



# Coastal Plain and Offshore Assessment Unit 70130101



-  Coastal Plain and Offshore Assessment Unit 70130101
-  Senegal Geologic Province 7013

**USGS PROVINCE:** Senegal (7013) **GEOLOGIST:** M.E. Brownfield and R.R. Charpentier

**TOTAL PETROLEUM SYSTEM:** Cretaceous-Tertiary Composite (701301)

**ASSESSMENT UNIT:** Coastal Plain and Offshore (70130101)

**DESCRIPTION:** Cretaceous and Tertiary rocks and reservoirs within the Senegal Basin.

**SOURCE ROCKS:** Marine shales in the Cenomanian-Turonian rocks. The Turonian can be as thick as 150 m and TOC (Type II kerogen) values range from 3 to 10 percent.

**MATURATION:** Latest Cretaceous? to Recent. Maturation is reached at reasonable depths from 1,500 to 2,900 m in the vicinity of the Dakar peninsula and in the Casamance offshore because of elevated geothermal gradients related to volcanism and salt diapirism.

**MIGRATION:** Late Miocene to Recent.

**RESERVOIR ROCKS:** Upper Cretaceous sandstones and lower Tertiary clastics and carbonates. The Lower Cretaceous carbonate platform (sealed by Cenomanian shales) shows good porosities from 10 to 23 percent. Cretaceous carbonate banks have not been explored. Oligocene carbonate reservoirs exist such as Dome Flore, which contains as much as 1 billion barrels of heavy oil (10° API, 1.6 percent sulfur).

**TRAPS AND SEALS:** Mesozoic-Cenozoic salt-related structures, fault-related structures related to volcanic intrusion (Dakar peninsula), growth fault related traps, slope truncation traps along the present shelf edge, Mesozoic pinchouts along the eastern margin, Lower Cretaceous-Jurassic carbonate bank deposits, and possible turbidite related traps.

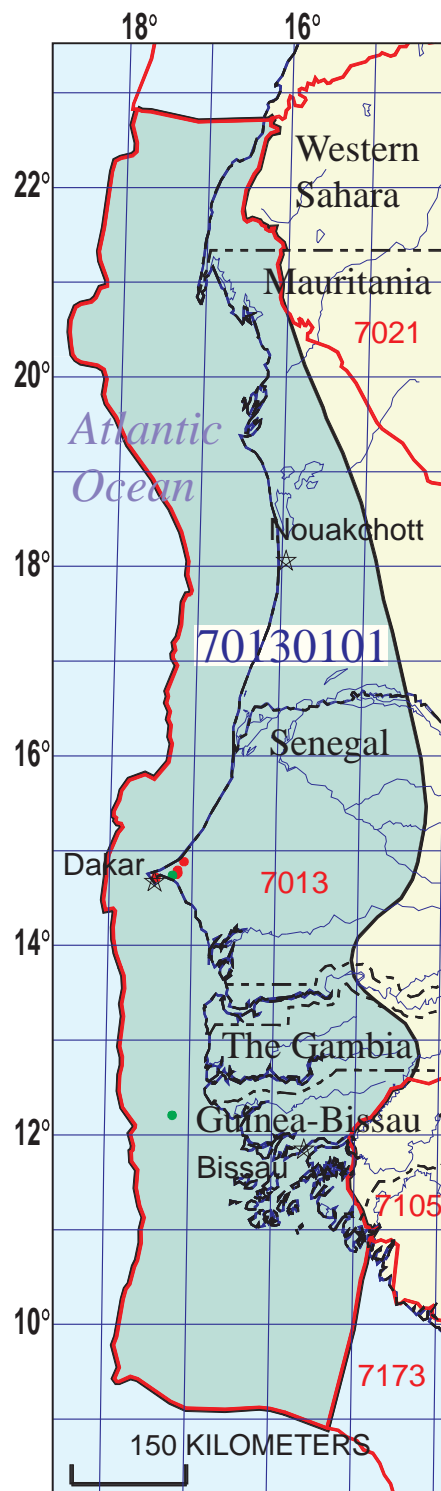
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## Coastal Plain and Offshore Assessment Unit - 70130101

### EXPLANATION

- Hydrography
  - Shoreline
  - 7013 Geologic province code and boundary
  - Country boundary
  - Gas field centerpoint
  - Oil field centerpoint
- 70130101
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Assessment unit  
code and boundary

**SEVENTH APPROXIMATION  
NEW MILLENNIUM WORLD PETROLEUM ASSESSMENT  
DATA FORM FOR CONVENTIONAL ASSESSMENT UNITS**

Date:..... 9/22/99  
 Assessment Geologist:..... M.E. Brownfield and R.R. Charpentier  
 Region:..... Sub-Saharan Africa and Antarctica Number: 7  
 Province:..... Senegal Number: 7013  
 Priority or Boutique..... Boutique  
 Total Petroleum System:..... Cretaceous-Tertiary Composite Number: 701301  
 Assessment Unit:..... Coastal Plain and Offshore Number: 70130101  
 \* Notes from Assessor MMS growth function.

