Société Nationale des Hydrocarbures, Cameroun National Hydrocarbons Corporation, Cameroun



Exploration Opportunities in two Producing Basins in Cameroon



Website of the National Hydrocarbons Corporation (SNH) of Cameroon: <u>www.snh.cm</u>



Invest in Comprom's Hydrocerbons Sector

Within its mandate to promote and valorise hydrocarbon resources in the mining property of the Republic of Cameroon, the National Hydrocarbons Corporation (SNH) has put on promotion, nine free blocks namely, Ndian River, Bolongo Exploration and Bakassi in the Cameroon's hydrocarbons rich Rio del Rey Basin (RDR), and Etinde Exploration, Ntem, Elombo, Tilapia, Bomono and Kombe-N'sepe in the highly prospective Douala/Kribi-Campo (DKC) Basin.

About SNH

SNH is a public industrial and commercial company with financial autonomy, created in 1980. It has the mission to:

- Promote, valorize and follow up all the petroleum activities in Cameroon;
- · Manage the State's interests in the domain of hydrocarbons;
- · Commercialise the share of the national oil and gas production accuring to the State;
- Manage and conserve E&P data generated in the country.

To accomplish these missions, SNH is notably empowered to:

- $\sqrt{\text{conduct all studies related to liquid}}$ and gaseous hydrocarbons;
- $\sqrt{\text{collect}}$ and store related information;
- $\sqrt{1}$ conduct negotiations of oil and gas contracts, in collaboration with the Ministries in charge of Mines, Finance, Energy, Economy, Trade and Environment;
- $\sqrt{monitor}$ the implementation of oil and gas contracts between the State and companies operating in the hydrocarbons sector;
- $\sqrt{\text{promote infrastructure creation for}}$ the production, transportation, pro-

cessing and storage of hydrocarbons within the national territory;

- $\sqrt{}$ collect and transport natural gas from producing companies to industries, power producers, other customers, distribution eligible Companies and processing plants;
- $\sqrt{\text{sign}}$, if need be, contracts with companies based and active in Cameroon in the field of production, transportation, distribution, processing or storage of hydrocarbons.

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Petroleum Geology Douala/I&fbf-Campo Basta

The Douala/Kribi-Campo Basin, covering a total area of 19000 km², is the northernmost basin of the South Atlantic rift. It lies between the prolific petroleum producing Niger Delta to the North and the Rio Muni Basin to the South.

Source rocks have been identified from several stratigraphic levels including the:

- Aptian/Albian
- Upper Cretaceous
- Oligocene/Miocene (Souellaba)
- Potential Paleocene/Eocene (N'kapa)

All the oil properties indicate that oils originate from terrigenousdominated source rocks deposited in a marine environment. Abundant oil seeps exist at the basin margins.

Hydrocarbon bearing reservoirs have been encountered at nearly every stratigraphic level from the Miocene (Souellaba) down to the Albian/Aptian (Upper and Lower Mundeck) and across a variety of depositional systems from continental to deepwater fans.



Stratigraphic summary of the Douala/Kribi-Campo Basin

Shales from across the different stratigraphic levels provide the seals.

Structural, stratigraphic and combined traps have been proven across the Douala/Kribi-Campo Basin.



Schematic structural and stratigraphic play summary

Douale/IRabi-Campo Basin

Etinde Exploration Block



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Cartoon highlighting the wells located on a diming background out of potential channel deposits in Paleocene



Douale/IMIbi-Campo Basin

Tilapia Block

Surface area

3,874.90 Km²

• Location

Offshore-shallow water

- Petroleum Plays
- Combination of structural and stratigraphic traps
- Tertiary confined channel turbidite complex/incised valley fill
- Tertiary shallow water/shoreline facies
- Upper Cretaceous turbidite and channel sands
- Discoveries, Prospects and Leads
- 11 wells drilled (4 with oil shows)
- Yoyo gas/condensate discovery nearby
- Oil discovery (Coco Marine-1)
- Multiple undrilled Operators' mapped prospects



Previous Operators' mapped prospects and leads



RMS Amplitude highlighting the coco marine discovery and channels taken from TerraCube^{REGRID} (CGG)

Douale/1247bi-Gampo Basin

Ntem Block (1/2)

Surface area

2,319.00 Km²

Location

Offshore, deep water area > 500 m

- Petroleum Plays
- Upper Cretaceous turbidite fans and slope channels associated with pinch-out
- Tertiary turbidite fans and channels
- Albian basal sands

