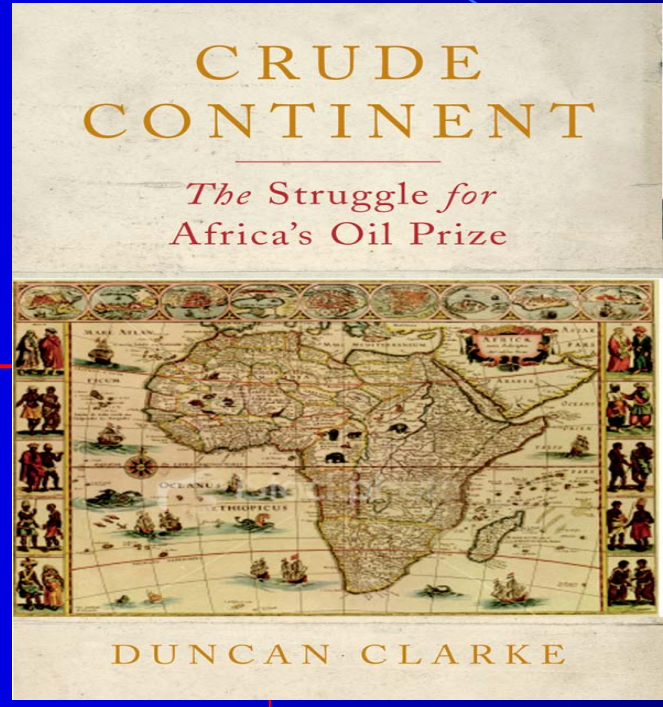
- Kufpec
- TPAO
- Gazprom/Rosneft
- Gulf Players/QP
- Private/State

African State Companies

- Sonatrach
- PetroSA
- NPDC
- ETAP
- Others

Latin American

- Petrobras
- Sipetrol
- PDVSA



Asian Lunge

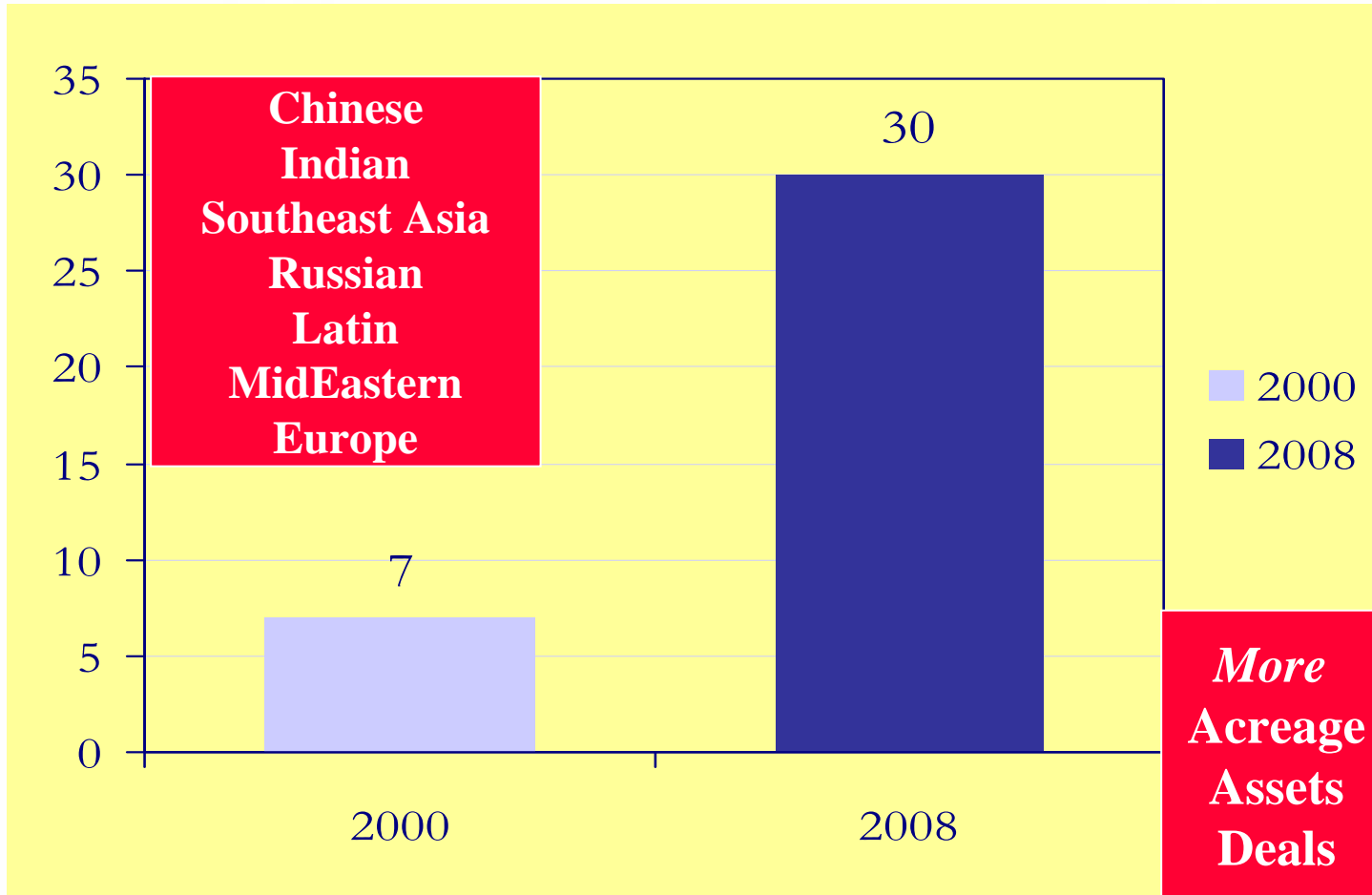
- Petronas
- China
- India
- East Asian
- Southeast Asia

Europe

- StatoilHydro
- Hellenic
- MOL
- Other

State Companies: Africa

Includes Foreign Ventures: African National Oil Companies



African National Oil Companies



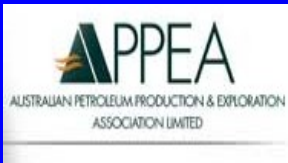
Kenya



Madagascar



GNPC, Gambia



African State Companies: 21st Century

PetroSA (Merger)

Petroguin

GEPetrol: Sonagas

Sonangas: Angola

Mocambique: CMH

Gambia National Petroleum Company

Mauritania: SMH

SHT (Chad)

Napcon

NilePet: GOSS

NatOil (Uganda)

Zambia ZNOC

**12 New
State Entities
This Century**

**Only 15 States
Lack
State Oil Company
For Upstream**

National Oil Companies: Africa

Outside Own Country

- **Sonatrach: Peru & Africa Ventures**
- **PetroSA: Diverse Africa Assets**
- **NPDC: WAGP, EG + Venture Targets**
- **ETAP: Targets**
- **Sonangol: Gabon + Intent**
- **NOC: Africa Venture Targets**

Foreign State Oil Companies
Dominate In Upstream Africa
Eating Africa's Lunch



- **Petronas: Widespread Africa**
- **CNPC: Sudan + PetroChina Assets**
- **CNOOC: Morocco, Kenya, Nigeria+**
- **Sinopec: Gabon, Nigeria, C-I ++**
- **OVL: Sudan, Libya, Cote d'Ivoire+**
- **Pertamina: Libya + Sudan**
- **Petrovietnam: Algeria, Madagascar**
- **PTTEP: Algeria, Egypt**
- **KNOC: North Africa, Congo**

- **Gazprom: Africa Targets**
- **Tatneft: Libya**
- **Kufpec: Tunisia, Mauritania**
- **Petrobras: Angola, Nigeria, Tanzania, Algeria, Libya, Mocambique**
- **StatoilHydro: Algeria, Angola, Libya, Nigeria ++**
- **Sipetrol: Egypt + Exit Guinea**
- **Gulf Players: Growing Portfolio**

Corporate Quest: Africa's Prize

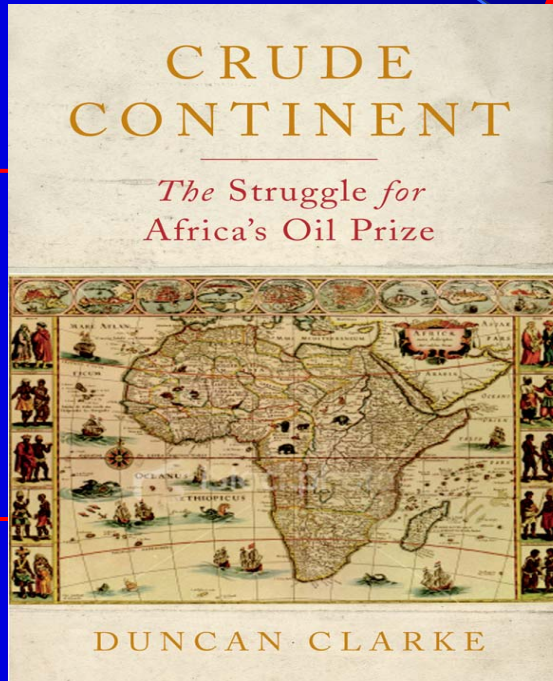
Future Fuels: Potential

- Pre Salt Plays
- Synfuels + GTL
- Coal To Liquids
- Heavy Oil Plays
- Tar Sands
- Biofuels + Jatropa