**CHARACTERISTICS OF ASSESSMENT UNIT**

Oil (<20,000 cfg/bo overall) **or** Gas ( $\geq$ 20,000 cfg/bo overall):... Oil

What is the minimum field size?..... 1 mmboe grown ( $\geq$ 1mmboe)  
 (the smallest field that has potential to be added to reserves in the next 30 years)

Number of discovered fields exceeding minimum size:..... Oil: 1 Gas: 2  
 Established (>13 fields) \_\_\_\_\_ Frontier (1-13 fields) X Hypothetical (no fields) \_\_\_\_\_

Median size (grown) of discovered oil fields (mmboe):  
 1st 3rd 11.6 2nd 3rd \_\_\_\_\_ 3rd 3rd \_\_\_\_\_  
 Median size (grown) of discovered gas fields (bcfg):  
 1st 3rd 26.2 2nd 3rd 32.9 3rd 3rd \_\_\_\_\_

**Assessment-Unit Probabilities:**

| <u>Attribute</u>  | <u>Probability of occurrence (0-1.0)</u> |
|---|--|
| 1. <b>CHARGE:</b> Adequate petroleum charge for an undiscovered field $\geq$ minimum size.....            | <u>1.0</u>                               |
| 2. <b>ROCKS:</b> Adequate reservoirs, traps, and seals for an undiscovered field $\geq$ minimum size..... | <u>1.0</u>                               |
| 3. <b>TIMING OF GEOLOGIC EVENTS:</b> Favorable timing for an undiscovered field $\geq$ minimum size       | <u>1.0</u>                               |

**Assessment-Unit GEOLOGIC Probability** (Product of 1, 2, and 3):..... 1.0

4. **ACCESSIBILITY:** Adequate location to allow exploration for an undiscovered field  
 $\geq$  minimum size..... 1.0

**UNDISCOVERED FIELDS**

**Number of Undiscovered Fields:** How many undiscovered fields exist that are  $\geq$  minimum size?:  
 (uncertainty of fixed but unknown values)

|                               |          |            |           |         |           |
|-------------------------------|----------|------------|-----------|---------|-----------|
| Oil fields:.....min. no. (>0) | <u>1</u> | median no. | <u>12</u> | max no. | <u>35</u> |
| Gas fields:.....min. no. (>0) | <u>1</u> | median no. | <u>10</u> | max no. | <u>25</u> |

**Size of Undiscovered Fields:** What are the anticipated sizes (**grown**) of the above fields?:  
 (variations in the sizes of undiscovered fields)

|   |          |             |           |           |             |
|---|----------|-------------|-----------|-----------|-------------|
| Oil in oil fields (mmbo).....min. size  | <u>1</u> | median size | <u>4</u>  | max. size | <u>500</u>  |
| Gas in gas fields (bcfg):.....min. size | <u>6</u> | median size | <u>20</u> | max. size | <u>1500</u> |

**AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS**

(uncertainty of fixed but unknown values)

| <u>Oil Fields:</u>                | minimum | median | maximum |
|-----------------------------------|---------|--------|---------|
| Gas/oil ratio (cfg/bo).....       | 1100    | 2200   | 3300    |
| NGL/gas ratio (bnl/mmcf).....     | 30      | 60     | 90      |
| <u>Gas fields:</u>                | minimum | median | maximum |
| Liquids/gas ratio (bnl/mmcf)..... | 22      | 44     | 66      |
| Oil/gas ratio (bo/mmcf).....      |         |        |         |

