CHAPTER-4

BRIC COUNTRY OVERVIEW AND ASSESSMENT OF THE O&G ESO MARKET OPPORTUNITY

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In this chapter, the country overview studies of BRIC nations are presented. The purpose of this is to evaluate and gain an understanding of the overview of each country from a macro perspective about the scale and size, economic scenario, educational system and services outsourcing industry in each country. Data points from the World Bank infrastructure network (2005) are used for the country overview studies presented in Sections 4.1 to 4.4. A brief on the O&G industry in each country is included in the country overview based on US Energy Information Administration (Sep 2009) and Oil & Gas Journal (2009) survey results. Section 4.5 presents the overview of the detailed activities in O&G ES. At the end of this chapter an assessment of the global spending on O&G ES and an analysis of the available market opportunity for O&G ESO companies are presented in Section 4.6.

4.1 BRAZIL: COUNTRY OVERVIEW

Brazil (Figure 4.1) is a Federative Republic comprising 26 states and a Federal District with a total population of 180 million (80% urban). The federal legislative power has two chambers – the House of Representatives with 512 representatives and the Senate with 81 senators, three from each state. Each state has its own constitution and legislative body, the Legislative Assemblies, with representatives elected by direct vote. Brazil has effectively been a representative democracy since 1985, when the transition from military regime to civilian control of the government was concluded. The Federal Constitution was approved in 1988.

The executive power is led by the President of the Republic, who appoints the ministers of state. The president is elected by direct and universal suffrage, which implies that the president is elected by direct vote from all Brazilian citizens of voting age. At the state level, the governor is the chief of the executive power and is also elected by direct and universal vote. Both the president and the governors serve a four year term, the same as state and federal representatives; the senators serve for six years.

Figure 4.1: Political map of Brazil

The judicial system is also organized in the federative principle. At the federal level, the Supreme Federal Tribunal (STF) is the highest instance of the judicial system and is entrusted with protecting the Constitution. The STF has ministers of state appointed by the executive power and confirmed by the senate. Alongside the STF, the Supreme Justice Tribunal has the mission of upholding federal law. At the state level, the judicial system has the Justice Tribunals (TJs).

4.1.1 Brazil: Economic Scenario

Brazil has shown consistent signs of economic growth in the past few years, thanks to healthy economic policies and increases in revenues and credit. With a nominal GDP of 1.5 TUSD in 2007, the eighth largest in the world, Brazil boasted a growth rate of 5.4%, fuelled by increased family expenditures. Inflation remained relatively low at 4.5% at the end of year 2007. Exports, following almost a decade of strong growth, reached 160 BUSD in 2007, a 20% increase over 2006. International reserves totalled 180 BUSD, equivalent to twice the country's foreign debt. In 2008, Brazil was given investment grade rating by Fitch and S&P, enabling the country to receive new

investments from multinational companies and from important Foreign Institutional Investors (FII), such as pension plans.

In the real economy, the aeronautic and automotive industries stand out as the forth and sixth largest in the world, respectively. In agribusiness, Brazil is one of the largest producers of soy, coffee, sugar cane and cattle. The country has had self-sufficiency in oil since 2006. At year-end 2007, oil production reached 2.1 million barrels a day. New offshore oil reserves discovered recently in the south-eastern region of Brazil are likely to make the country a large exporter of oil as early as 2012.

Brazil generates 83% of its electricity in hydroelectric plants and has become a global benchmark in the use of clean and renewable energy. Furthermore, the country is a global leader in the development and production of ethanol, a renewable fuel that is emerging as a viable alternative to oil. Brazil also has large reserves of uranium, an energy source that has seen a worldwide increase in its usage.

4.1.2 Brazil: Educational System

In Brazil, practically everyone under 15 years of age is enrolled in primary school, which lasts 9 years. After three more years of high school, students can choose to enrol in a technical school for one year. They will then be prepared to enter the job market. Where higher education is concerned, as of 2006 Brazil had 270 universities (both federal, state and private) and 5.8 million college students. According to data published by the Ministry of Education, 247,000 professionals graduate from universities and technical schools in Brazil every year. More than 250 new public technical institutes are being setup by the end of 2010.