Investment Stakes

- Portfolio
- Investment
- Financings
- Equity Markets
- Listed Companies

Great Power Interests



LNG Prospects

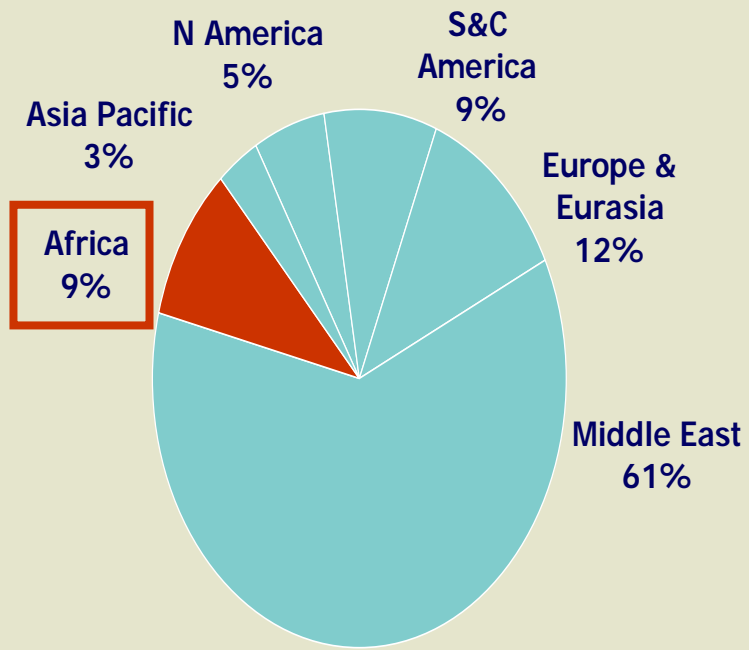
- More LNG Plants
- Increased Capacity
- North Atlantic Markets

Oil Reserves: Assets + Potential

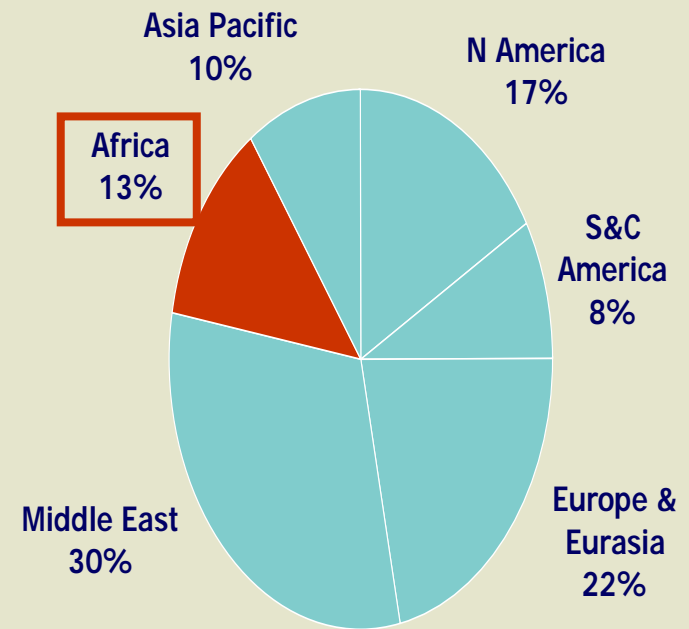
- Proven: 120 BBLS
- YTF: 50+ BBLS
- Underexplored Zone
- Frontier Basins
- EEZ + Interiors

Gas Ventures

- Gas Discoveries
- Gas/Power + IPP
- Inter State Gas Deals
- Gas Players

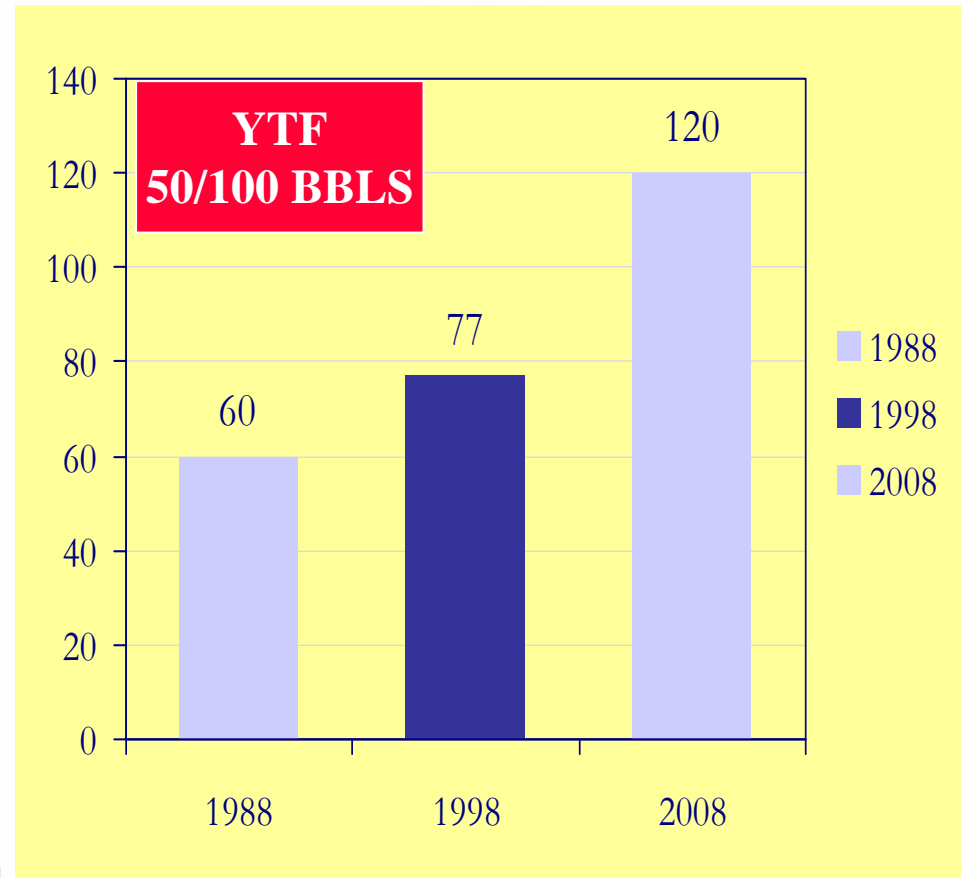
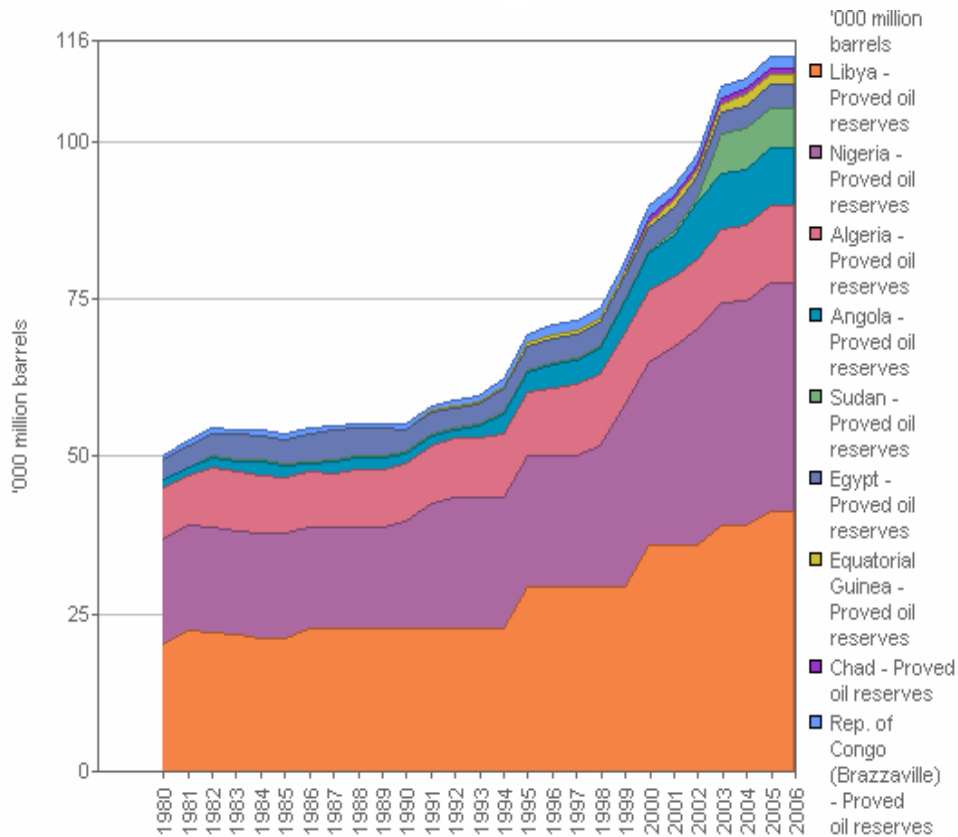