• Discoveries, Prospects and Leads

- 01 well drilled (Bamboo-1) with oil shows
- Several prospects and multiple leads identified and mapped so far



Previous Operators' mapped prospects and leads



Frequency decomposition on a stratal slice of Cretaceous channel and fan taken from TerraCube^{REGRID} (CGG)



Douele/MathieGermpo Besth

Ntem Block (2/2)



Seismic line which illustrates numerous channels canyons and fans



Douale/Mabi-Campo Basin

Elombo Block (1/2)

- Surface area 2,405.00 Km²
- Location

Offshore in water depth: 0-400 m

- Petroleum Plays
- Upper Cretaceous and Tertiary turbidite fans and channel sands
- Gravitational fault related traps
- Salt related anticlines and flank pinch-outs
- Miocene channels and canyons fills
- Discoveries, Prospects and Leads
 - 06 wells drilled
- CM-1A encountered oil shows
- Multiple prospects and leads identified



Previous Operators' mapped prospects and leads



Cartoon demonstrating additional trapping mechanisms associated with salt diapir



Seismic line showing the location of the Kribi Marine-1 well in relation to the salt diapir



Douale/IMabi-Campo Basin

Elombo Block (2/2)



Seismic line from GeoSpec's TerraCube^{REGRID} volume in the Elombo Block, showing rollover anticlines in the Cretaceous and Tertiary sections, associated with faulting



Seismic line showing the location of the Kribi Marine-1 well in relation to the salt diapir it penetrated. Of particular note are the high amplitudes at the crest of the structure which were penetrated into by the well

Douale/IRtabi-Campo Basin

Kombe-N'sepe Block (1/2)

- Surface area
 3,026.00 Km²
- Location
 - Nearshore and onshore areas
- Petroleum Plays

Three distinct trends:

- Tertiary (Miocene/Oligocene) targets in Souellaba Formation
- Mid Cretaceous targets in base of slope sands in the Logbaba and Logbadjeck Formations
- Mid to Lower Cretaceous targets in slope to shelf sands in the Mundeck Formation
- Discoveries, Prospects and Leads
 - 18 wells drilled
 - Nearby Mvia oil producing field
 - Hydrocarbon seeps indicating Tertiary and Cretaceous source rocks

- Minor hydrocarbon discoveries
- Prospects and leads identified
- Live oil recorded from seeps



Previous Operators' mapped prospects and leads



Example of Upper Cretaceous plays



Douale/Maibi-Campo Basin

Kombe-N'sepe Block (2/2)



Map view and seismic section over Ndonga prospect



Illustration of one prospect over the Cretaceous from previous Operators

Douale/Mabi-Campo Basin

Bomono Block (1/2)

- Surface area
 2,327.50 Km²
- Location
- Onshore and
- Transition zone

Petroleum Plays

- Structural and stratigraphic trap
- Logbaba Formation : tilted, rotated fault blocks

• Discoveries, Prospects and Leads

- 18 wells drilled
- Gas/condensate discoveries
- Multiple mapped undrilled prospects



Bomono block localisation and previous Operators' mapped prospects and leads



2D seismic interpreted line illustrates plays associated with tilted fault block



Douale/Iktfbi-Campo Basin

Bomono Block (2/2)





Cartoon illustrating plays associated with tilted fault block and additional trapping mechanisms

Rio del Rey Basin NDIAN RIVER MANATEE-1 BAKASSI IK M-改 IEM-1 500000 0 0 BNM-BOM. BSM-1¥ IAM-MD-1 BOLONGO DBM-10 EXPLORATION 500000 Legend: Exploration well with no presence of hydrocarbons Exploration well with oil and gas shows

Wells and Fields Map

Exploration well with oil shows \bigcirc

- Exploration well with gas shows

- Accumulation of liquid hydrocarbons
 - Gas accumulation
 - Free blocks limits



Petroleum Geology

The Rio Del Rey (RDR) Basin is a divergent margin basin formed as a result of the Aptian to Albian opening of the South Atlantic Ocean.

The basin sedimentary fill corresponds to the easternmost edge of the prolific Tertiary Niger Delta complex. It is separated geographically from the Douala/Kribi-Campo Basin by the Tertiary Cameroon Volcanic Line.