4.1.3 Brazil: Overview of the Services Outsourcing Industry

Brazil is relatively a new entrant in the list of offshore destinations. As a 'near-shore' destination, Brazil offers significant value and resources when compared to Asia, for USA based companies that are attracted to the region's cost advantages, cultural affinity and abundant resources. In fact, Brazil has what many U.S. and some European companies want: low-cost Portuguese-language capability and a growing, relatively low-cost, skilled bilingual workforce. In addition, Brazil time zones and

cultures are closely aligned with those of the United States. Boasting the largest economy in Latin America, Brazil already has a mature service market in which consumers and companies have access to high-quality customer care services. Brazil hosts some of the world's most competitive IT shops, and is becoming a world player in the ITO arena. Brazil-based ITO companies such as Politec, Stefanini, Datasul, DBA, CPM, Itautec, Promon and Tivit are equal in size to many key international competitors and are successfully expanding their capabilities beyond Brazil. The recent formation of Brazilian Association of Software & Service Export Companies (BRASSCOM), confirms Brazil's strategic intent to play the offshoring game aggressively. A study by A.T. Kearney (2007) assisted BRASSCOM and the Brazilian government by establishing an agenda to make Brazil a key player on the global offshoring arena in coming years, mainly by capitalizing on its size and its established, sophisticated market. Brazil also has the largest call centre industry in Latin America, but it is not yet a strong competitor for operations in English or Spanish, nor for English-language BPO - mainly due to the language barriers predominant in lower-paying jobs (Portuguese is the country's primary language), rigid labour laws and a strong focus on the domestic market. Although its Portuguese language services are world-class, its largest contact centres require several months to recruit and train even a small pool of English-speaking agents. Brazil's large size, however, can still keep its local call centres busy and growing with domestic work, though vendors are starting to knock on doors outside of Brazil more aggressively. Brazil is in a good position to leverage its competitive advantage in ITO and further develop its BPO offerings. With a large population and strong technical skills, particularly in the IT, engineering, financial and pharmaceutical sectors Brazil is positioning itself as an outsourcing hub for services related to these sectors. Already, a number of multinationals, including IBM, HSBC, General Motors and Nestle, have taken advantage of these capabilities and established major global IT and shared service centres in Brazil. Notably, most have opted for captive centres, highlighting a belief that Brazil can develop its BPO supply base. São Paulo presents the best potential for offshoring services given its cultural diversity and foreign language potential. Safety and security issues in São Paulo and Rio de Janeiro are similar to those that people have about other large cities in emerging countries. Brazil's

geographic size and large population means that there are other cities, mainly in the south and northeast of the country, worth considering. Despite all of this potential promise, Brazil still suffers from rigid labour regulations, excessive bureaucracy and notable infrastructure bottlenecks.

4.1.4 Brazil: Oil Industry Overview

According to the Oil and Gas Journal (OGJ), Brazil had 12.6 billion barrels of proven oil reserves in 2009, second-largest in South America after Venezuela. The offshore Campos and Santos Basins, located on the country's southeast coast, contain the vast majority of Brazil's proven reserves. In 2008, Brazil produced 2.4 million barrels per day (barrels/day) of oil, of which 76 percent was crude oil. Brazil's oil production has risen steadily in recent years, with the country's oil production in 2008 about 150,000 barrels/day (6 percent) higher than 2007. Based on its September 2009 Short-Term energy outlook, United States Energy Information Administration (EIA) forecasts Brazilian oil production to reach 2.61 million barrels/day in 2009 and 2.81 million barrels/day in 2010 (refer Figure 4.2). Brazil's oil consumption averaged 2.52 million barrels/day in 2008. As a result of this rising oil production and flat consumption growth, it is expected that Brazil will become a net oil exporter in 2009.

