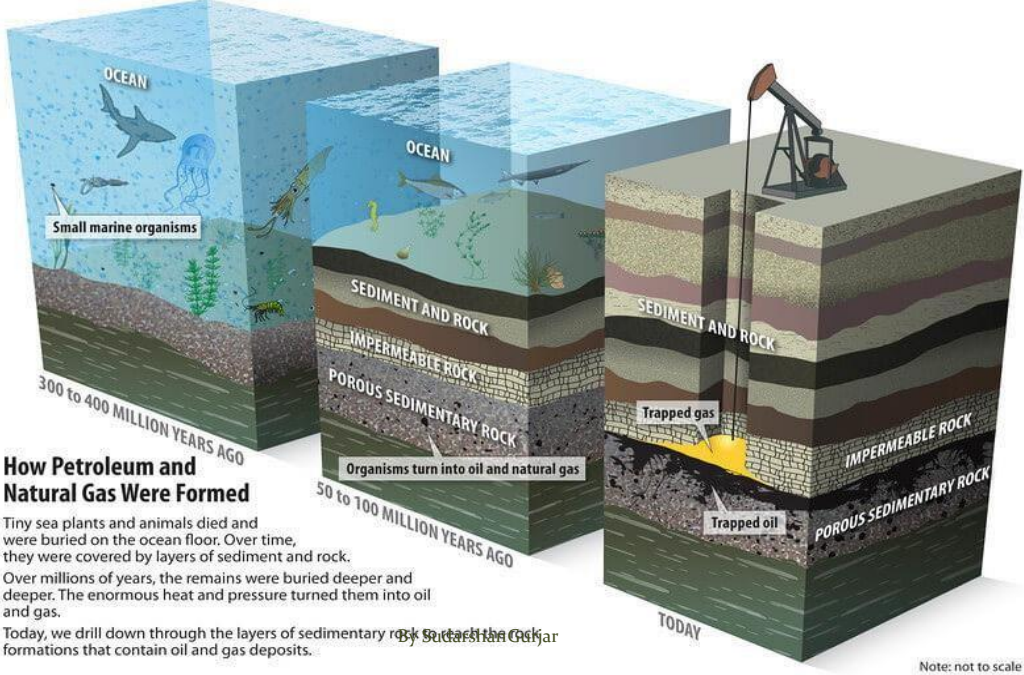
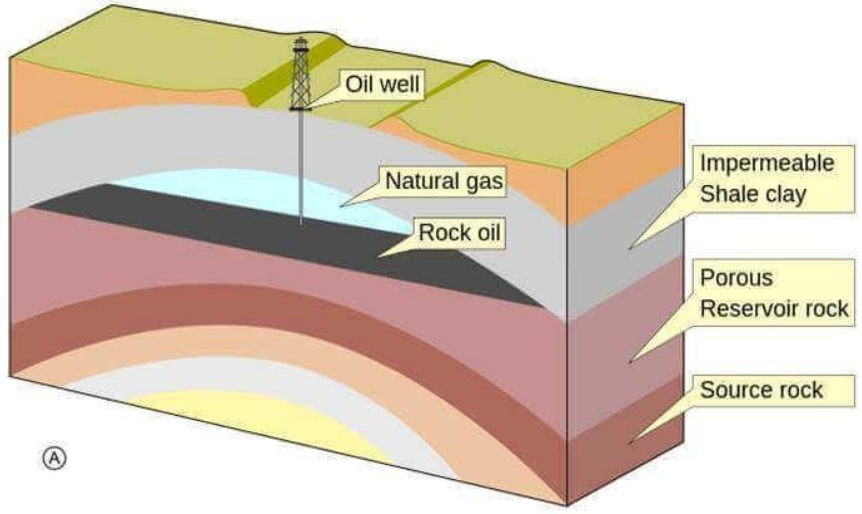
Petroleum & Natural Gas World+ India

By SudarshanGurjar

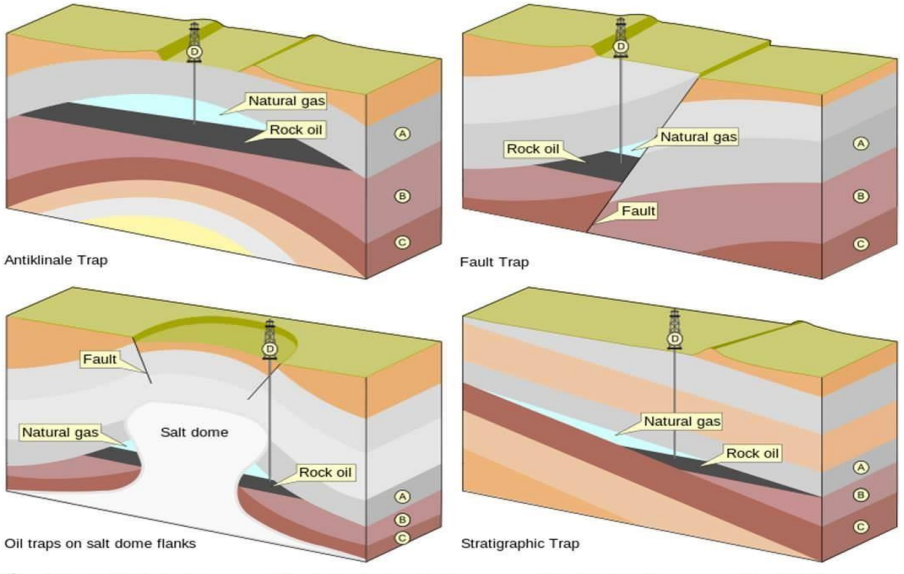

OCEAN
Small marine organisms
300 to 400 MILLION YEARS AGO
OCEAN
SEDIMENT AND ROCK
IMPERMEABLE ROCK
POROUS SEDIMENTARY ROCK
Organisms turn into oil and natural gas
50 to 100 MILLION YEARS AGO
SEDIMENT AND ROCK
Trapped gas
IMPERMEABLE ROCK
Trapped oil
POROUS SEDIMENTARY ROCK
TODAY
How Petroleum and Natural Gas Were Formed
Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of sediment and rock.
Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.
Today, we drill down through the layers of sedimentary rock to reach the rock formations that contain oil and gas deposits.
By Sudarshan Gurjar
Note: not to scale

- An oil reservoir must have three conditions.