**Africa: Share of World Proven Reserves
2008**



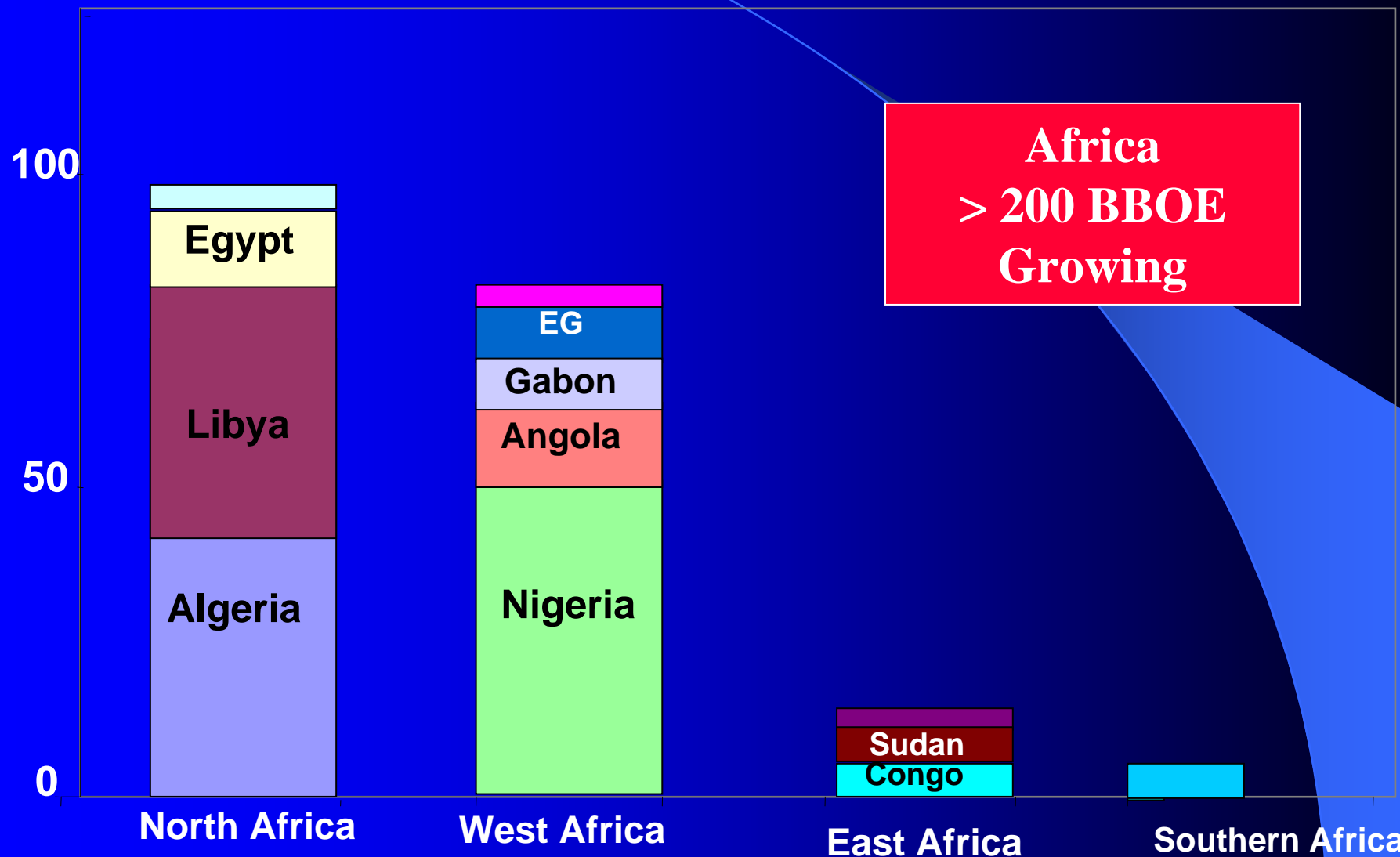
**Africa: Share of World Oil Output
2008**