The basin has four structural provinces, defined on the basis of deformation types:

- The Growth Fault Province in the North: differential loading of deltaic and continental sediments on underlying prodelta marine shale generated E-W trending syn-sedimentary faults.
- The Shale Ridge Province in the Southwest: the overburden of deltaic and continental sediments triggered squeeze flow of underlying mobile shales of the Akata Formation forming diapirs (shale domes, mud volcanoes, shale ridges).
- The Delta Toe-Thrust Belt in the South central area: zone of compressional/ transpressional thrust structures.
- The Eastern Province in the Southeast: slightly deformed foreland area juxtaposing the Cameroon Volcanic Line.

The general stratigraphy (see stratigraphic summary chart) is equivalent to that of the Niger Delta and is made up of three main diachronous formations in the basin, as described in the table below. Only one well penetrates the Cretaceous section, made up of sand and shales with source rock potential.



Stratigraphic summary of the Rio del Rey Basin

Petroleum Systems

Source Rock: Agbada, Akata shales and Cretaceous mudstone

Reservoir: Agbada sands and Nguti/Isongo turbidites and intra- Akata sands (Oongue turbidites) Seal Rock: Agbada and Akata shales

Traps: associated to growth faults and shale diapirs, faulting, toe thrust structures

Migration: along faults and permeable beds.

Main Formation	Lithology (Age range)	Depositional Environments
Benin	Continental massive sands and rare shale interbeds (Upper Miocene to Recent)	Alluvial and coastal plain
Agbada	Siliciclastic deltaic sequence. Interbeds of sands, silts and shales (Upper Miocene to Recent). Turbidite sandstones (Diongo, Nguti, Isongo).	Delta front, prodelta, fluvio-deltaic
Akata	Undercompacted marine shales, turbidite sandstones (Oongue), channel fill or offshore bar deposits (Etisah, Qua Iboe, Rubble beds) (Paleocene to Recent)	Prodelta, deepwater

Ndian River Block

• Surface area 2,530.00 Km²

• Location

Transition zone

- Petroleum Plays
- Good play diversity and multiple leads and prospects identified with considerable potential.
- Shallow deltaic with growth faults (Agbada)
- Delta Toe Thrust Turbiditic Play (Diongo, Isongo, Oongue)
- Shale Ridge Mini-basin Turbidite play (Nguti)
- Traps are associated with faulting at the flank and crest of Toe thrust.

• Discoveries, Prospects and Leads

- 04 wells drilled with 2 discoveries (Ubene-1 and Munge-1)
- Several small shallow prospects (Creteceous)
- Several deep prospects (Nguti, Diongo/Isongo turbidites) generated from existing crest of toe thrusts.



Previous Operators' mapped prospects and leads





Bolongo Exploration Block (1/2)

- Surface area 390.29 Km²
- Location

Offshore in water depth < 70 m

- Petroleum Plays
- Isongo turbidite play
- Structural and stratigraphic traps
- Nguti turbidite / debris flow
- Agbada sands in:
- Plays associated with crestal collapse
- Post-erosional fill
- Zafiro equivalent Paleocene channel plays
- Bolongo ridge

restal collapse play (Agbada sands)

- Discoveries, Prospects and Leads
 - 03 wells with oil and gas shows
 - Prospects and leads mapped at several stratigraphic levels



Previous Operators' mapped prospects and leads



E-W example seismic and plays taken from the CGG enhanced dataset



Post-erosional

Agbada sands

Bolongo Exploration Block (2/2)



Seismic section illustating Mandrill prospect



Amplitudes map over Mandrill prospect



Bakassi Block (1/2)

- Surface area 736.87 Km²
- Location
 - Transition and
 - zone onshore
- Petroleum Plays
 - Deltaic growth faults (Agbada) Paleocene platform turbidite plays
 - Separate East and West systems
 - Cretaceous horst block play

• Discoveries, Prospects and Leads

- 04 wells with 1 gas discovery (IEM-1)
- Prospects and leads identified
- Live oil recovered from seeps



Past Operators' mapped prospects and leads



Plays over the Bakassi Block

Bakassi Block (2/2)



Northern prospect





Douala/Kribi Campo Basin Wells and Sefsmic Data Packages

10°E 00000 Legend Additional wells Douala/Kribi Campo wells Seismic Montage Packages and Douala 3D data available Douala 2D data available 00000 2°30'N **CGG** 500000 600000

Data Package available from CGG (enhanced, workstation ready)

~7 637 km² 3D TerraCube^{REGRID}

~12 571 km TerraCube^{2D} (outside the 3D area)*

32 Wells and Seismic Montages Packages**

*2D seismic data inside 3D areas will be delivered but not charged for

**including digital LAS, Formation Description Logs (reconnaissance petrophysics), digitally re-mastered Mud Logs and digitally re-mastered Composite Logs (where available)