1. **Porosity (tiny gaps in soil)** so as to accommodate sufficiently large amounts of oil
2. **Permeability** (allowing liquids or gases to pass through)
3. **Porous sandstone beds or fissured limestone containing oil should be capped below by impervious beds**



By SudarshanGurjar



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Cayman Islands


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NUNAVUT
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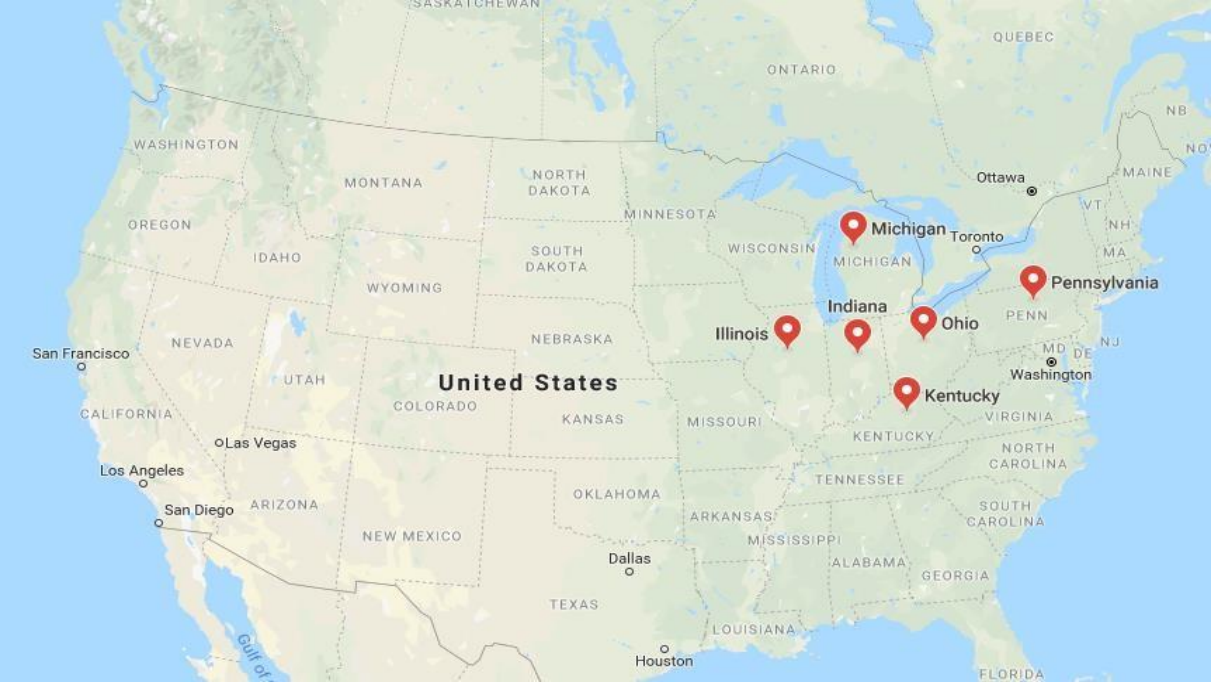
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Europe

Romania – Ploesti, Arges, Ticleni and Bacau.
Germany
Norway- Ekofisk.
Britain- Sharing oil deposits of North Sea.


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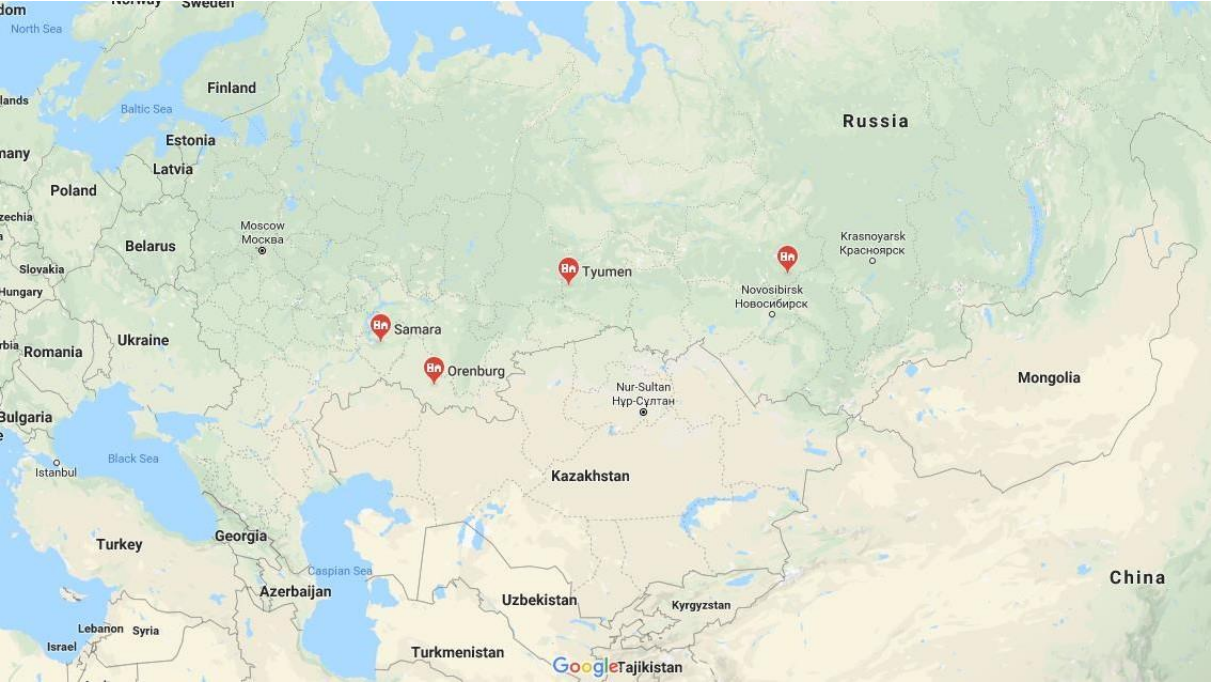
North Sea
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Новосибирск
Krasnoyarsk
Красноярск
Mongolia
China
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Asia

India- Assam, Gulf of Cambay.

Saudi Arabia- Dhahran, buqayq, Quatif, Ain Dar, khurais
Ghawar and Safaniya Oil Field.

Iran- Masjid-i-Sulalman, Naft-i-Shah, Lali, Agha Jari and Bahregan.

Iraq- Kirkuk, Zubayr, Rumaila and Mosul.

Kuwait- Burgan, Kuwait-Arabian Neutral Zone.

Others- Bahrein, an Island off Saudi Arabia, Qatar, United Arab Emirates- Abu Dhabi.

Masjed Soleyman
Irsoleymān

City

Khurais oil field

Location of Khurais oil field

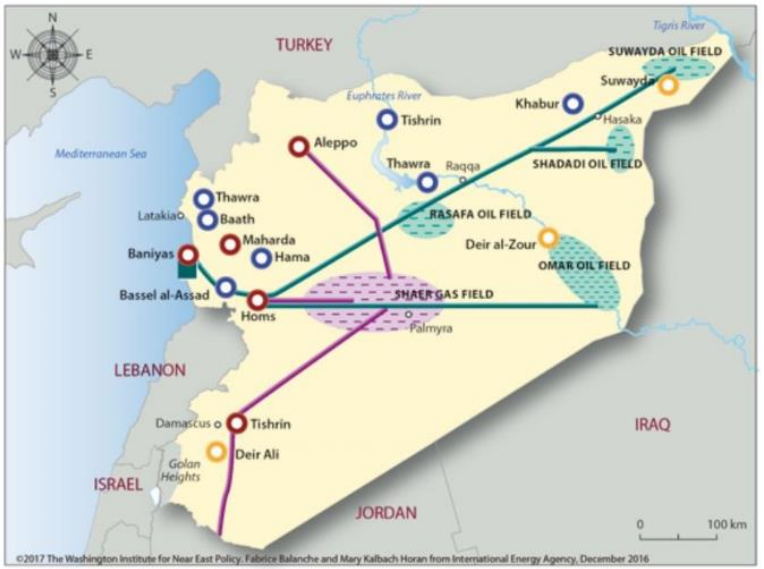
Rumaila

Location of Rumaila

Location in the Kingdom of Saudi Arabia

Az Zubair Field

Location of Az Zubair Field


ENERGY PRODUCTION IN SYRIA
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Tigris River
SUWAYDA OIL FIELD
Suwayda
Euphrates River
Khabur
Tishrin
Hasaka
Aleppo
Mediterranean Sea
Thawra
Raqqa
SHADADI OIL FIELD
Thawra
Latakia
Baath
RASAFA OIL FIELD
Deir al-Zour
Maharda
Baniyas
Hama
OMAR OIL FIELD
Bassel al-Assad
SHAER GAS FIELD
Homs
Palmyra
LEBANON
Damascus
Tishrin
IRAQ
Deir Ali
Golan Heights
ISRAEL
JORDAN
0
100 km
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Oil field
Gas field
Oil pipeline
Gas pipeline
Hydroelectric power plant
Thermal power plant
Prospective thermal power plant
Oil terminal