Africa: Proven Oil Reserves: BBLs

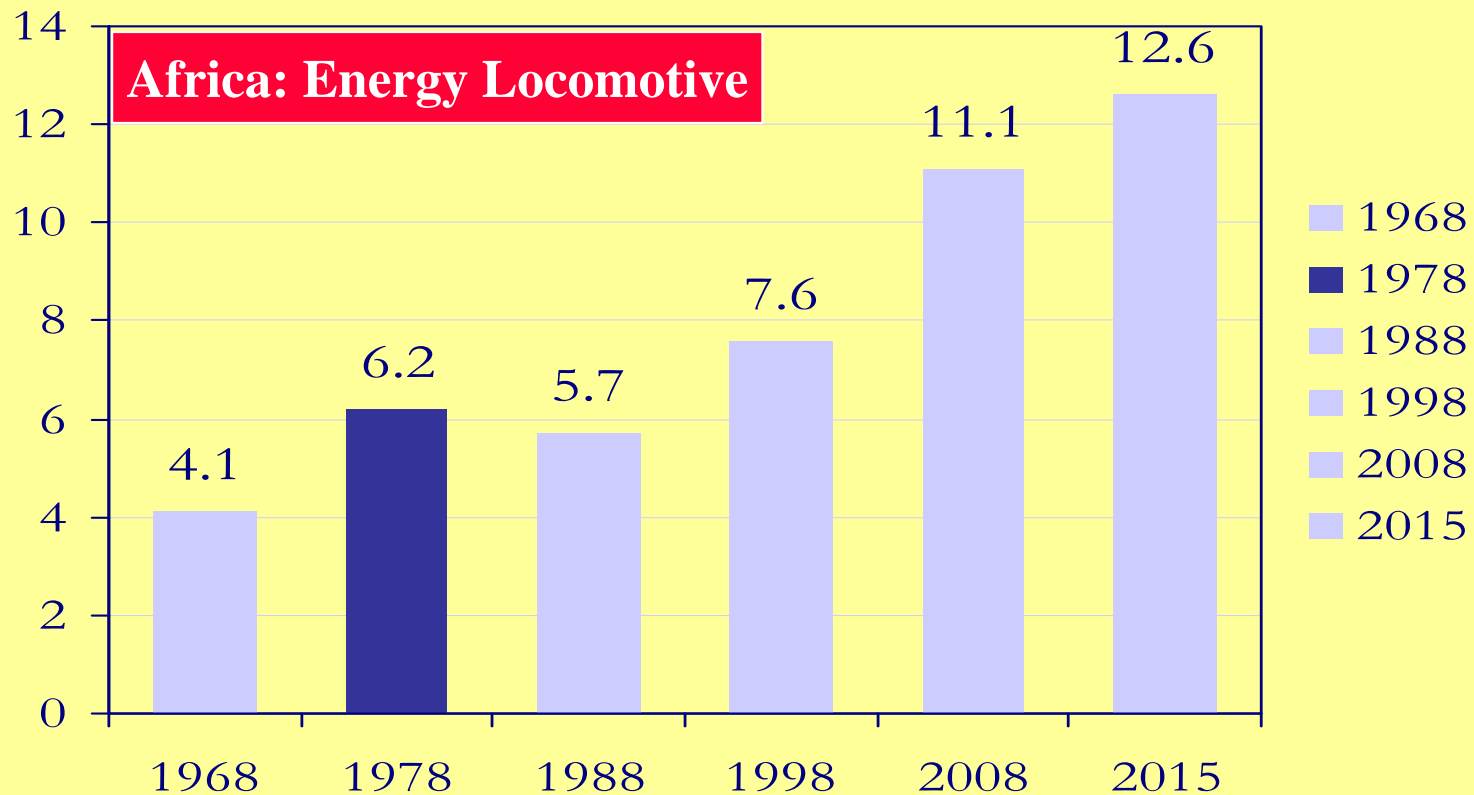


Reserve Significance
Russia: 120/150 BBLs
Arctic Yet-To-Find: 90 BBLs

African Oil + Gas Reserves BBOE

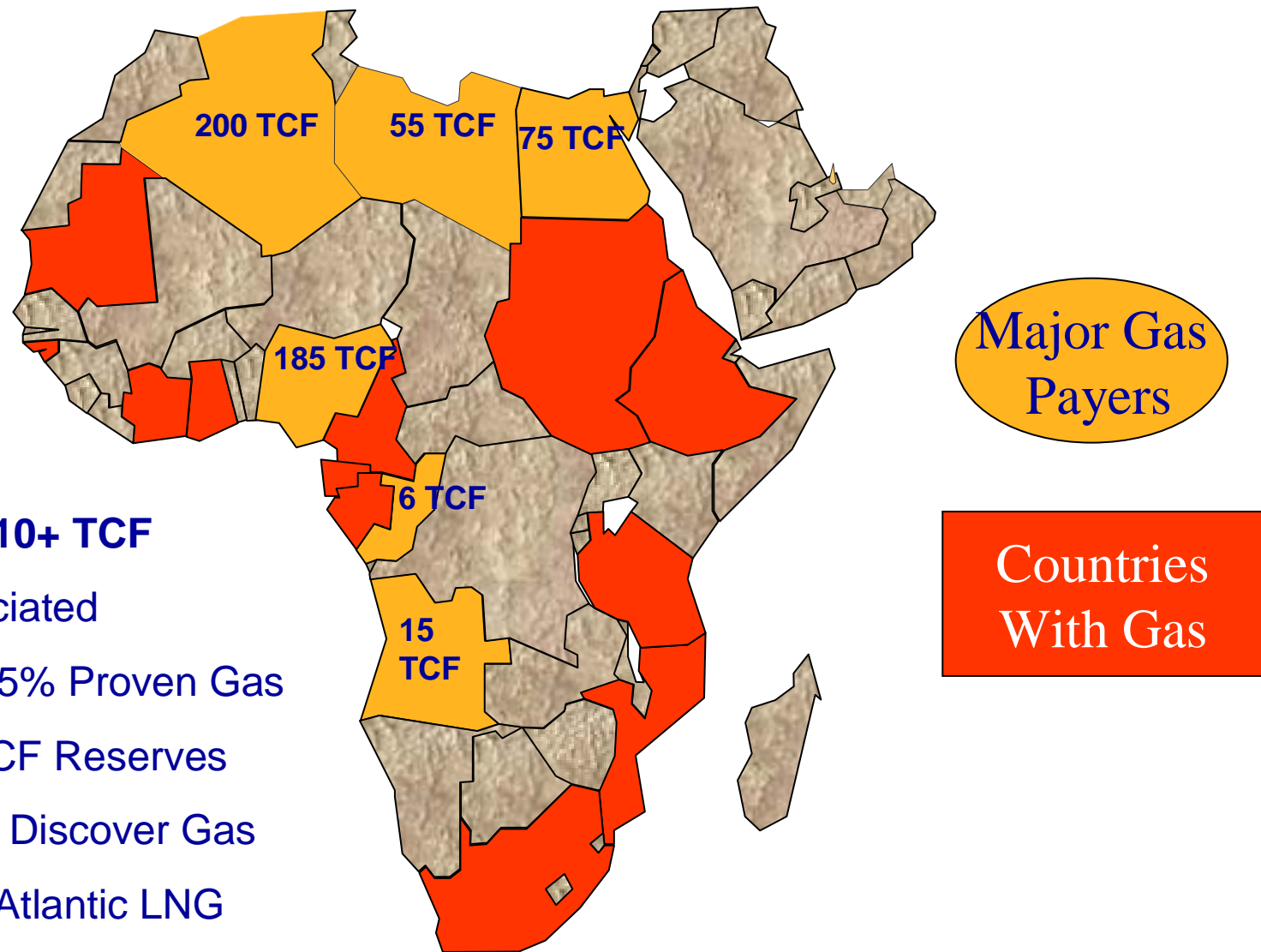


Africa: Oil Production: MBOPD *



** Projection: Global Pacific & Partners*

African Proven Gas Reserves: 2008



Proven Gas: **510+ TCF**

50% Non Associated

6 Countries = 95% Proven Gas

Cut Off > 5.0 TCF Reserves

More Countries Discover Gas

Major Exports: Atlantic LNG

Emerging African Gas Game

Africa

Energy Investment Stake *

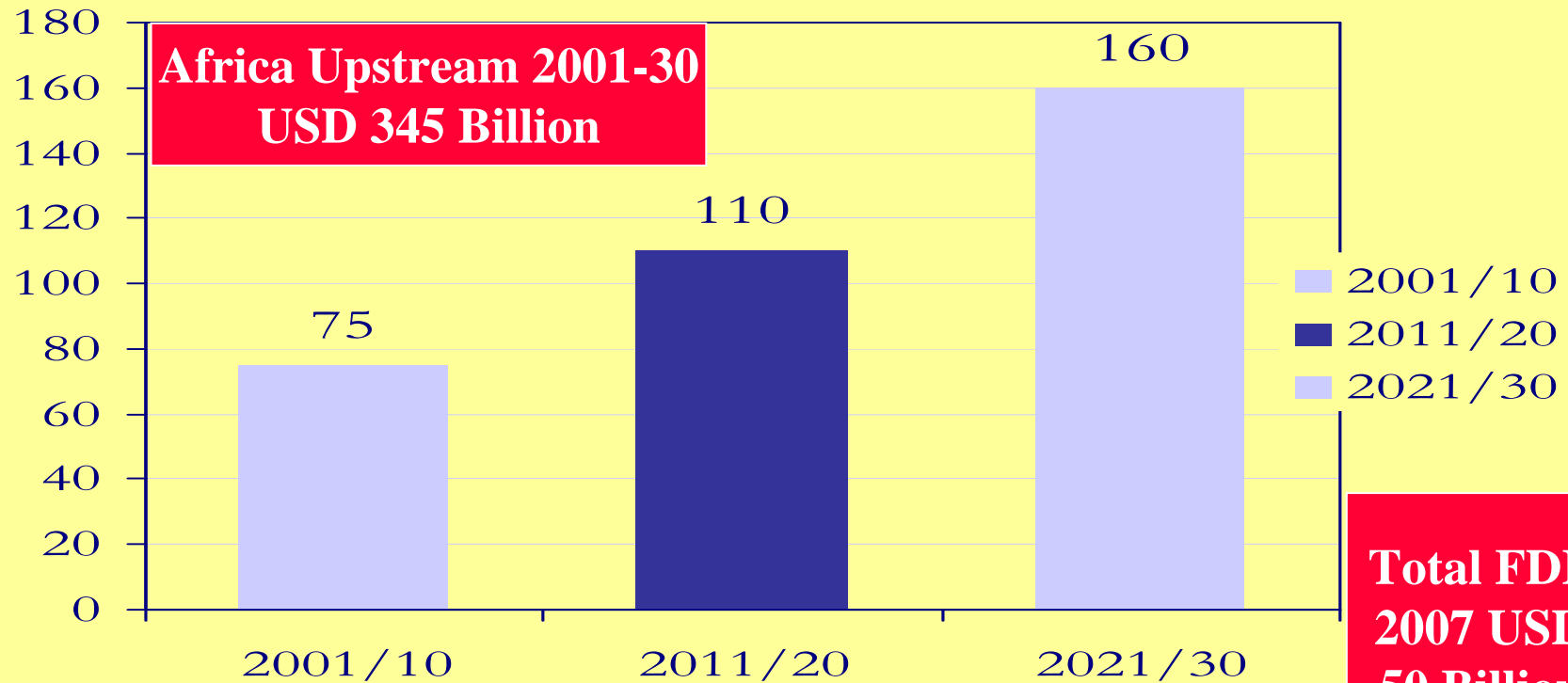
**World's No 1
Energy Capex Destination**