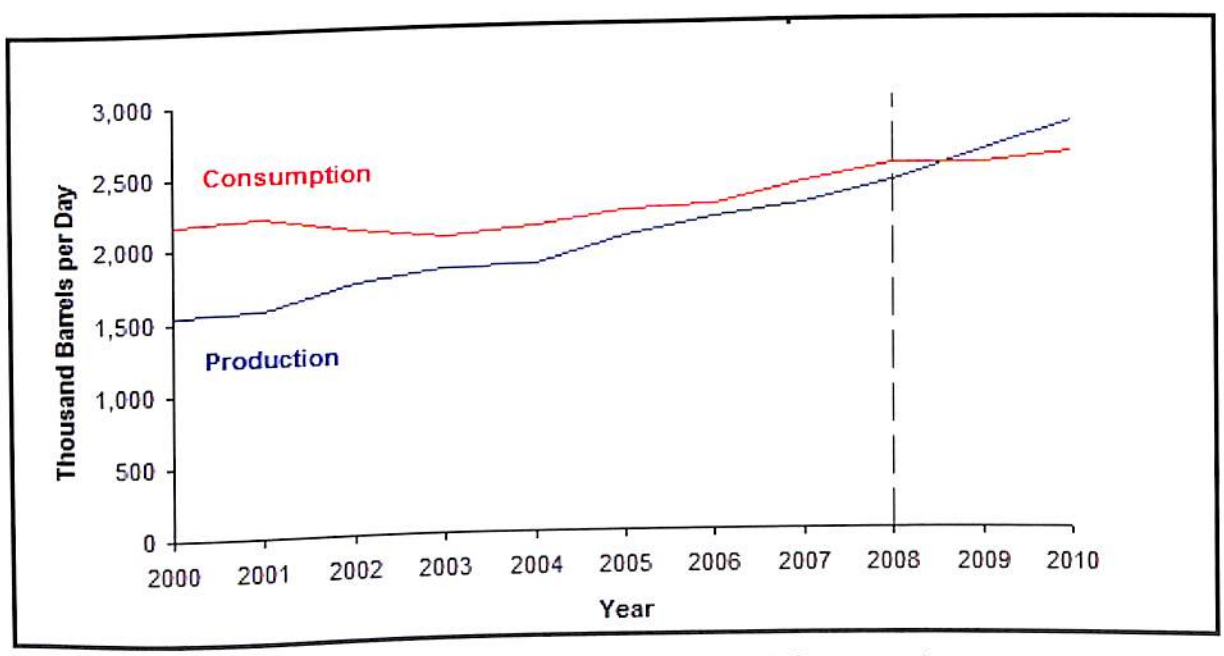

Figure 4.2: Brazil's Oil Production and Consumption
Source: US Energy Information Administration (Sep 2009)

4.1.5 Brazil: Oil Sector Organization

State-controlled Petrobras is the dominant player in Brazil's oil sector, holding important positions in up, mid, and downstream activities. The company held a monopoly on oil-related activities in the country until 1997, when the government opened the sector to competition. The principal government agency charged with monitoring the oil sector is the National Petroleum Agency (ANP), which is responsible for issuing E&P licenses and ensuring compliance with relevant regulations. Despite the opening of the sector to private actors in the late 1990s, foreign-operated oil projects are not common in Brazil and represent a small share of total oil production. Royal Dutch Shell was the first foreign operator of crude oil production in the country, and it is now joined by Chevron and Devon. Private competition in the sector is not just from foreign companies: in September 2009, Brazilian Oil company OGX commenced an exploratory drilling program in the Campos Basin.

Petrobras controls almost all crude oil production in Brazil. The largest oil-production region of the country is Rio de Janeiro state, which contains over 80 percent of Brazil's total production. Most of Brazil's crude oil production is offshore in very deep water and consists of mostly-heavy grades. Petrobras has brought numerous projects on-stream recently. In December 2008, Petrobras brought the P-53 Floating Production, Storage, and Offloading (FPSO) unit online in the Marlim Leste field, with a production capacity of 180,000 barrels/day. In January 2009, Petrobras deployed a second FPSO to the Marlim Sul field, P-51, also with a production capacity of 180,000 barrels/day. In March 2009, Petrobras launched the FPSO Cidade de Niteroi in the Jabuti field, with a production capacity of 100,000 barrels/day. Finally, in May 2009, Petrobras commenced the Tupi Extended Well Test, the first attempt to produce from the recently-discovered sub-salt reserves in the Santos Basin (see below). Along with these new projects, many units brought online in 2008 continued to ramp-up towards their peak production rates. In large part due to this sizable slate of recent expansions, it is expected that Brazil's total oil production could reach 2.81 million barrels/day in 2010. This forecast takes into account the above-mentioned projects and an estimate for decline rates at Brazil's older, mature fields. This could make Brazil one of the largest sources of new, non-OPEC (Organisation of the Petroleum Exporting Countries) oil supply growth.

According to OGJ, Brazil has 1.9 million barrels/day of crude oil refining capacity spread amongst 13 refineries in Jan 2009. Petrobras operates 11 facilities, the largest being the 360,000-barrels/day Paulinia refinery in Sao Paulo. Petrobras also controls a dominant stake in the retail products market. The refining capacity in Brazil is relatively simple, meaning that the country must export some of its heavy crude oil production and import light crude oil: according to Petrobras, domestic crude constituted 78 percent of total domestic refinery feedstock. According to its strategic plan, Petrobras plans to increase its Brazilian refining capacity to 3.0 million barrels/day by 2020. In 2007, Petrobras began initial site preparation for a new, 230,000-barrels/day refinery in Pernambuco, dubbed Abreu e Lima. The project is supposed to be a joint venture with state-owned Petroleos de Venezuela S.A. (PdVSA), with each country providing half of the heavy-oil feedstock for the plant. However, the two partners have yet to conclude a final agreement. Petrobras estimated that the project would cost 12 BUSD.