Kuwait
Hafar Al Batin
حفر الباطن
Al Khanafah Wildlife Sanctuary
محمية الخنفة
Tabuk
تبوك
Hail
حائل
Buraydah
بريدة
Az Zulfi
الزلفي
Ar Rass
الرس
Medina
المدينة المنورة
Yanbu
ينبع
Al Duwadimi
الدوادمي
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Al Kharj
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Saudi Arabia
Thuwal
ثول
Jeddah
جدة
Mecca
مكة
Taif
الطائف
Al Aflaj
الأفلاج
Wadi ad-Dawasir
وادي الدواسر
Al Bahah
الباحة
Bisha
بيشة
Oroug Bani M'aradh Wildlife Sanctuary
محمية عروق بني معارض
Khamis Mushait
خميس مشيط
Abha
أبها
Jazan
جازان
Sharorah
شرورة
Port Sudan
بورتسودان
Red Sea
Al Qatif
Dhahran
Buqayq
New Ain Dar
Persian Gulf
Qatar
Bandar Abbas
بندر عباس
Kish
كيش
Dubai
دبي
Ras Al-Khaimah
رأس الخيمة
United Arab Emirates
Gulf of Oman
Muscat
مسقط
Nizwa
ولاية نزوى
Sur
صور
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Salalah
صلالة
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Abbasi Great Mosque
Iran
Aghajari
Bahregan Airport
Of Emamhasan Port
Tehran
Mashhad
Afghanistan
Basrah
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Tabriz
تبریز
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اردبیل
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Siirt
Batman
Rasht
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Harrat al Harrah Conservation
محمية حرة الحرة
Arar
عرعر
Basrah
بصرة
Shiraz
شیراز
Sakaka
سكاكا
Altubaiq Natural Reserve
محمية الطبيق
Eilat
Rafha
رفحاء
Al Khanafah Wildlife
Kuwait

Asia

Indonesia- Sumatra, Palembang, Jambi, Minas and Pengkalani.

Borneo Islands- Kalimantan and Irian Jaya, Brunei.

Malaysia- Off Sarawak and Sabah.

Myanmar- Singu, Yenang-Yaung, Indaw and Minbu.


Banda Aceh
ACEH
Malacca Strait
PENANG
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KELANTAN
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PERAK
Medan
Pematangsiantar
Malaysia
Kuala Lumpur
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Minas
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WEST SUMATRA
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BANGKA BELITUNG ISLANDS
Belitung
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Makassar
Java Sea
Banda Sea


Singu
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札幌
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North Korea
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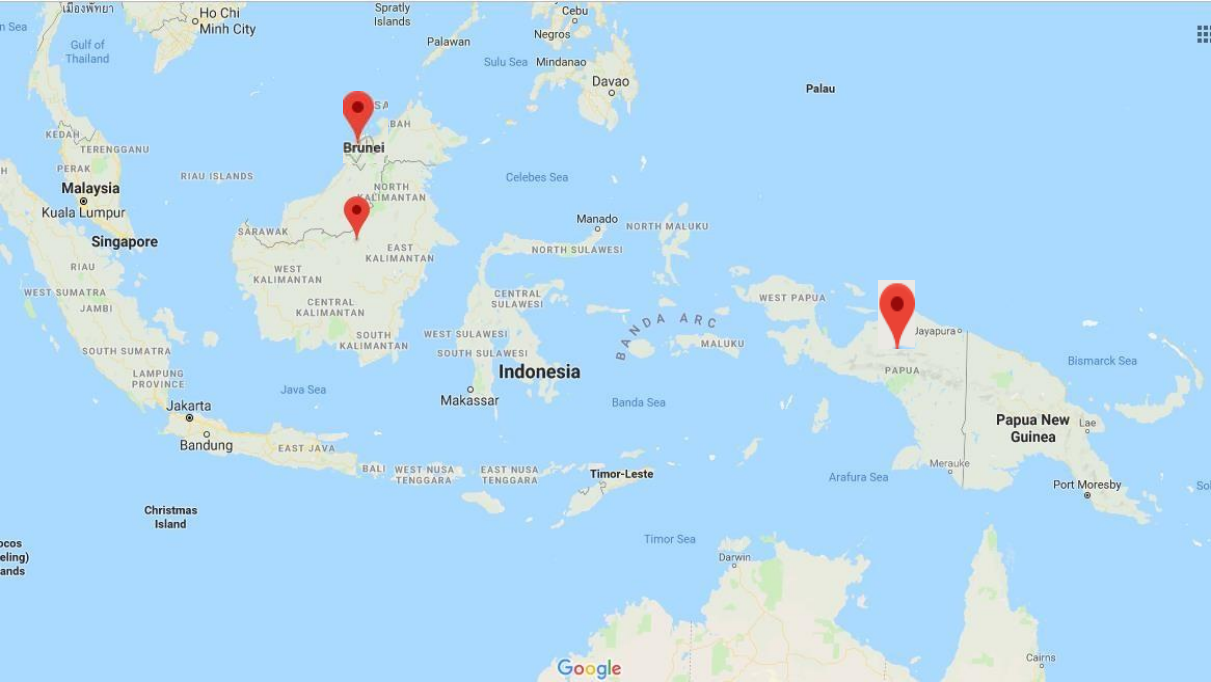
香港
Luzon


Ho Chi Minh City
Spratly Islands
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Mindanao
Davao
Palau
Gulf of Thailand
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Malaysia
Kuala Lumpur
Singapore
Celebes Sea
Manado
NORTH MALUKU
NORTH SULAWESI
WEST PAPUA
Jayapura
BANDA ARC
MALUKU
Indonesia
Makassar
Java Sea
Banda Sea
Bismarck Sea
PAPUA
Papua New Guinea
Jakarta
Bandung
EAST JAVA
BALI
WEST NUSA TENGGARA
EAST NUSA TENGGARA
Timor-Leste
Arafura Sea
Merauke
Port Moresby
Christmas Island
Timor Sea
Darwin
Cairns
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Africa

Algeria- Hassir'Mel, Hassimassaoud and Edjele.

Libya- Dahra, Beda, Zeltan.

Nigeria- Biafra and other fields in Niger delta.

Other- Angola, Gabon and Zaire, Chad, Cameroon, Niger, Ghana.