Douala/Kribi Campo Basin

Wells and Sefamic Data Packages

Wells and Seismic Montages (32)			
Douala/Kribi Campo			
Bamboo-l	Eboni-l	Ossa Est-1	
Batanga F-2	Kribi B-1	Pibissou-l	
Bome-1	Kribi Marine-l	Sanaga South A-1	
Bwabe-1	Kribi N-l	Sanaga-1X	
Campo B-1	Kribi R-1	Sapele-1,Sapele-1ST*	
Campo-R1	Mombe-1, IST*	Sapele-3	
Cheetah-1	Moulongo-1X	Trema-1	
Coco Marine-1	Mvia-3	Wouri-1X	
Coco Marine-2	Ngata-1, 1ST*	Yassoukou Marine-1	
D-l,D-lr*	Nkoudou-1	Yatou-1X	
Doume-1	Nord Matanda-1X		

*Combined Wells and Seismic Montages Packages

3D Surveys
Survey
Elombo West
Etinde HP5&6 Phase 4
Tilapia - Yoyo
Elombo East
Etinde HP5&6 Phase 3
Etinde HP5&6 Phase 2
Etinde HP5&6 Phase 1
Nyong
Ntem
Ebodje
Ebome

3D Survey Angle Stacks available at cost of reproduction			
Year	Survey	Acquisition Information	Angle Stacks
2001	Ebodje 3D	Y	0-12/12/24/24-36
2003	Ntem 3D	Y	0-15/12-30/30-45/45-55
2003	Nyong II 3D	Y	Ν
2010	Tilapia 3D	Y	5-18/35-45
2010	Etinde Exploration	Y	HP5: 0-15/15-30/30-45
	3D (MLHP 5 & 6)		HP6: 0-12/12-24/24-36
2010	Elombo 3D WEST	Y	0-12/12-24/24-36
2010	Elombo 3D EAST	Y	0-12/12-24/24-36/36-48

- Geochemical database
- BioStratigraphic review (17 key wells)
- Sedimentological interpretation of TerraCube STRATAL

- TerraCube ${}^{{\rm INTERP}}$ regional surfaces
- GeoModel of the TerraCube^{REGRID}



Rio Del Rey Basin Wells and Sefsmio Data Packages



Data Package available from CGG (enhanced, workstation ready)

- ~1 232 km² 3DTerraCube^{REGRID}
- ~7 646 km TerraCube^{2D} (outside the 3D area)*

14 Wells and Seismic Montages Packages**

*2D seismic data inside 3D areas will be delivered but not charged for

**including digital LAS, Formation Description Logs (reconnaissance petrophysics), digitally re-mastered Mud Logs and digitally re-mastered Composite Logs (where available)





Rio Del Rey Basin Wells and Sefsmie Data Packages

Wells and Seismic Montages (14)			
Rio del Rey			
Atayo Marine-1	Isongo Marine-Cl	Njonji Marine-1,	South Kole Marine 1,
Bakassi West Marine-1	Isongo Marine-El	Njonji Marine-1B,	South Kole Marine 2
Erong Marine-1	Koto Marine-1,	Njonji Marine-1BT1	Victoria Est 1
Erong Nord Marine-1	Koto Marine-2*	Oongue Marine 1,	
Etinde Marine-1	Narendi-1,	Oongue Marine 2,	
Idenao Marine-1	Narendi-2*	Oongue Marine 3*	

*Combined Wells and Seismic Montages Packages

3D Surveys
Survey Name by SNH
Bolongo Exploration
"Bomana
(part of RdR Merge)"
Debunsha
Etisah
"Lokele III
(part of RdR Merge)"
Nanar
"H48 Nord Kita
(part of RdR Merge)"
"H48 Sud Lipendja
(part of RdR Merge)"

3D Survey Angle Stacks available at cost of reproduction		
Year	Survey	Angle Stacks
2010	Bolongo Exploration	Near (2-14) / Mid (15-27) / Far (28- 40) / Ultra Far (40-55)
2006	Bomana	See RdR Merge
1999	Debunsha	
1998	Etisah	Near (5-17) / Mid (17-31) / Far (34- 45) / Ultra Far (40-55)
1990	Lokele III	See RdR Merge
2009	Nanar	
1991	H48 Nord Kita	See RdR Merge
1991	H48 Sud Lipendja	See RdR Merge
	RDR Merge	Near 5-23 / Far 23-41