4.1.6 Brazil: Natural Gas Industry Overview

OGJ reported that Brazil had 12.9 Trillion cubic feet (Tcf) of proven natural gas reserves in 2009. The Campos and Santos Basins hold the majority of reserves, but there are also sizable reserves in the interior parts of the country. Despite Brazil's sizable natural gas reserves, natural gas production has grown slowly in recent years, mainly due to a lack of domestic transportation capacity and low domestic prices. In 2008, Brazil produced 446 Billion cubic feet (Bcf) of natural gas, mostly unchanged from 2007.

Natural gas consumption is a small part of the country's overall energy mix, constituting only 7 percent of total energy consumption in 2006 (refer Figure 4.3). However, natural gas demand is rising: in 2008, Brazil consumed 835 Bcf of natural gas, up from 701 Bcf in 2007. High oil prices have helped spur natural gas demand in Brazil: natural gas is mostly used as a substitute for fuel oil in industrial and power-generating applications, and domestic prices for natural gas are much lower than international fuel oil prices. The introduction of natural gas imports has increased available supplies, helping to facilitate this growth in domestic consumption.

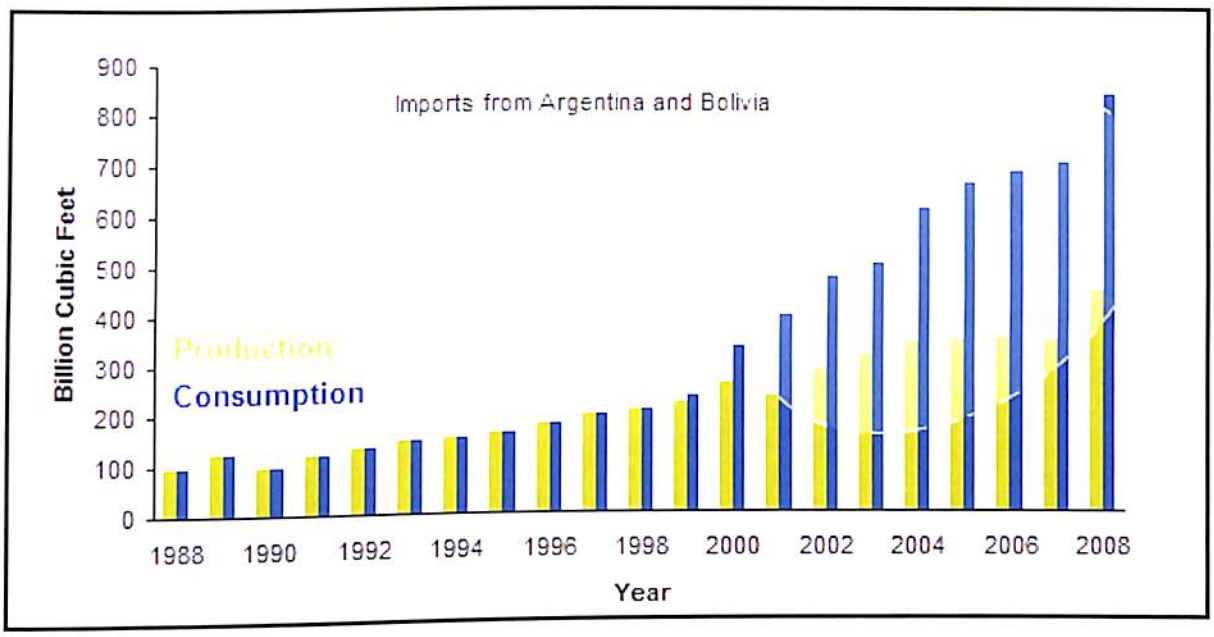

Figure 4.3: Brazil's Natural Gas Production and Consumption
Source: US Energy Information Administration (Sep 2009)

Petrobras is the largest producer of natural gas in Brazil. The company reportedly controls over 90 percent of Brazil's natural gas reserves. Other important participants in the sector include Sulgas and Britain's British Gas (BG). ANP has sought to attract international investment to the sector, with recent exploration licensing rounds including many gas-prone areas. Petrobras is also the largest wholesale supplier of natural gas. The industrial sector is the largest consumer of natural gas in Brazil, representing about 80 percent of total domestic consumption. However, the two fastest growing sectors are thermal electricity generation and vehicular Compressed Natural Gas (CNG).