Hassi R'Mel
Hassimassaoud
Spain
Tyrrhenian Sea
Greece
Istanbul
Turkey
Tunisia
Mediterranean Sea
Syria
Lebanon
Iraq
Iran
Israel
Jordan
Morocco
Algeria
Edjele
Libya
Egypt
Western Sahara
Saudi Arabia
Mauritania
Red Sea
Mali
Niger
Yemen
Sudan
Eritrea
Senegal
Gambia
Guinea-Bissau
Chad
Gulf of Aden
Djibouti
Burkina Faso
Guinea
Sierra Leone
Benin
Nigeria
Ethiopia
Côte d'Ivoire
Togo
Ghana
Liberia
Lagos
Central African Republic
South Sudan
Cameroon
Somalia
Gulf of Guinea
Equatorial Guinea
Uganda
Kenya
Gabon
Nairobi
Rwanda
Burundi
DRC
Kinshasa
Tanzania
Luanda

Australia

Queensland- Moonie, Alice Springs in Northern Territory, Bass Strait.


Timor Sea
NORTHERN TERRITORY
QUEENSLAND
Australia
WESTERN AUSTRALIA
Moonie
Brisbane
SOUTH AUSTRALIA
Perth
NEW SOUTH WALES
Newcastle
Adelaide
Great Australian Bight
ACT
Melbourne
Bass Strait
TASMANIA

Americas

Mexico- Sabinas, Reynosa, Tampico, Ciudad Madero, Poza Rica, Cardenas, Ciudad Pemex.

Venezuela- Mene Grande and La Rosa near Lake MaraCaibo, Llanos and in the Orinoco delta.

Columbia- Magdalena Valley and extreme south-western corner of the Maracaibo Basin.

Peru- Zorritos near Tumbes, Lobitos and Negritos near Talara, GansoAzul in the Amazon Basin.


Aruba
Curaçao
Coro
Barranquilla
Maracaibo
Cartagena
Valledupar
Caracas
Barquisimeto
Puerto La Cruz
Valencia
Maturin
Sincelejo
Montería
Merida
Barinas
Guayana C
Apartadó
Cúcuta
San Cristobal
Ciudad Bolívar
Bucaramanga
Venezuela
Medellín
El Caura
Tunja
Parque
Nacional
Natural El
Tuparro
Pereira
Bogotá
Ibagué
Villavicencio
Cali
Colombia
Neiva
Popayán


ARIZONA
NEW MEXICO
ARKANSAS
MISSISSIPPI
GEORGIA
San Diego
Phoenix
Tucson
El Paso
Dallas
Atlanta
BAJA CALIFORNIA
SONORA
CHIHUAHUA
TEXAS
Austin
Houston
LOUISIANA
New Orleans
Jacksonvil
Orland
Gulf of California
Sabinas
Reynosa
BAJA CALIFORNIA SUR
SINALOA
DURANGO
Monterrey
Gulf of Mexico
Mexico
TAMAULIPAS
Havana
Ciudad Madero
SAN LUIS POTOSI
Tampico
NAYARIT
Mérida
Cancún
Guadalajara
GUANAJUATO
Poza Rica de Hidalgo
YUCATAN
JALISCO
Mexico City
Heroica Veracruz
QUINTANA ROO
COLIMA
MICHOACÁN
CAMPECHE
Cárdenas
PUEBLA
VERACRUZ
Ciudad Pemex
GUERRERO
Belmopan
Acapulco
CHIAPAS
Belize
OAXACA
Guatemala
Guatemala
Honduras
El Salvador
Nicaragua
Managua
Costa Rica


Aruba
Curaçao
and the
Grenadines
Grenada
Coro
Barranquilla
Maracaibo
Cartagena
Valledupar
Caracas
Trinidad
and Tobago
Puerto La Cruz
Mene Grande
Valencia
Maturin
Sincelejo
Monteria
Merida
Barinas
Guayana City
Cúcuta
San Cristobal
Ciudad Bolívar
Orinoco
Sierra Imataca
Bucaramanga
Venezuela
Medellín
El Caura
Tunja
Parque
Nacional
Natural El
Tuparro
Parque
Nacional
Canaima
Pereira
Bogotá
Villavicencio
Ibagué
Colombia
Neiva
Boa Vista
Parque
Nacional
Parima
Tapirapecó
YANOMAMI


Medellín
Bogotá
Pereira
Cali
Colombia
Paramaribo
Guyana
Suriname
French Guiana
Boa Vista
STATE OF RORAIMA
Quito
Ecuador
Zorritos District
Lobitos District
Negritos
El Ganso Azul
Manaus
STATE OF AMAZONAS
STATE OF ACRE
Brazil
Peru
Lima District
STATE OF RONDÔNIA
STATE OF MATO GROSSO
Cusco
Arequipa
La Paz

Saudi Arabia	• **The discovery that transformed Saudi Arabia into a leading oil country was Al-Ghawār oil field.** • **Another important discovery was the Saffaniyah offshore field in the Persian Gulf. It is the one of the largest oil field in the world**
Iraq, Kuwait, Iran	• These countries have a number of supergiant fields. • Al-Burqan oilfield of Kuwait.
Russia	• Russia is thought to possess the best potential for new discoveries. • There are two supergiant oil fields – Western Siberia and Yenisey Khatanga. • Kamchatka peninsula and Sakhalin Island are said to have significant oil reserves. • Volga-Caspian Region has many oil and gas fields.

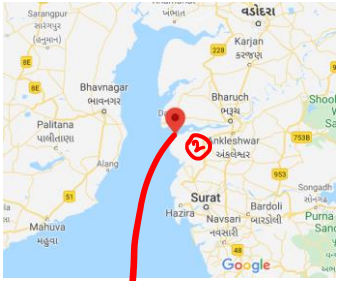
Location of the Safaniya oil field within Saudi Arabia