Investment 2001 - 2030

USD 1.25 Trillion

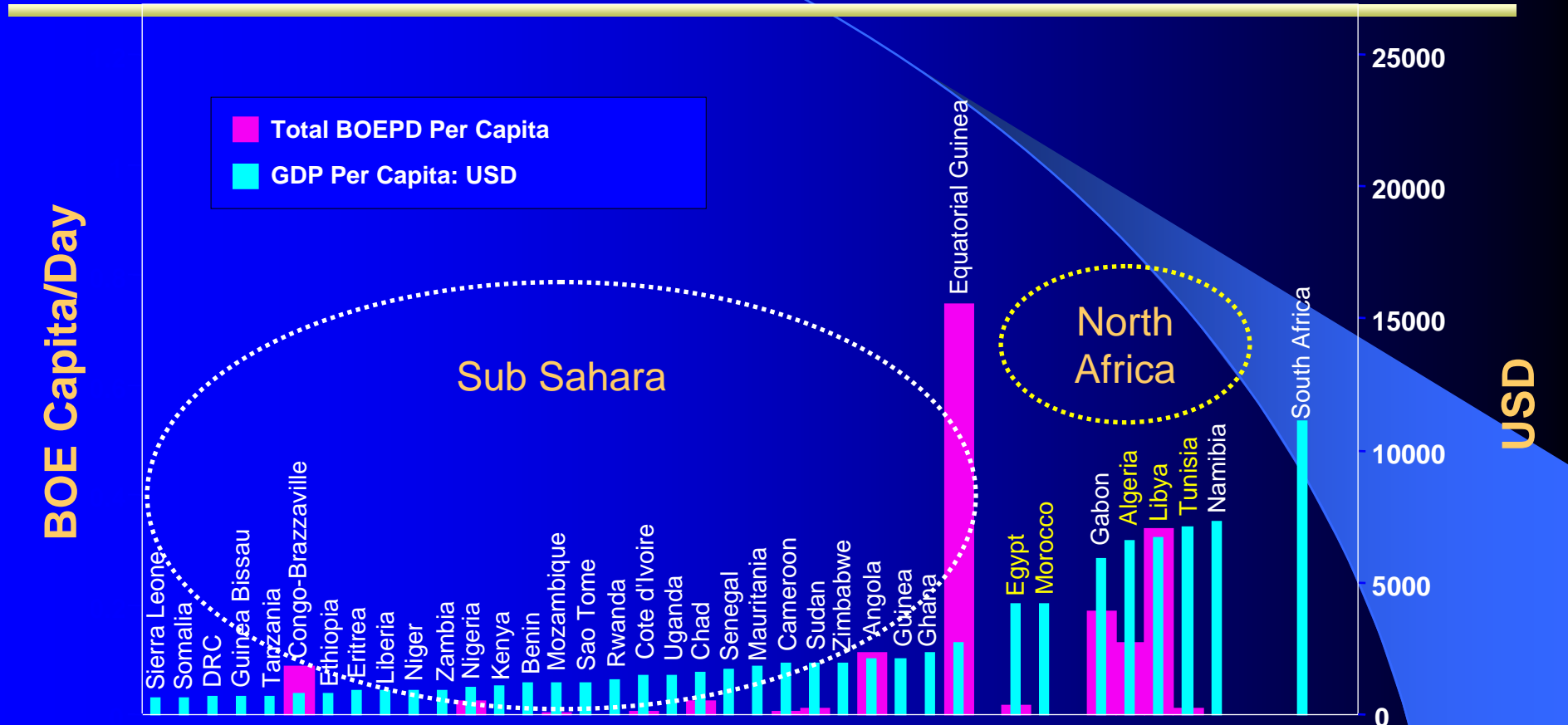
*** OECD Estimates**

Africa: Upstream Investment: USD Billion



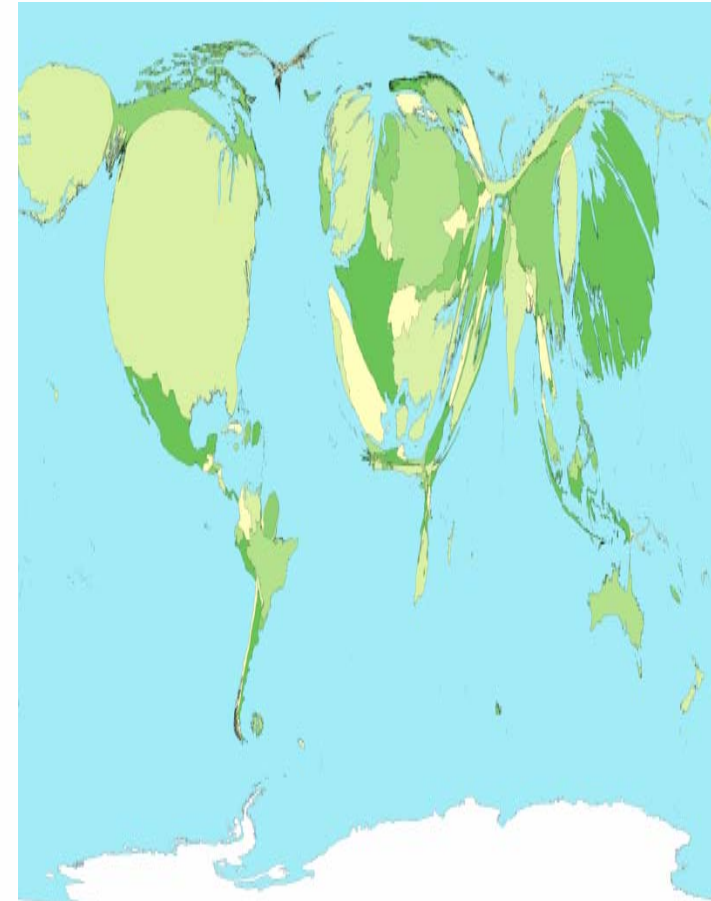
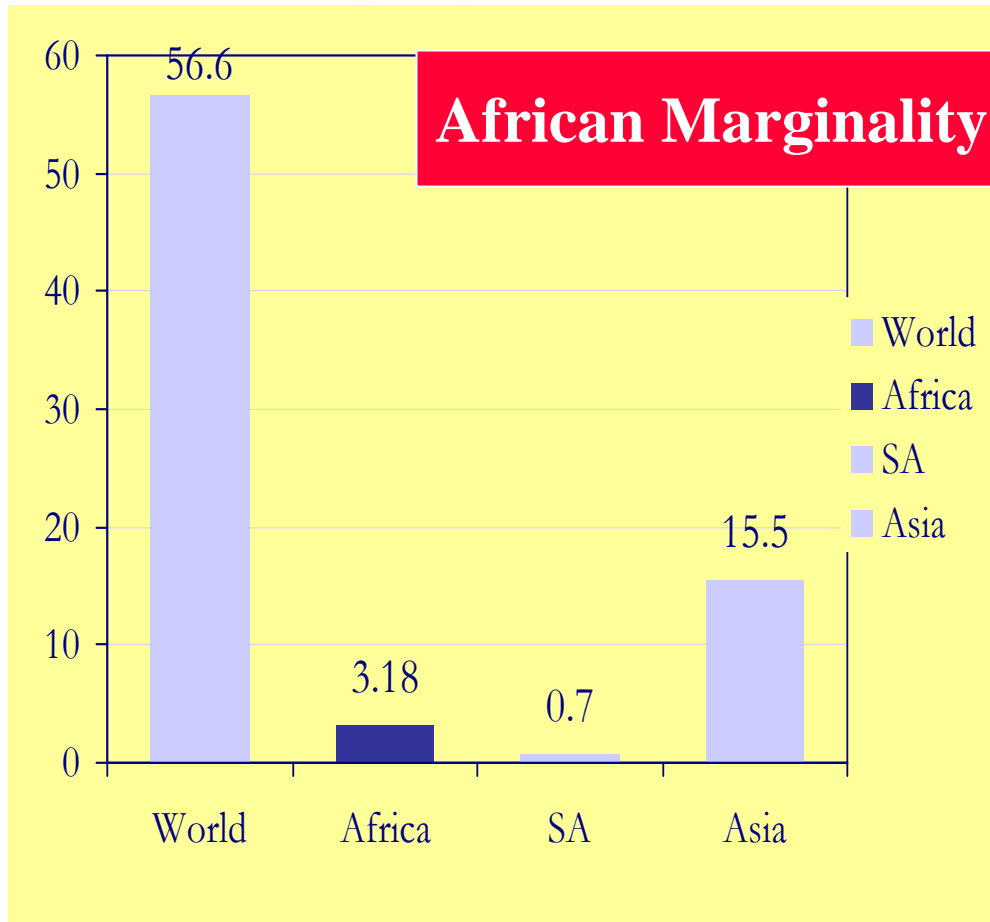
Africa Energy/GDP Ratio: 4% To 2030
Oil & Gas Investment: 48% Total: USD 600 Billion

Africa: Hydrocarbons + GDP



Will Oil "Save" Africa ?
Can Oil Companies Fix African Poverty ?

Africa/World GDP 2008: USD Trillion *



* Estimates Based On IMF: PPP Basis

Africa: Economic Dimension

“Medieval Africa”