4.2 RUSSIA: COUNTRY OVERVIEW

At 17,075,400 square Kilometres (6,592,800 sq. miles), Russia (Figure 4.4) is the largest country in the world, covering more than an eighth of the Earth's land area; with 142 million people, it is the ninth largest by population. It extends across the whole of northern Asia and 40% of Europe, spanning 11 time zones and incorporating a great range of environments and landforms. Russia has the world's greatest reserves of mineral and energy resources, and is considered an energy superpower. It has the world's largest forest reserves and its lakes contain approximately one-quarter of the world's unfrozen fresh water.

Figure 4.4: Political map of Russia

According to the Constitution, which was adopted by national referendum following the 1993 Russian constitutional crisis, Russia is a federation and formally a semi-presidential republic, wherein the President is the head of state and the Prime Minister is the head of government. The Russian Federation is fundamentally structured as a representative democracy. Executive power is exercised by the government. Legislative power is vested in the two chambers of the Federal Assembly. The government is regulated by a system of checks and balances defined by the Constitution of the Russian Federation, which serves as the country's supreme legal document and as a social contract for the people of the Russian Federation.

4.2.1 Russia: Economic Scenario

The economic crisis that struck all post-Soviet countries in the 1990s was twice as intense as the Great Depression in the countries of Western Europe and the United States in the 1930s. Even before financial crisis of 1998, Russia's GDP was half of what it had been in the early 1990s. Since the turn of the century, rising oil prices, increased foreign investment, higher domestic consumption and greater political stability have bolstered economic growth in Russia. The country ended 2007 with its ninth straight year of growth, averaging 7% annually since the financial crisis of 1998. In 2007, Russia's GDP was 1.289 TUSD - 2.076 TUSD on Purchasing Power Parity (PPP) basis - making it the sixth largest economy in the world) with GDP

growing 8.1% from the previous year. Growth was primarily driven by non-traded services and goods for the domestic market, as opposed to oil or mineral extraction and exports. The average salary in Russia was USD 640 per month in early 2008, up from USD 80 in 2000. Approximately 14% of Russians lived below the national poverty line in 2007, significantly down from 40% in 1998 at the worst of the post-Soviet collapse. Unemployment in Russia was at 6% in 2007, down from about 12.4% in 1999.

Russia has the world's largest natural gas reserves, the second largest coal reserves and the eighth largest oil reserves. It is the world's leading natural gas exporter and the second leading oil exporter. Oil, natural gas, metals, and timber account for more than 80% of Russian exports abroad. Despite higher energy prices, O&G only contribute to 5.7% of Russia's GDP. Oil export earnings have allowed Russia to increase its foreign reserves from 12 BUSD in 1999 to 597.3 BUSD in August 2008, the third largest reserves in the world. The country has also been able to substantially reduce its formerly massive foreign debt on account of this.

4.2.2 Russia: Educational System

Russia has a free education system guaranteed to all citizens by the Constitution, and has a literacy rate of 99.4%. Entry to higher education is highly competitive. As a result of great emphasis on science and technology in education, Russian medical, mathematical, scientific, and space and aviation research is generally of a high order. Russia is also considered well ahead of most other resource-rich countries in its economic development, with a long tradition of education, science, and industry. The country has more higher education graduates than any other country in Europe.

The Russian Constitution grants a universal right to higher education free of charge through competitive entry. The Government allocates funding to pay the tuition fees within an established quota, or number of students for each state institution. This is considered crucial because it provides access to higher education to all skilled students, as opposed to only those who can afford it. In addition, students are paid a small stipend and provided with free housing. However, the institutions have to be funded entirely from the federal and regional budgets; institutions have found

themselves unable to provide adequate teachers' salaries, students' stipends, and to maintain their facilities. To address the issue, many state institutions started to open commercial positions, which have been growing steadily since. Many private higher education institutions have emerged to address the need for a skilled work-force for high-tech and emerging industries and economic sectors.