Location of Burgan Field in Kuwait

Location of Ghawar Field

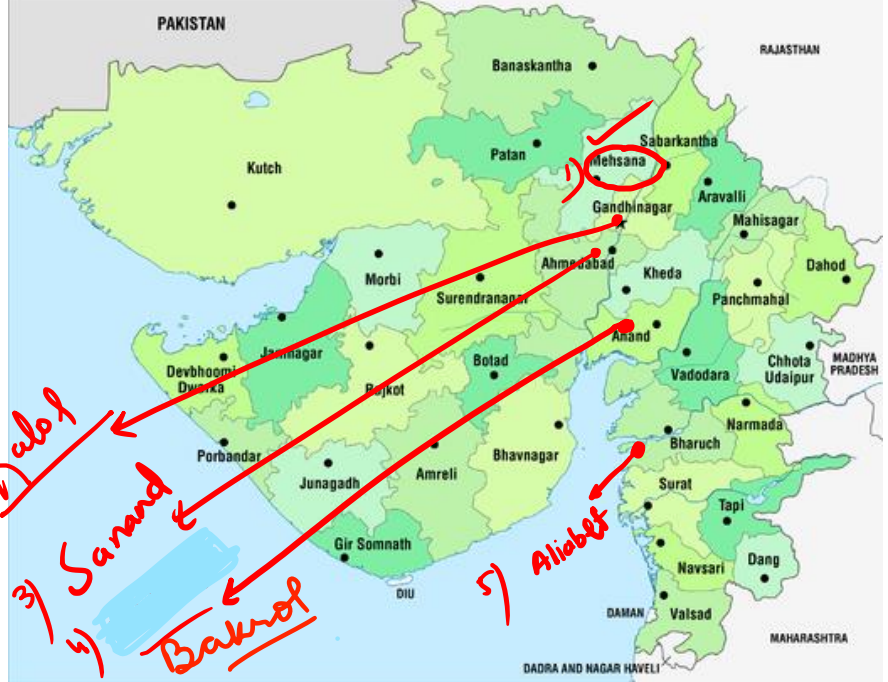
North America	• **North America has many sedimentary basins.** • **Many oilfields have been found in North Slope region of Alaska and East Texas.** • **The Rocky Mountain region contains an enormous amount of petroleum reserve.** • **Canada has huge deposits of oil sands in the Athabasca region in western Canada** • **Canada's largest oil field is off Newfoundland.**
Venezuela	• Venezuela is the major oil exporter in the Western Hemisphere. • Most of the country's reserves are located in the Orinoco belt.
Western Europe	• Significant oil reserves are found in North Sea. • Exploration in the Barents Sea has been of great interest.
Africa	• The main oil-producing countries of Africa are Libya, Algeria, Nigeria and Egypt. • Niger delta in Nigeria contains enormous amount of oil. • Egypt is self-sufficient in oil production. • Algeria is another significant producer of petroleum where much of the national income comes from oil-export. • Libya became a consistent producer of petroleum.

Top Crude Oil Producers (2018)			Top Crude Oil Consumers (2017)			Top Crude Oil Exporters (% share)
Country	**Million barrels/day**		**Country**	**Million barrels/day**		
1. USA	17.8	18%	**1. USA**	19.8	20%	**1. Saudi Arabia (16%)**
2. Saudi Arabia	12.4	12%	**2. China**	12.7	13%	**2. Russia: (11%)**
3. Russia	11.4	11%	**3. India**	4.6	5%	3. Iraq (8.1%)
4. Canada	5.2	5%	4. Japan	3.9	4%	4. Canada (5.9%)
5. China	4.8	5%	5. Russia	3.2	4%	5. UAE (5.2%)
India (11th place)	2.5	3%				


વડોદરા
Sarangpur
Karjan
Bhavnagar
Bharuch
Palitana
Ankleshwar
Alang
Surat
Hazira
Navsari
Bardoli
Mahuva
Songadh
Google

Aliabet


CHINA
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
MYANMAR
I N D I A
Barmer
Gulf of Kachchh
Mehsana
Kalol
Khamshat
Ahmedabad
Ankleshwar
Aliabet
Gulf of Khambhat
Mumbai High
Orissa Coast
Bay of Bengal
Krishna-Godavari basin
Arabian Sea
Andaman Sea
SRI LANKA
Dibrugarh
Rudrasagar
Digboi
Naharkatia
Lakhimpur
Hugrijan
Sibsagar
Badarpur
Tripura
Proven basins
Oil fields
Gas fields


PAKISTAN
RAJASTHAN
Banaskantha
Patan
Mehsana
Sabarkantha
Kutch
Aravalli
Gandhinagar
Mahisagar
Ahmedabad
Kheda
Dahod
Morbi
Surendranagar
Panchmahal
Anand
Jamnagar
Botad
Chhota Udaipur
MADHYA PRADESH
Devbhoomi Dwarka
Rajkot
Vadodara
Narmada
Bharuch
Porbandar
Bhavnagar
Junagadh
Amreli
Surat
Tapi
Gir Somnath
Navsari
Dang
DIU
DAMAN
Valsad
MAHARASHTRA
DADRA AND NAGAR HAVELI
1) Kalol
2) Sanand
3) Bakrol
4) Aliabet

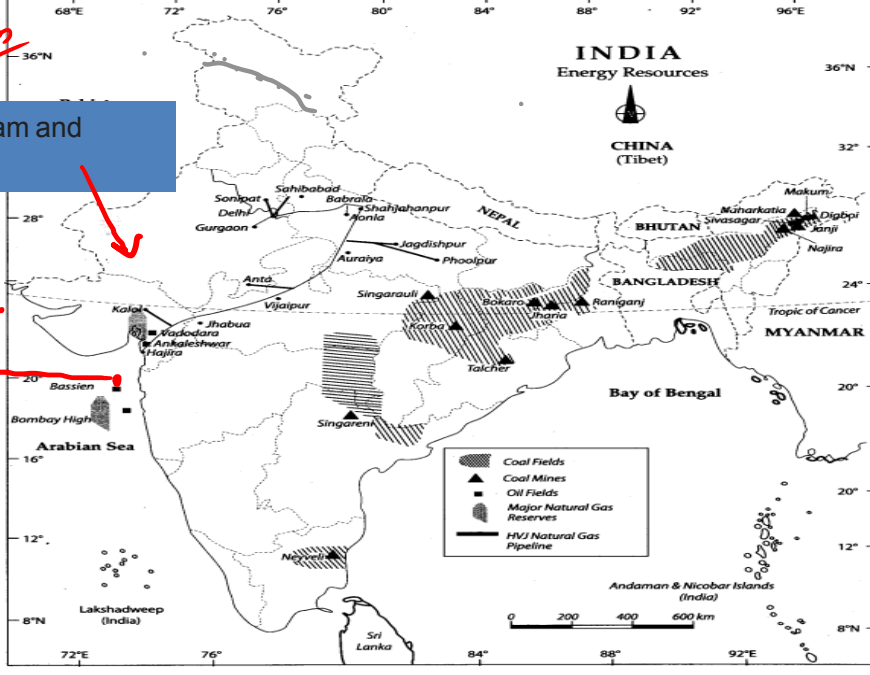
Rajasthan

Mangala, Bhagyam and Aishwariya

+Saraswati

+ Rajeshwari.

Panna-Mukta oilfield



Assam Oilfields	• **Oldest oil producing state in India.** • **The Digboi field in Dibrugarh district is the oldest oil field of India.** • **The Naharkatiya field and The Moran-Hugrijan field are also important.** • **The main oil bearing strata extend for a distance of 320 km in upper Assam along the Brahmaputra valley.** • **Makum region** • **Oilfields of Assam are relatively inaccessible and are distantly located from the main consuming areas.** • **Oil from Assam is therefore, refined mostly in the refineries located at Noonamati in Assam (443 km), Digboi, Guwahati, Bongaigaon, Barauni in Bihar (724 km) and Numaligarh.**
Gujarat Oilfields	• Ankleshwar, Khambhat, Ahmedabad, Barkol, and Sanand are important oilfields of this region. • Oil from these fields are sent to refineries at Trombay and Koyali.
Rajasthan Oilfields	• Rajasthan is the largest on shore oil producing state of India. • One of the largest inland oil discoveries was made in Barmer district. • Other important discoveries are Mangala oil field, Sarswati and Rajeshwari.