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**SELECTED ANCILLARY DATA FOR UNDISCOVERED FIELDS**

(variations in the properties of undiscovered fields)

| <u>Oil Fields:</u>                      | minimum | median | maximum |
|---|---------|--------|---------|
| API gravity (degrees).....              | 10      | 36     | 50      |
| Sulfur content of oil (%).....          | 0.06    | 0.7    | 1.6     |
| Drilling Depth (m) .....                | 500     | 1500   | 4000    |
| Depth (m) of water (if applicable)..... | 0       | 500    | 2000    |
| <u>Gas Fields:</u>                      | minimum | median | maximum |
| Inert gas content (%).....              |         |        |         |
| CO <sub>2</sub> content (%).....        |         |        |         |
| Hydrogen-sulfide content (%).....       |         |        |         |
| Drilling Depth (m).....                 | 500     | 1500   | 5000    |
| Depth (m) of water (if applicable)..... | 0       | 500    | 2000    |

**ALLOCATION OF UNDISCOVERED RESOURCES IN THE ASSESSMENT UNIT  
TO COUNTRIES OR OTHER LAND PARCELS** (uncertainty of fixed but unknown values)

1. Mauritania represents 31 areal % of the total assessment unit

|   |         |        |         |
|---|---------|--------|---------|
| <u>Oil in Oil Fields:</u>                           | minimum | median | maximum |
| Richness factor (unitless multiplier):.....         | _____   | _____  | _____   |
| Volume % in parcel (areal % x richness factor):...  | _____   | 31     | _____   |
| Portion of volume % that is offshore (0-100%):..... | _____   | 100    | _____   |
| <u>Gas in Gas Fields:</u>                           | minimum | median | maximum |
| Richness factor (unitless multiplier):.....         | _____   | _____  | _____   |
| Volume % in parcel (areal % x richness factor):...  | _____   | 31     | _____   |
| Portion of volume % that is offshore (0-100%):..... | _____   | 100    | _____   |

2. Senegal represents 32 areal % of the total assessment unit

|   |         |        |         |
|---|---------|--------|---------|
| <u>Oil in Oil Fields:</u>                           | minimum | median | maximum |
| Richness factor (unitless multiplier):.....         | _____   | _____  | _____   |
| Volume % in parcel (areal % x richness factor):...  | _____   | 32     | _____   |
| Portion of volume % that is offshore (0-100%):..... | _____   | 80     | _____   |
| <u>Gas in Gas Fields:</u>                           | minimum | median | maximum |
| Richness factor (unitless multiplier):.....         | _____   | _____  | _____   |
| Volume % in parcel (areal % x richness factor):...  | _____   | 32     | _____   |
| Portion of volume % that is offshore (0-100%):..... | _____   | 80     | _____   |

3. Guinea-Bissau represents 24 areal % of the total assessment unit

|   |         |        |         |
|---|---------|--------|---------|
| <u>Oil in Oil Fields:</u>                           | minimum | median | maximum |
| Richness factor (unitless multiplier):.....         | _____   | _____  | _____   |
| Volume % in parcel (areal % x richness factor):...  | _____   | 24     | _____   |
| Portion of volume % that is offshore (0-100%):..... | _____   | 100    | _____   |
| <u>Gas in Gas Fields:</u>                           | minimum | median | maximum |
| Richness factor (unitless multiplier):.....         | _____   | _____  | _____   |
| Volume % in parcel (areal % x richness factor):...  | _____   | 24     | _____   |
| Portion of volume % that is offshore (0-100%):..... | _____   | 100    | _____   |

4. The Gambia represents 4 areal % of the total assessment unit

|   |         |        |         |
|---|---------|--------|---------|
| <u>Oil in Oil Fields:</u>                           | minimum | median | maximum |
| Richness factor (unitless multiplier):.....         | _____   | _____  | _____   |
| Volume % in parcel (areal % x richness factor):...  | _____   | 4      | _____   |
| Portion of volume % that is offshore (0-100%):..... | _____   | 100    | _____   |
| <u>Gas in Gas Fields:</u>                           | minimum | median | maximum |
| Richness factor (unitless multiplier):.....         | _____   | _____  | _____   |
| Volume % in parcel (areal % x richness factor):...  | _____   | 4      | _____   |
| Portion of volume % that is offshore (0-100%):..... | _____   | 100    | _____   |