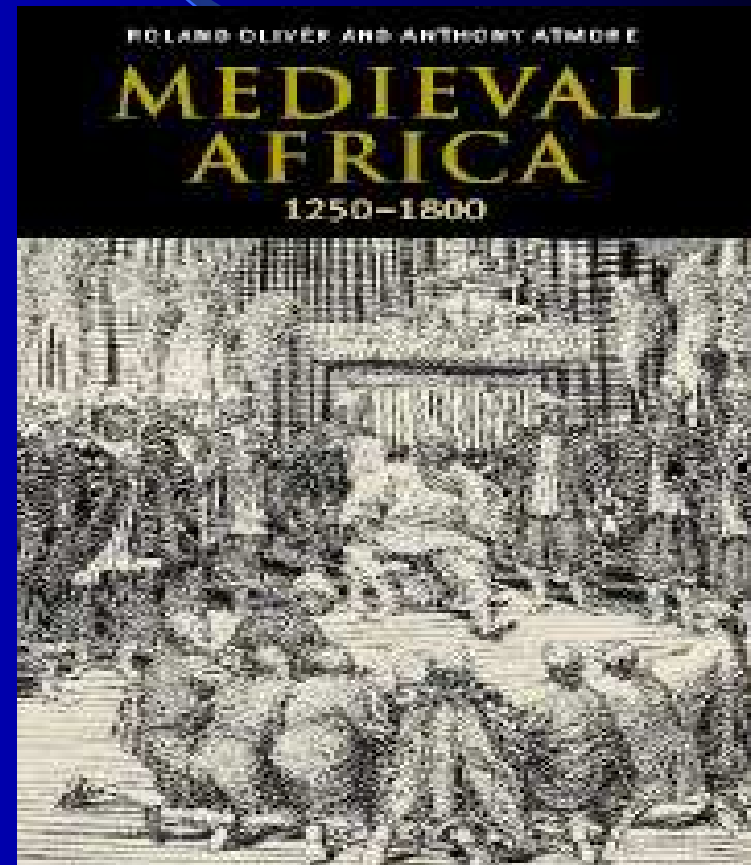
Ancient Economies

Subsistence Modes

“Feudal” Continuity

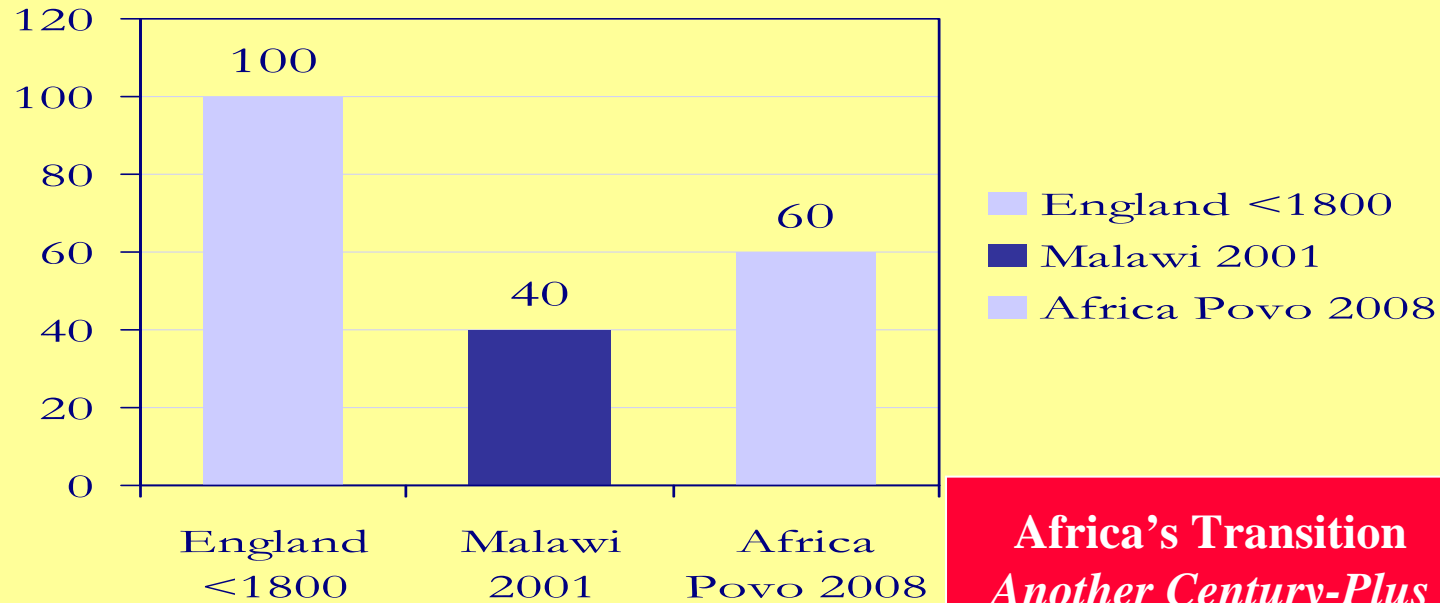
Underdevelopment

**Pre Modern + Modernity
*Exist In Long Transition***



Africa, Medievalism, Roman Empire

Relative Real Income Index



Africa's Transition
Another Century-Plus

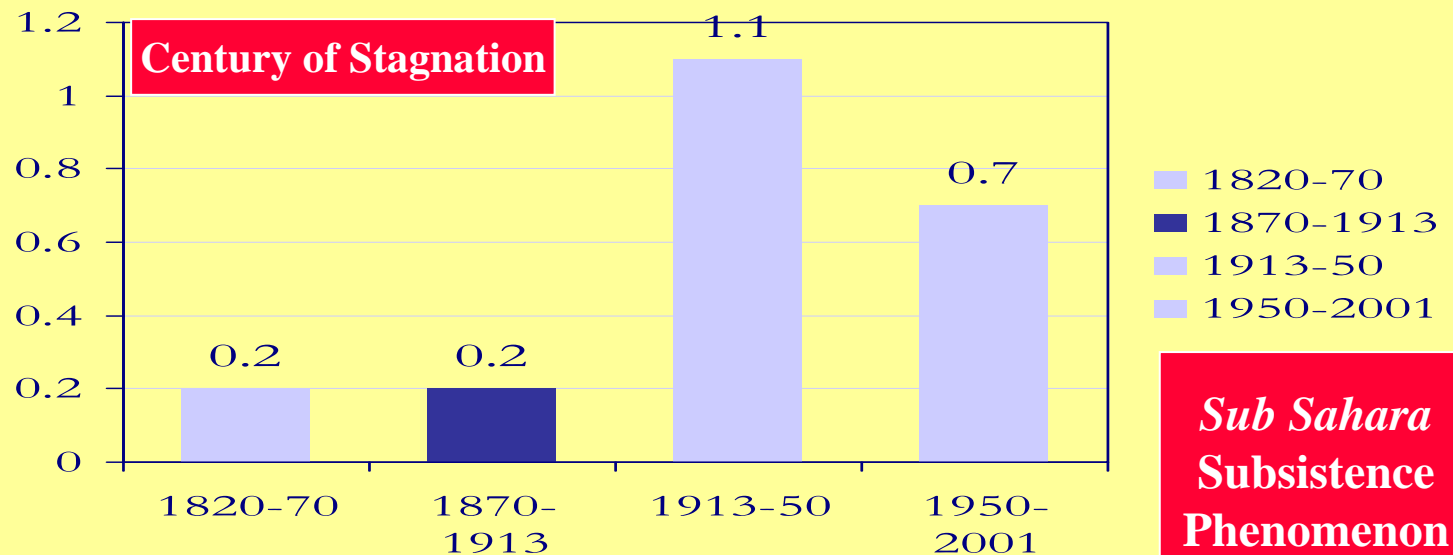
After Greg Clark, A Farewell To Alms, 2007

1. **Medieval Europe: Above England < 1800**
2. **Roman Empire: Material Standards = England < 1800**
3. **Agrarian Societies: No Gains From 1800 BC To 1800 AD**
4. **“Povo”: Africa’s 50% Poor: 475 Million @ < \$1-Day**

Sub Saharan Africa

Long Run Growth: Real GDP per Capita

PPP Adjusted 1990 Dollars

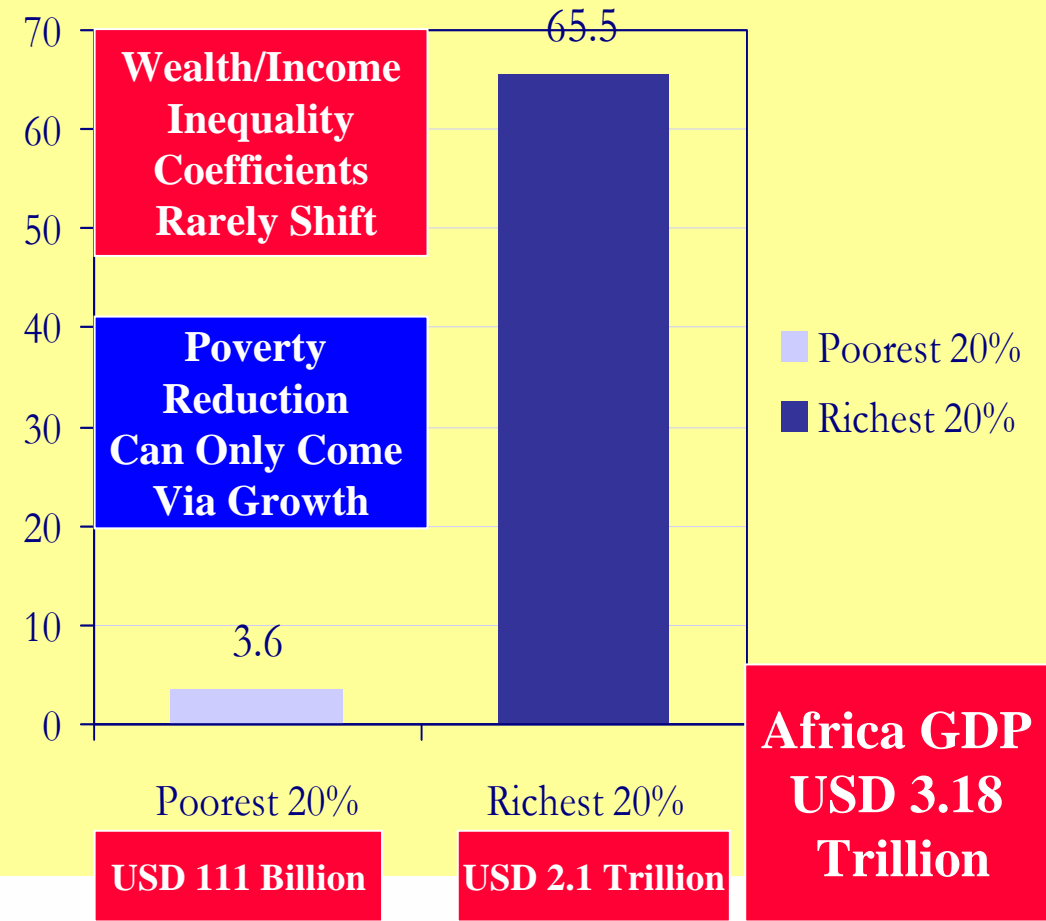
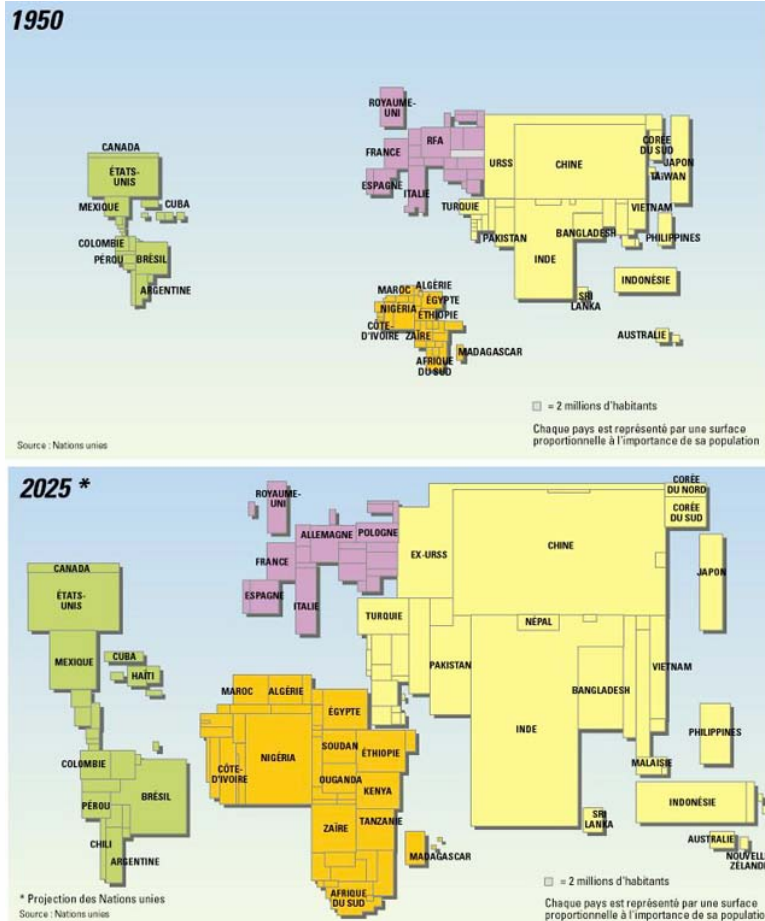


After Angus Maddison, The World Economy: Historical Statistics, 2001, OECD

1. **Caveat: based on scaled up estimates (Ghana, South Africa)**
2. **No account made for known distributional effects**
3. **Most probable: Malthusian level subsistence for vast majority**
4. **Worst performance: Sub-Sahara outside South Africa**