Western Coast	• **Mumbai High, Bassein and Aliabet.** • **Mumbai High: 1974; rock strata of Miocene age.** • **Sagar Samrat, Bassein: south of Mumbai High.** • **Aliabet: Aliabet island is in the Gulf of Khambhat.**
Eastern Coast	• The basin and delta regions of the Godavari, the Krishna (K-G basin) and the Cauvery rivers hold great potential for oil and gas production. • The Rawa field in Krishna-Godavari off-shore basin is an important one. • The Narimanam & Kovilappal oilfields in the Cauvery on-shore basin are also important.

State-wise crude oil production trends (thousand metric tonnes)

State/Source
1.Rajasthan
2.Gujarat
3.Assam
4.Tamil Nadu
5.Andhra Pradesh
6.Arunachal Pradesh

Refinery Location	Capacity (MMTPA)*
SEZ, Jamnagar, Gujarat (RIL – private sector)	35
DTA-Jamnagar (RIL – private sector)	33
Vadinar, Gujarat (Essar Oil – private sector)	20
Kochi, Kerala (BPCL)	15
Panipat, Haryana (IOCL)	15
Paradip, Odisha (IOCL)	15
Mangalore, Karnataka (MRPL)	15
Koyali, Gujarat (IOCL)	13
Mumbai, Maharashtra (BPCL)	12
Bathinda, Punjab (JV refinieries)	11
Manali, Tamil Nadu (CPCL)	10
Visakhapatnam, Andhra Pradesh (HPCL)	8.3

Mathura, U.P (IOCL)	8
Bina, MP (JV refineries)	7.8
Haldia, West Bengal (IOCL)	7.5
Mumbai, Maharashtra (HPCL)	7.5
Barauni, Bihar (IOCL)	6
Numaligarh, Assam (Numaligarh Refinery Ltd.)	3
Bongaigaon, Assam (IOCL)	2.35
Guwahati, Assam (IOCL)	1
Nagapattinam (CPCL)	1
Digboi, Assam (IOCL)	0.65
Tatipaka, AP	0.066
Total	249

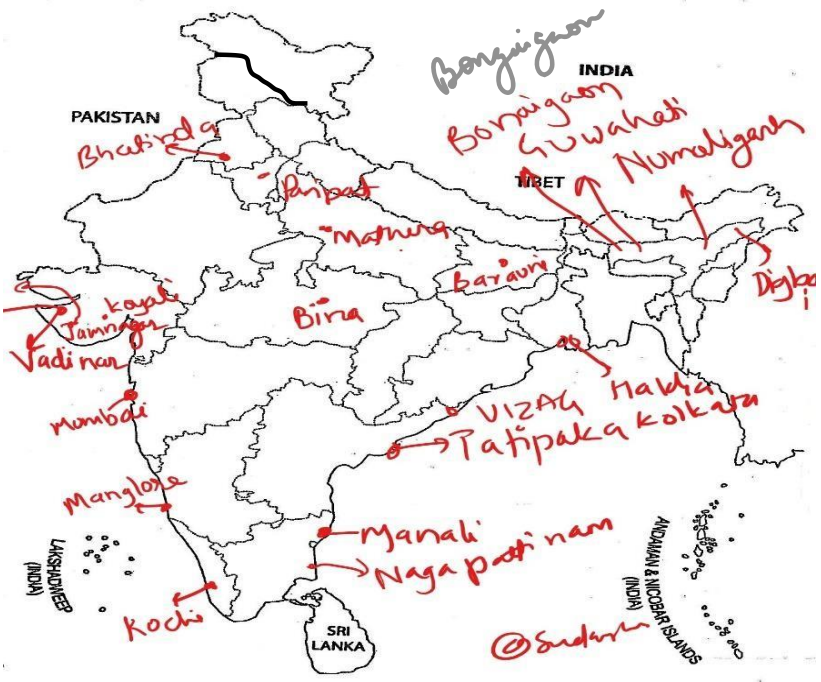
MMTPA: Million Metric Tonne Per Annum

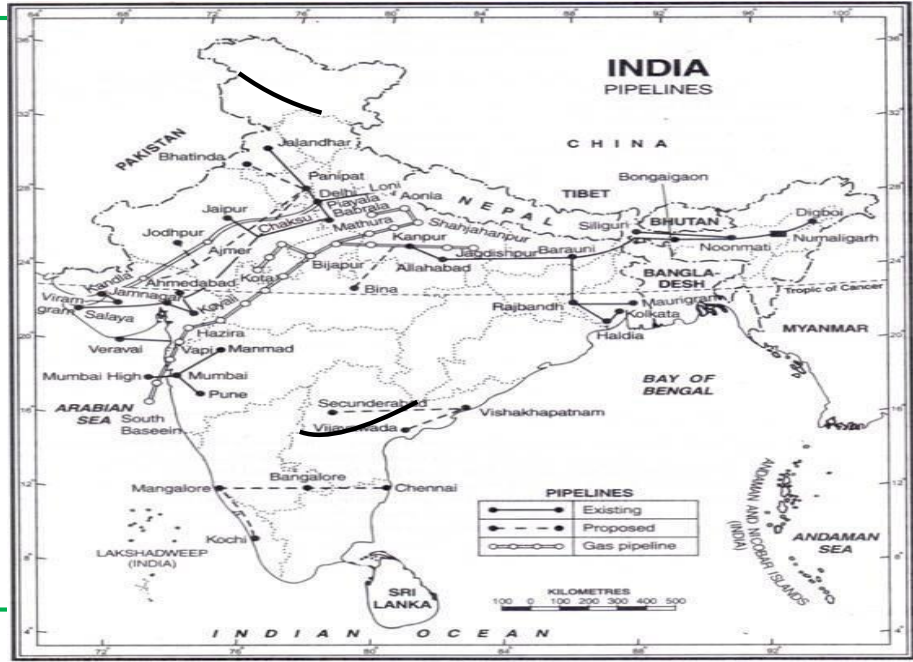
BPCL: Bharat Petroleum Corporation Limited (Public Sector Units)

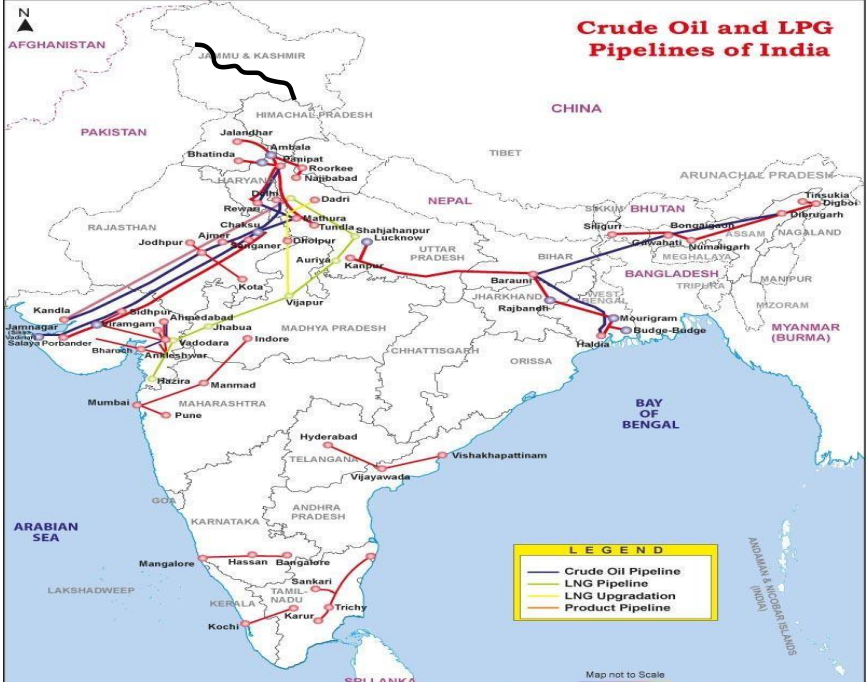
CPCL: Chennai Petroleum Corporation Limited (Public Sector Units)

