Hydrocarbons potential and resources in Sudan

By

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The views expressed are those of the author and do not necessarily reflect the views of UNCTAD.
Republic of Sudan
Ministry of Petroleum & Gas
Oil Exploration and Production Authority (OEPA)

Hydrocarbon Potential and Resources in Sudan

By
Ahmed Gibreel
Objectives.

Introduction.

Summary.

Hydrocarbon Potentiality.
  - Sudanese Basins Subdivisions.
  - Key Basins overview.

Resources.

Conclusions.

Forward Plan.
To highlight:

- Sudan Hydrocarbon potentiality.
- Sudan Resources.
Introduction

First Oil Export 1999

- Salima Basin
- Misaha Basin
- Mourdi Basin
- Wadi Hawar Basin
- Muglad Basin
- Rawat Basin
- Blue Nile Basin
- Red Sea Basin
- Um Agaga Basin
- Khartoum & Atbara basins
- Gadarif Basin

MINISTRY OF PETROLEUM & GAS
SUDANSE PETROLEUM CORPORATION
OIL EXPLORATION AND PRODUCTION GENERAL ADMINISTRATION (OPGA)
SUDAN HYDROCARBON E & P LICENSE BLOCKS
Sudan is considered one of the top most African hydrocarbon potential countries.

Nearly twenty hydrocarbon basins do exist:
- Late Proterozoic-Paleozoic continental sag basins (Misaha, Murdi, Wadi Hawar and Salima).
- Mesozoic-Cenozoic rift basins (Muglad, Rawat, Khartoum, Blue Nile and Red sea).

Most of the Sudanese basins is by far highly under explored due to data scarcity and others logistical constrains.

Proven petroleum system in the Paleozoic, Mesozoic and Cenozoic.
Sudanese basins could be classified into:

- Producing (1 basin).
- Early exploration stage basins:
  - Have proven petroleum systems with some discoveries (5 basins: Rawat, Red Sea, Blue Nile, Um Agaga and Khartoum basins).
  - Have proven petroleum systems but no notable discoveries yet been made e.g. Mourdi Basin.
- Frontier basins.
Considerable amount of hydrocarbon has been discovered in Sudan, from structural traps identified in rift basins:

- OIIP of 6,575 MMSTB.
- GIIP of 2,658 BSCF*.

The country’s speculative oil in place resource is totaling to 23,604 MMSTB.

Recently, few unconventional plays have been tested such as basement and tight sands.

Some compelling evidences from recent studies indicate that the Upper Cretaceous of the Muglad basin might be working particularly in the central part which is expected to add more resources.

* This came only by chance during the hunt for Oil.
Producing Basin

Muglad
Early Exploration stage basins

Proven Petroleum System + discoveries

- Red Sea
- Khartoum
- Blue Nile
- Um Agaga
- Rawat
Early Exploration stage basins

Proven Petroleum System + No discovery yet
### Muglad - Producing Basin

#### Age: Cretaceous/ Jurassic?

#### Tectonic Evolution: Extensional, Three Rift cycles.

#### Size: 200*800 km

#### Sedimentary thickness: ~15 km

#### Petroleum System/s:
1. Early Cretaceous (Proven).
2. Late Cretaceous (anticipated).

#### Proven Play types:
1. Structural traps.
2. Basement.
3. Tight sands

#### Expected Play types:
1. Stratigraphic trap.
2. Shale Gas.

#### Resources:
- **Discovered Resources**
  - OIIP = 6,501 MMSTB
  - GIIP = 2,017 BSCF

- **Undiscovered Resources**
  - OIIP = 12,453 MMSTB

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Rawat (Proven Petroleum System + discoveries)

**Age:** Cretaceous

**Tectonic Evolution:** Extensional, Three Rift cycles.

**Size:** ~11,170 km²

**Sed. thickness:** ~ 6 km

**Petroleum System/s:**

**Proven Play types:**
1. Structural traps.
2. Tight sands

**Expected Play types:**
1. Stratigraphic trap.

**Resources:**
- **Discovered Resources**
  - OIIP = 37 MMSTB
- **Undiscovered Resources**
  - OIIP = 386 MMSTB
Blue Nile (Proven Petroleum System + discoveries)

**Age:** Jurassic

**Tectonic Evolution:** Extensional, One Rift cycle.

**Size:** 40*155 km

**Sedimentary thickness:** ~ 7 km

**Petroleum System/s:**
1. Jurassic- Cretaceous.

**Proven Play types:**
1. Structural traps.
2. Tight sands

**Expected Play types:**
1. Stratigraphic trap.
2. Shale Gas.

**Resources:**
- Discovered Resources
  - OIIP = 1 MMSTB
  - GIIP = 116 BSCF
Red Sea (Proven Petroleum System + discoveries)

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**Age:** Tertiary

**Tectonic Evolution:**
Extensional, One Rift cycle.

**Size:** 300 * 1700 km

**Sed. thickness:** ~ 7 km

**Petroleum System/s:**
1- Tertiary.

**Proven Play types:**
1- Structural traps.

**Expected Play types:**
1- Stratigraphic trap.

**Resources:**
- Discovered Resources
  - OIIP = 37 MMSTB
  - GIIP = 525 BSCF
- Undiscovered Resources
  - OIIP = 8,381 MMSTB
Age: Jurassic

Tectonic Evolution:
Extensional, Two Rift cycles.

Size: 40*70 km
Sed. thickness: ~ 5.5 km

Petroleum System/s:
1- Cretaceous (Proven).

Proven Play types:
1- Structural traps.

Expected Play types:
1- Stratigraphic trap.

Resources:
Discovered Resources
Oil.
Undiscovered Resources
OIIP = 620 MMSTB
**Um Agaga (Proven Petroleum System + discoveries)**

**UM AGAG STRATIGRAPHIC SCHEME**

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</table>

**Age:** Cretaceous

**Tectonic Evolution:**
Extensional, three Rift cycles.

**Size:** ~30*80 km

**Sed. thickness:** ~ 5 km

- Petroleum System/s:
  1- Cretaceous (Proven).

- Proven Play types:
  1- Structural traps.

- Expected Play types:
  1- Stratigraphic trap.

**Resources:**

**Discovered Resources Oil.**

**Undiscovered Resources OIIP = 597 MMSTB**
## Sudan Resources

<table>
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<tr>
<th>Basin</th>
<th>Discovered Resources</th>
<th>Undiscovered Resources (SR)</th>
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<tr>
<td></td>
<td>OIIP (MMSTB)</td>
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<td>Rawat</td>
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<td>Mourdi Basin</td>
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<td><strong>Total</strong></td>
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<td><strong>2,658</strong></td>
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Conclusions

- Tremendous achievements in the HC exploration and development sector has been made in Sudan for the past five decades.

- Until before the South Sudan separation in 2011, Sudan was ranked No. 6 top oil producer in Africa after Egypt (Africa Pedia).

- The reported Undiscovered Resource figures are highly underestimated due to the fact that most of the Sudanese basins are currently not well explored.

- Huge HC resources are expected to be uncovered through literal and wise exploration practices with the advantage of technological advancement.
Forward Plan

- More efforts are needed to think out of the box and consider testing new plays e.g. stratigraphic traps, basement, shale gas and tight reservoir.

- Application of up-to-date technologies in order to minimize basins exploration and development risks and maximize the resources.
Thank You!