Demographic Shift 2025

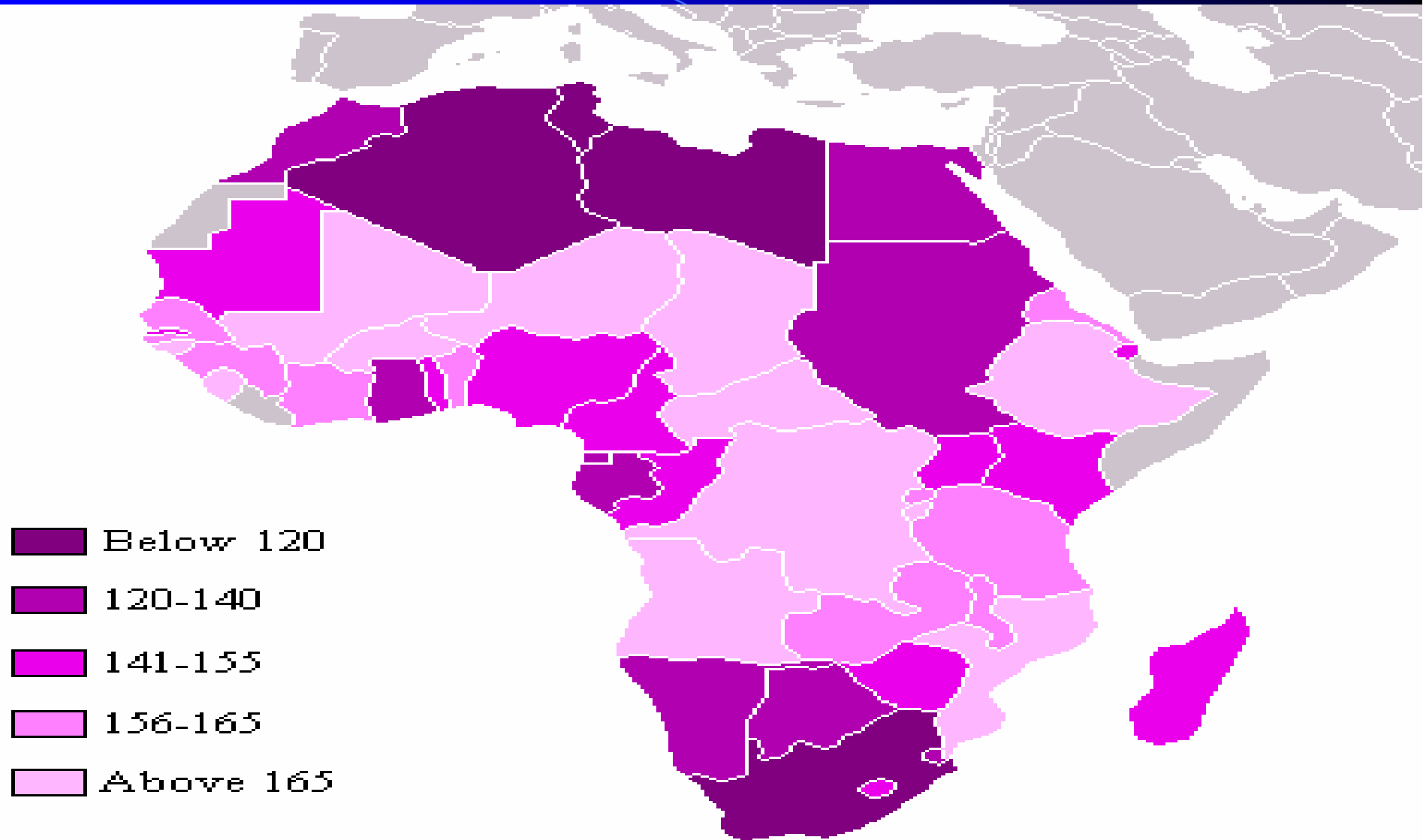
Sub Sahara: Income 2008*



**Projected: 2 Billion Africa 2050
To Double In 40 Years**

*** Estimated: IBRD
Sub Sahara Africa: USD 2 Trillion
3.5% World (USD 57 Trillion)**

Africa Ranking: World HDI



“Contested Africa”

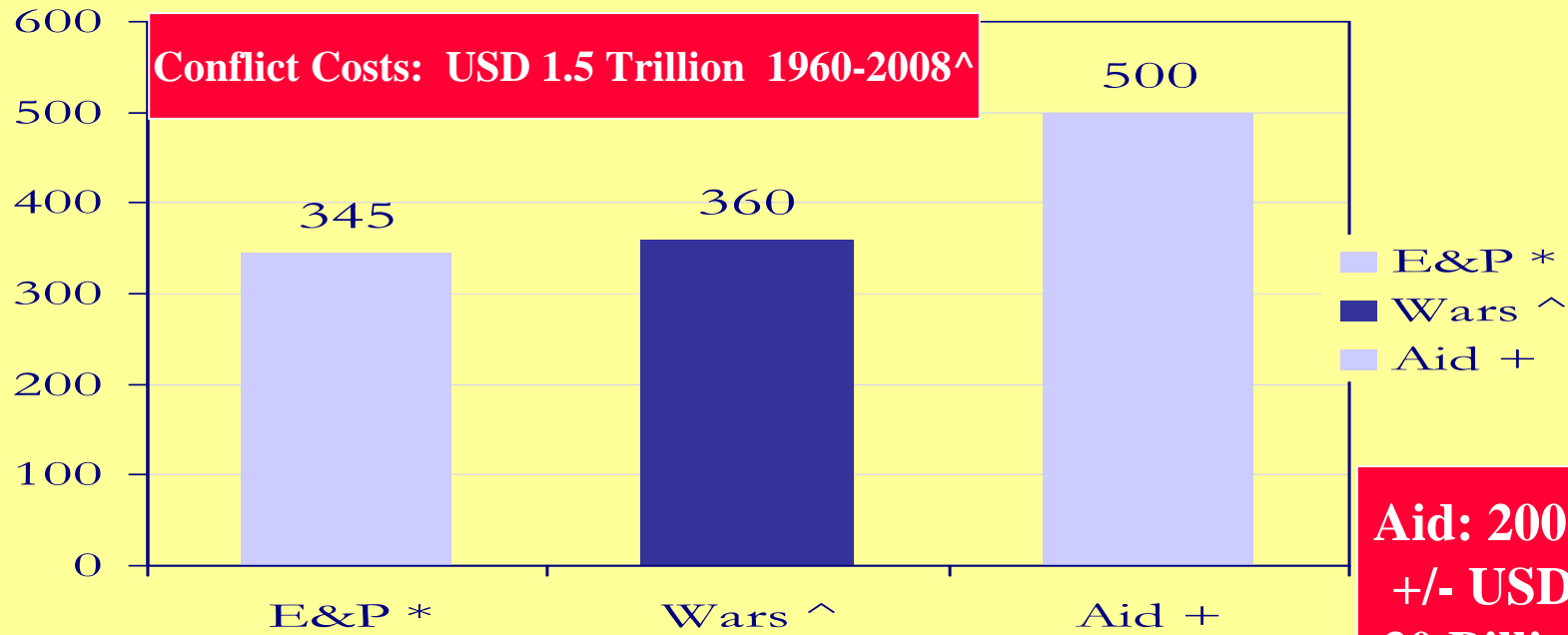
Pressured States: Subsistence Worlds

- **Western Sahara: “Closed Zone”**
- **Chad/CAR: Rebellions**
- **Sudan: Darfur, South Sudan**
- **Tuareg: Niger, Mali, Algeria, Libya**
- **Somalia: Ultra Failed State**
- **Horn of Africa: Ethiopia/Eritrea**
- **Eastern Rifts: Comoros**
- **DRC Great Lakes: Legitimacy**
- **Zanzibar + Kenya Fracture**
- **Barotseland, Cabinda, Others**
- **Niger Delta: Warlords, Conflict**
- **Cote d’Ivoire: Bifurcation ?**
- **Country Instability: Nigeria ++**
- **Implosions: Zimbabwe ++**
- **Offshore + EEZ Contested Zones**





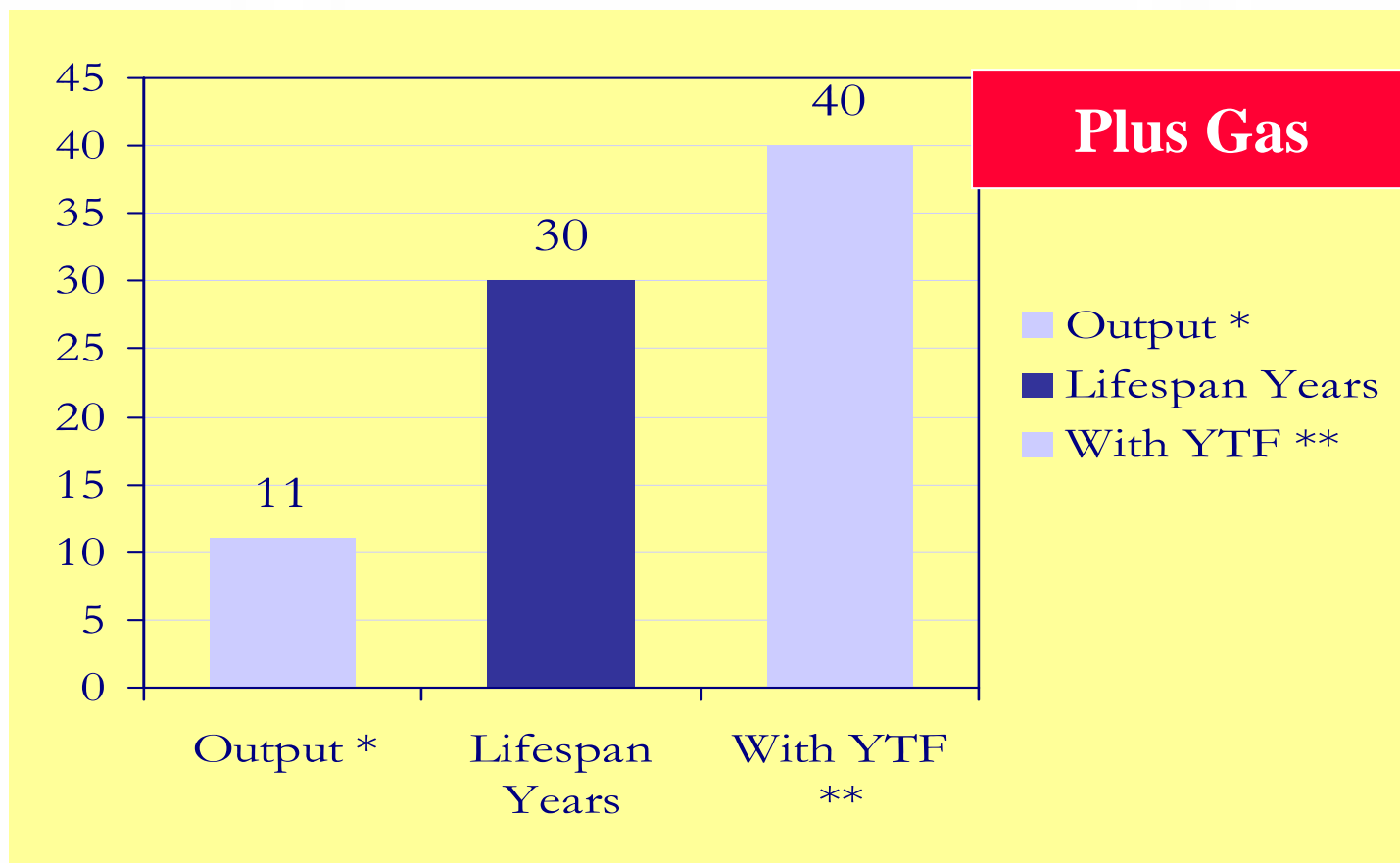
Africa: Investment/Costs USD Billion



- * E & P Investments 2001-2030: O/G Capex 600 Billion
- ^ War Costs 1990-2008: ^ Estimated @ Triple 1960-90
- + Foreign Aid Flows: 1956-2008: Excludes Debt Relief