HPCL: Hindustan Petroleum Corporation Limited (Public Sector Units)

IOCL: Indian Oil Corporation Limited (Public Sector Units)


Bongaigaon
INDIA
PAKISTAN
Bhatinda
Bongaigaon
Guwahati
Numaligarh
TIBET
Panipat
Mathura
Barauni
Digbo
Kayali
Tamnagar
Bina
Vadinar
Haldia
Mumbai
VIZAG
Patipaka
Kolkata
Mangalore
Manali
Nagapattinam
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)
Kochi
SRI LANKA
Sundarban


INDIA
PIPELINES
PAKISTAN
CHINA
NEPAL
TIBET
BHUTAN
BANGLA-
DESH
MYANMAR
Tropic of Cancer
BAY OF
BENGAL
ARABIAN
SEA
INDIAN OCEAN
SRI
LANKA
ANDAMAN
SEA
NICOBAR AND NICOBAR ISLANDS
(INDIA)
LAKSHADWEEP
(INDIA)
Jalandhar
Bhatinda
Panipat
Delhi
Loni
Aonla
Jaipur
Babrala
Chaksu
Mathura
Shahjahanpur
Jodhpur
Ajmer
Kanpur
Jagdishpur
Barauni
Bongaigaon
Siliguri
Digboi
Noonmati
Numaligarh
Kandla
Ahmedabad
Kota
Bijapur
Allahabad
Bina
Jamnagar
Viramgram
Salaya
Koyali
Rajbandh
Maurigram
Kolkata
Haldia
Hazira
Veraval
Vapi
Manmad
Mumbai High
Mumbai
Pune
Secunderabad
Vishakhapatnam
Vijayawada
South
Baseein
Mangalore
Bangalore
Chennai
Kochi
PIPELINES
Existing
Proposed
Gas pipeline
KILOMETRES
100 0 100 200 300 400 500


Crude Oil and LPG Pipelines of India
N
AFGHANISTAN
JAMMU & KASHMIR
PAKISTAN
CHINA
HIMACHAL PRADESH
TIBET
ARUNACHAL PRADESH
Jalandhar
Amtala
Bhatinda
Panipat
Roorkee
Najibabad
HARYANA
Delhi
Dadri
NEPAL
Rewari
Mathura
Tundla
SIKKIM
BHUTAN
Tinsukia
Digboi
Dibrugarh
Sliguri
Bongaigaon
RAJASTHAN
Chaksu
Ajmer
Shahjahanpur
Lucknow
Jodhpur
Ganganer
Dholpur
Guwahati
Numaligarh
ASSAM
NAGALAND
UTTAR PRADESH
Auriya
Kanpur
BIHAR
MEGHALAYA
BANGLADESH
Barauni
MANIPUR
Kota
JHARKHAND
TRIPURA
Vijapur
WEST BENGAL
Rajbandh
MIZORAM
Kandla
Siddhpur
Ahmadabad
Mourigram
Jamnagar
Viramgam
Jhabua
MADHYA PRADESH
Budge-Budge
MYANMAR (BURMA)
Salaya
Porbander
Vadodara
Indore
Haldia
Bharoch
Ankleshwar
CHHATTISGARH
ORISSA
Hazira
Manmad
BAY OF BENGAL
Mumbai
MAHARASHTRA
Pune
Hyderabad
TELANGANA
Vishakhapattinam
Vijayawada
GOA
ANDHRA PRADESH
ARABIAN SEA
KARNATAKA
LEGEND
Crude Oil Pipeline
LNG Pipeline
LNG Upgradation
Product Pipeline
Mangalore
Hassan
Bangalore
ANDAMAN & NICOBAR ISLANDS (INDIA)
Sankari
LAKSHADWEEP
TAMIL-NADU
KERALA
Trichy
Karur
Kochi
Map not to Scale

- **Petroleum Product Pipelines**

Naharkatia-Nunmati-Barauni Pipeline ➔ **first pipeline constructed in India**

Hajira-Bijapur-Jagdishpur (HBJ) Gas Pipeline ➔ **world's largest underground pipeline**

Jamnagar-Loni LPG Pipeline ➔ **longest LPG pipeline in the world**

- **Petroleum Product Pipelines**

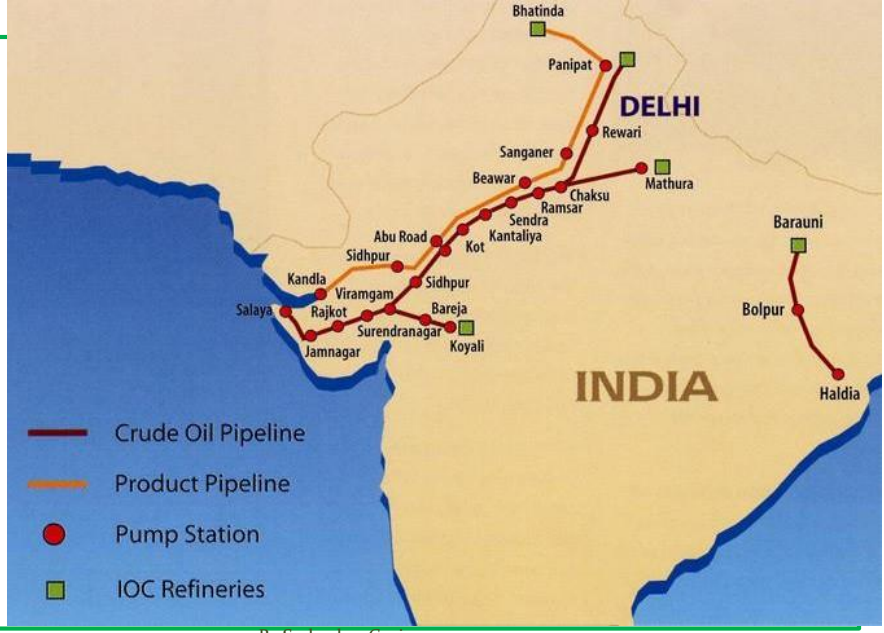
- Guwahati-Siliguri Pipeline (GSPL)
- Koyali-Ahmedabad Pipeline (KAPL)
- Barauni-Kanpur Pipeline (BKPL)
- Panipat-Delhi Pipeline (PDPL)
- Panipat-Rewari Pipeline (PRPL)
- Chennai – Trichy - Madurai Product Pipeline (CTMPL)
- Chennai-Bangalore Pipeline
- Naharkatia-Nunmati-Barauni Pipeline ➔ **first pipeline constructed in India**
- Mumbai High-Mumbai-Ankleshwar-Koyali Pipeline.
- Hajira-Bijapur-Jagdishpur (HBJ) Gas Pipeline ➔ **world's largest underground pipeline**
- Jamnagar-Loni LPG Pipeline ➔ **longest LPG pipeline in the world**
- Kochi-Mangalore-Bangalore pipeline
- Vishakhapatnam Secunderabad pipeline
- Mangalore-Chennai pipeline
- Vijayawada-Vishakhapatnam pipeline