+ TerraCube $^{\mbox{\scriptsize INTERP}}$ regional surfaces

+ GeoModel of the TerraCube $\ensuremath{^{\text{REGRID}}}$



Legal and regulatory framework for Exploration and Production activities in Cameroon (1/2)

The legal and regulatory framework for hydrocarbons exploration and production activities in the Republic of Cameroon is mainly governed by:

- the **Petroleum Code** promulgated into Law n°. 2019/008 of April 25, 2019, and its enabling Decree to be signed imminently, to promote investments in the upstream petroleum sector;
- the **Gas Code** promulgated into Law n°. 2012/006 of April 19,2012 and its enabling text, Decree no.2014/3438/ PM of October 27, 2014, to promote investments in the midstream/downstream gas sector.

In addition, there is Law n°. 2011/025 of December 14, 2011 on the **Development of Associated Gas** and its enabling text, Decree n°. 2013/1205 of March 18, 2013, to promote reduction of gas flaring.

The Petroleum Code

A Petroleum Contract in Cameroon is signed under the provisions of the Petroleum Code. The Petroleum Code and its enabling text, address all legal and regulatory matters relating to the conduct of Petroleum Operations in Cameroon, and notably :

- provide clear identification of the nature of the Petroleum Contract (Concession, Risk Service or Production Sharing Contract);
- · provides flexibility for the negotiation of Petroleum Contracts;
- contains several Tax and Customs' exemptions depending on the Phase of operations involved (Exploration, Development and Exploitation);
- · provides stability of the legal, economic and fiscal regime;
- · provides access to International Arbitration for the settlement of disputes if Parties do not settle amicably;
- address issues related to Environmental Protection, Decommissioning and Sites Restoration.

The Petroleum Code institutes many incentives to improve the economic of projects, as well as specific incentives to revive exploration and production activities, and support production.

The Gas Code

The present Gas Code promulgated into Law n°. 2012/006 of April 19, 2012 and its enabling text, Decree n°. 2014/3438/PM of October 27, 2014, institutes incentives for investments in projects such as LNG, Methanol and Fertilizer production. It provides for:

- stability of the fiscal and legal regime; and
- · obligations for the State to secure investments for gas projects.

One of its main innovations is the institution of the **Gas Agreement** tto be signed between the State and the Gas Company. The Gas Agreement specifies legal, fiscal, social and environmental conditions to be applied to major gas monetisation projects, and provides for incentives to improve the economics of such major gas projects.

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The Law on the development of Associated Gas

This Law, promulgated on 14th December 2011, governs the development of associated gas; its purpose is to:

· foster the recovery of flared or released gas for commercialisation;



Legal and regulatory framework for Exploration and Production activities in Cameroon (2/2)

- create attractive contractual and tax conditions for oil contract holders to develop associated gas;
- · contribute to the reduction of greenhouse gas emission and environmental protection.

The flaring permit may be granted as a special measure by the Minister in charge of the upstream oil sector at the request of the Operator, subject to security-related provisions and where the technical or economic factors warrant, for a period not exceeding 60 days renewable.

Local Content

In any upstream and downstream development projects, Companies should make proposals on Local Content. Local Content includes all activities relating to local capacity building, use of local human and material resources, technology transfer, use of local industrial and service companies and the creation of measurable added value for the local economy.

Procedure to License blocks (one on one procedure)

During 2021 and until further notice, any of the nine free blocks shall be licensed through a one-on-one process whose main steps are outlined as follows:

- formal expression of interest in one or several free blocks shall be notified in writing to the Executive General Manager of SNH by a Petroleum Company or Consortium of Companies. The address for such notification is provided here-in;
- access of any of the available two data packages which underpin the prospectivity of the blocks is strongly encouraged to enable technical evaluation(s) of the block(s) of interest in view of formulating a proposal(s).
 SNH's Petroleum Information Centre and/or CGG (GeoSpec) shall be contacted for all data issues;
- iii. any proposal submitted to the State in accordance with the Terms of Reference (TORs) hereunder in pursuance and confirmation of the interest expressed, shall be evaluated by the State;
- iv. if the proposal satisfactorily meets the criteria of the TORs, the Company or Consortium shall be invited to negotiate and eventually sign a Production Sharing Contract (PSC), following the procedures and the Petroleum Legislation in force;

When such negotiations are successfully concluded, a PSC is signed between the State and the Contractor (Petroleum Company or Consortium) for the conduct of Petroleum Operations during the term of the contract. Such signature constitutes grant of an Exclusive Exploration Authorisation(s).