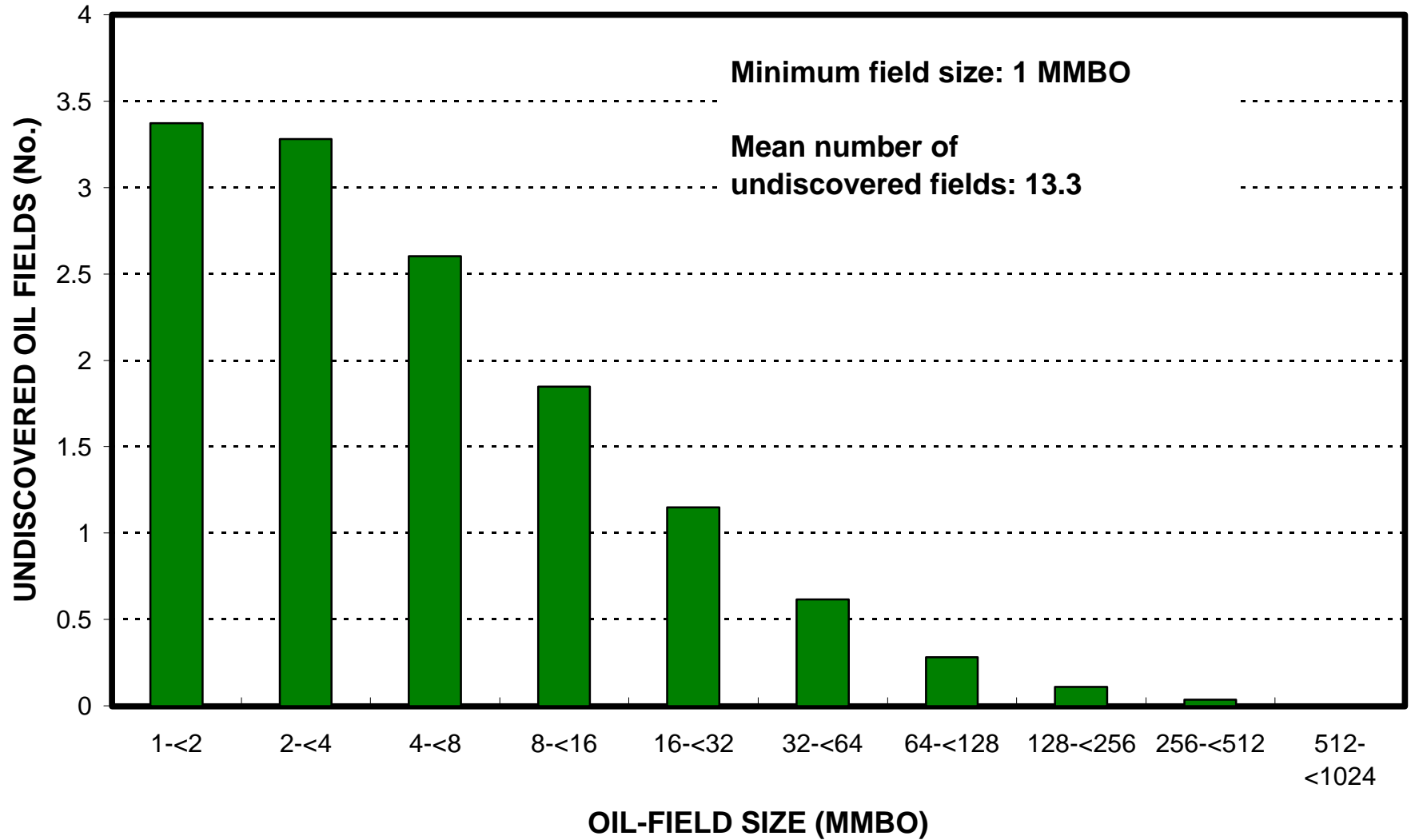
5. Western Sahara represents 9 areal % of the total assessment unit

| <u>Oil in Oil Fields:</u>                          | minimum | median     | maximum |
|--|---------|------------|---------|
| Richness factor (unitless multiplier):.....        | _____   | _____      | _____   |
| Volume % in parcel (areal % x richness factor):... | _____   | <u>9</u>   | _____   |
| Portion of volume % that is offshore (0-100%)..... | _____   | <u>100</u> | _____   |

| <u>Gas in Gas Fields:</u>                          | minimum | median     | maximum |
|--|---------|------------|---------|
| Richness factor (unitless multiplier):.....        | _____   | _____      | _____   |
| Volume % in parcel (areal % x richness factor):... | _____   | <u>9</u>   | _____   |
| Portion of volume % that is offshore (0-100%)..... | _____   | <u>100</u> | _____   |

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## Undiscovered Field-Size Distribution





# Coastal Plain and Offshore, AU 70130101

## Undiscovered Field-Size Distribution