- **Crude Oil Pipelines**

Salaya (Gujrat)-Mathura Pipeline (SMPL)

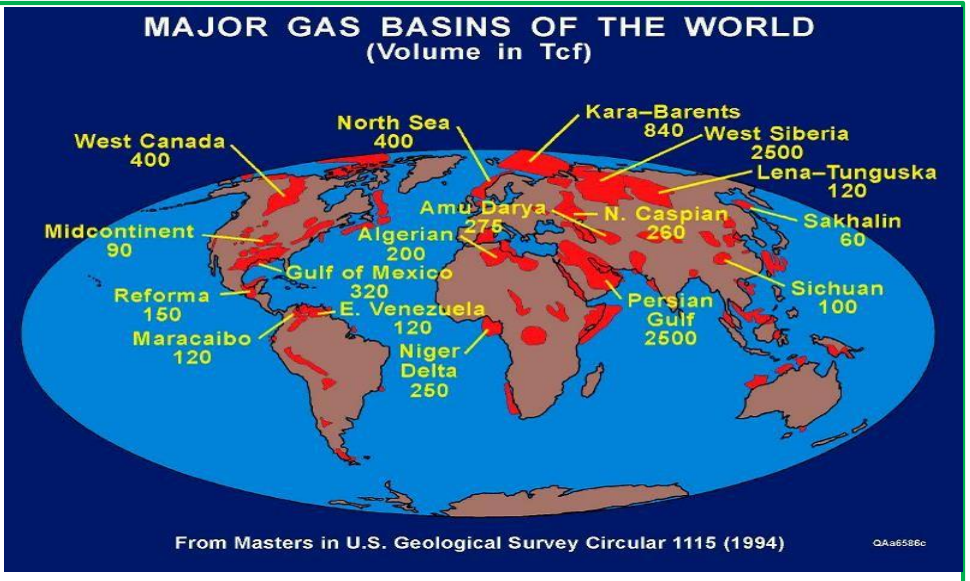
Paradip-Haldia-Barauni Pipeline (PHBPL)

Mundra-Panipat Pipeline (MPPL)



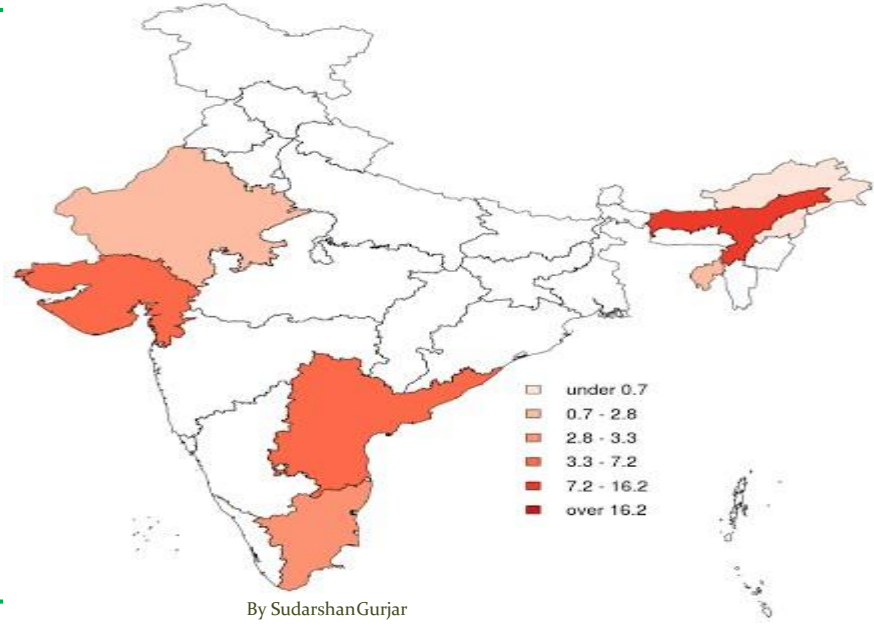
By SudarshanGurjar

- Natural gas consists of primarily **methane** and **ethane.** (LPG is a mixture of **butane and propane)**
- Propane, butane, pentane, and hexane are also present.
- Natural gas is formed during the process of formation of Petroleum.
- Hence, it is often found dissolved in oil or as a gas cap above the oil.
- Sometimes, pressure of natural gas forces oil up to the surface. Such natural gas is known as **associated gas or wet gas.**
- Some reservoirs contain gas and **no oil**. This gas is termed **non-associated gas or dry gas.**.


MAJOR GAS BASINS OF THE WORLD
(Volume in Tcf)
West Canada
400
North Sea
400
Kara–Barents
840
West Siberia
2500
Lena–Tunguska
120
Amu Darya
275
N. Caspian
260
Sakhalin
60
Midcontinent
90
Algerian
200
Gulf of Mexico
320
Reforma
150
E. Venezuela
120
Maracaibo
120
Niger
Delta
250
Persian
Gulf
2500
Sichuan
100
From Masters in U.S. Geological Survey Circular 1115 (1994)
QAa6586c

Proven Reserves 2018 (Trillion m^3)		Production 2018 (Billion m^3)		Consumption 2018 (Billion m^3)	
Country	**Reserves**	**Country**	**Production**	**Country**	**Consumption**
1. Russia	47.8	**1. United States**	864	1. **United States**	848
2. Iran	33.7	**2. Russia**	741	2. **Russia**	505
3. Qatar	24	3. Iran	232	3. China	275
4. United States	15	4. Canada	188	4. Iran	219
Leading exporters: **Russia, Qatar, Norway** Leading Importers: China, Japan, European Union countries like **Germany**, Italy, etc.					

- India proven gas reserves of **1.3 Billion m^3**.
- Indian consumed only 55 Billion m^3 of natural gas in 2018.



By SudarshanGurjar

1. Coalbed Methane

- Considerable quantities of **methane** is trapped within coal seams (underground coal deposits).
- A significant portion of this gas remains as free gas in the **joints and fractures of the coal seam**.
- Large quantities of gas are adsorbed on the internal surfaces of the micropores within the coal itself.
- This gas can be accessed by drilling wells into the coal seam and **pumping large quantities of water** that saturate the seam (water will occupy the gaps and pores and will push out the gas).
- Coalbed methane is now becoming an important source of **natural gas**.
- Unlike much natural gas from conventional reservoirs, coalbed methane contains **very little heavier hydrocarbons** such as **propane or butane**.
- The presence of this gas is well known from its occurrence in underground coal mining, where it presents a **serious safety risk**.

State	Estimated CBM Resources (BCM)
1. Jharkhand	**722**
2. Rajasthan	360
3. Gujarat	351
4. Orissa	243
5. Chhattisgarh	240
6. Madhya Pradesh	218
7. West Bengal	218
Total CBM Resources	GOI has identified CBM Resources of **2,600 billion cubic meters (91.8 TCF)**.