AU Estimate Annual Corruption Costs
USD 148 Billion: 4.65% GDP

Africa's Oil Patrimony

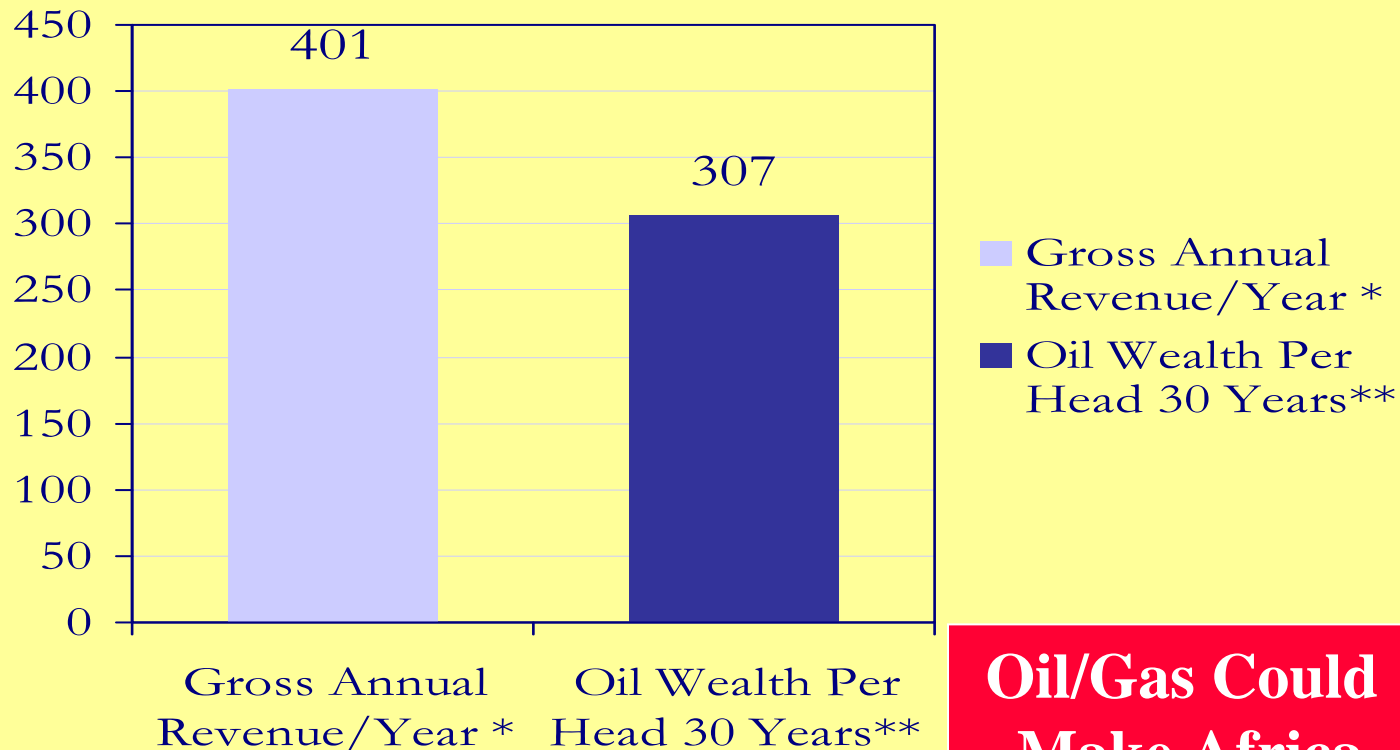


* **Output @ 11 MMBOPD, 2008**

Reserve Lifespan = 30 Years @ 4 BBLs/Year

** **YTF @ 50 MMBLS: Adds 10 Years To Lifespan**

Africa's Oil: Relative Significance



**Oil/Gas Could
Make Africa**

*** Current Gross Revenues: Billion Dollars**

**** Oil Wealth/USD Head-Annual @ \$ 100/Barrel
Over 30 Years With Population @ 1.3 Billion**

Great Power Interests



Geopolitics

Security Issues
UN Security Council
Africa Relationships
Strategic Partners

Oil + Energy

Acreege Access
Oil/Gas Reserves
Corporate + State
Gas/LNG Projects
Crude Oil Imports

Africa's Landscape Contestation In Transition

Realities + Issues In Oil Debates ++

Poverty, slavery, wars (“blood oil”), oil reserve depletion, social tension, bribery, human rights, corruption, environment destruction, rainforests, resource control, transparency, humanitarian aid, militia, fundamentalism, ecosystems, climate change, diversity, ethnic survival, nomads, autochthonous rights, arms, racism, equity, security, endangered species, conflict, wilderness, debt, currency stability, biospheres, ideology, political risks, offshore funds, theft, media, anarchy, divestment, ethical investment, oil financed politicians, governance, sanctions + **more**



“Africa’s Future: Endogenous”

Real Y/P^{Povo}: 2050

$$Y/P^{Povo} = f (GDP^R, Pop^N, Gini^{W/Y}, S^{GI-Yrs}, I^{SWC}, M^{U+HDI} - X)^{T=42}$$

Y/P = Real Income/Capita: After Inflation

Povo = 50% Africa’s Poor @ \$1/Day Constant

GDP = Growth Rate: Secular Trend = R

Pop = Population Povo: Rising Numbers = N

Gini = Coefficients: Wealth/Income Inequality

S = Stability: Governance/Investment (Years)

I = Incidence: Social Conflict/Wars/Coups

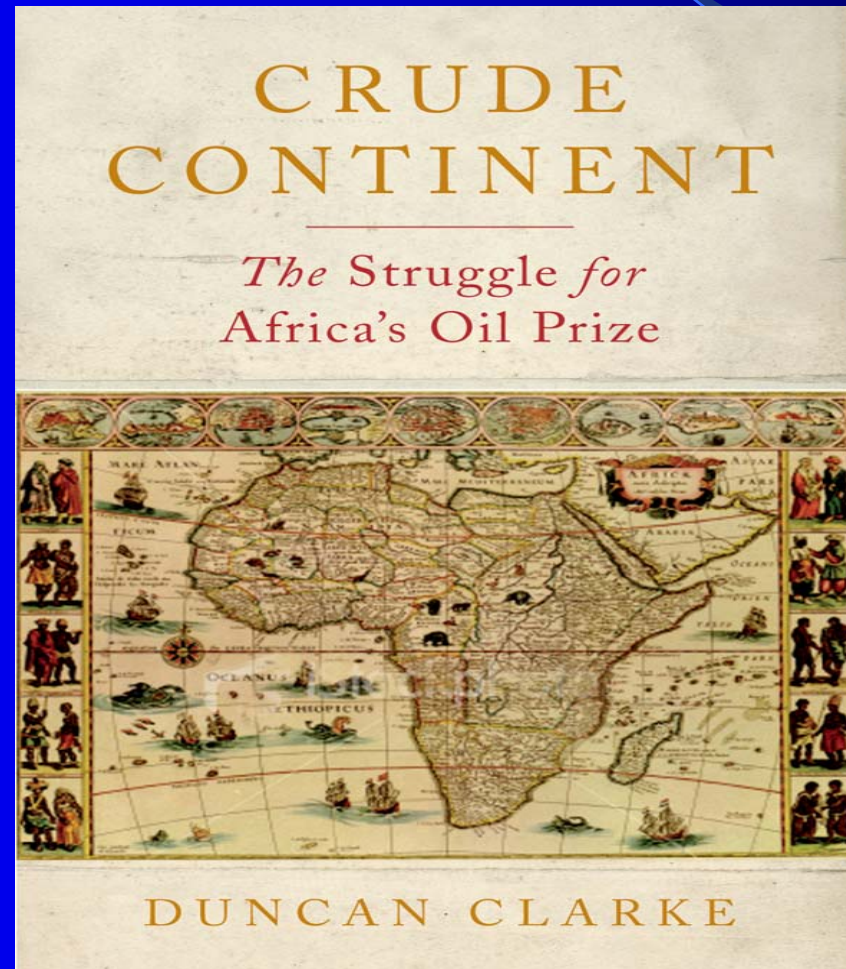
M = “Misery Index”: Unemployment + HDI

X = Costs: Droughts, Famines, Economic Crises

T = Time: 42 Years

Which Way Africa ?

Darkness: Destiny





Global Pacific & Partners

London, The Hague, Nicosia, Johannesburg

www.petro21.com