4.2.3 Russia: Overview of the Services Outsourcing Industry

Russia offers a challenging business environment for the outsourcing industry with excellent technical universities, a world-class aerospace and defence industry, and the third largest concentration of scientists per capita. Russia offers unique capabilities in highly specialized engineering and applied sciences. Still, a deteriorating local industrial base offers few opportunities for top talent and creates an excess supply for foreign investors in the IT and engineering industries. Russia has significant cost advantages, competitive universities and a large pool of engineers and scientists as compared to many Western counterparts. Yet a weak infrastructure and lack of global integration has kept Russia away from reaching its full potential as an offshore destination. Improving the business environment and enhancing foreign investor confidence will be prerequisites for Russian success in the offshore arena. Russia is bidding for a bigger slice of the lucrative global offshore-outsourcing market, but it is being hindered by the poor international perception of the country. Russia's IT services industry is currently growing at about 10 percent per year and was worth 1 BUSD in 2005. But even though Russia is in Gartner's (2007) top 10 list of near-shore outsourcing locations, the research firm said companies are still wary of sending work there. One of Russia's strengths, however, is the mathematical, engineering and science graduates turned out by the country's universities, a legacy of the Soviet education system. The department of computational mathematics and cybernetics at Moscow State University, for example, takes in 500 new students per year - 10 percent of the entire university's new intake - and turns out 450 graduates annually. Russia's biggest IT outsourcing company, Luxoft, has 70 percent of its 2,300 employees holding a Master's degree, and 6 percent having a PhD enabling it to provide high-end business process services like equity-trading applications and core enterprise systems to its clients.

Boeing, Dell, Deutsche Bank, Alcatel, Reuters, London Stock Exchange and Siemens are examples of more than 250 global companies active in Russia-based offshore software development. Initially these companies outsourced routine tasks such as mainframe maintenance and Y2K fixes but gradually these units have started providing complex Oracle, Microsoft .Net and Java programming applications.

Russia has gained a well-earned reputation for application development, data management, web application/design, content management, e-commerce, Enterprise Resource Planning (ERP), office applications, education, entertainment and middleware. Additional areas of strength include custom R&D and design work, embedded systems development, specialized testing, software package integration and translation services. In fact, while other countries are getting projects to handle commoditized coding projects, Russia is increasingly the destination for high value, sophisticated, mission critical application development.

A long list of analysts like Esther Dyson and Gartner have said the Russians are the absolute tops when it comes to complex programming. Russia's workforce is comprised of skilled and highly experienced high tech and engineering talent with creative minds and good communication abilities. Russia was ranked third by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in the number of scientists and engineers per capita worldwide. In addition Russia has a talent pool of over 4.7 million students, 50 percent of which are majoring in science, math, and computer sciences.

Russia's IT market has come a long way in a short time. The country has, for example, a very strong home-grown IT sector with almost 300 software companies operating today and a total market size of 2.5 BUSD. Due to growing government support, IT's share of Russian overall exports has gone from 0.3 percent to more than five percent in the last two years. These numbers were achieved in parallel with a healthy overall national growth. The International Monetary Fund (IMF) recently quoted an average annual GDP growth in Russia of 7.1 percent over the past six years, with its IT sector expanding by 22 percent per annum. The Russian IT sector is also increasingly sophisticated in terms of quality control. The leading IT outsourcers have been

certified to meet the highest global quality standards such as Capability Maturity Model (CMM) and Capability Maturity Model Integration (CMMI). Companies looking to outsource offshore will find in Russia mature and dynamic businesses utilizing rigorous software development discipline, high quality standards and flexible management processes. A combination of technological expertise, the educational strength, strong IT infrastructure, cultural proximity and lower costs makes Russia one of the world's most dynamic countries for IT outsourcing.

4.2.4 Russia: Oil Industry Overview

Russia is a major world oil producer, sometimes producing even more than Saudi Arabia. Russia's output rebounded during the early 2000s, but the effects of high government taxation and a mature field base threaten an overall decline in production. According to the OGJ's 2009 survey, Russia has proven oil reserves of 60 billion barrels, most of which are located in Western Siberia, between the Ural Mountains and the Central Siberian Plateau. Eastern Siberia is one area where little exploration has taken place. The Russian Ministry of Natural Resources estimated in 2005 that reserves in Eastern Siberian provinces totalled 4.7 billion barrels.

With production of 9.8 million barrels/day of liquids (not including oil products), and consumption of roughly 2.8 million barrels/day, Russia exported (in net) around 7 million barrels/day. According to official Russian statistics, roughly 4.4 million barrels/day of this total is crude oil. Over 70 percent of Russian crude oil production is exported, while the remaining 30 percent is refined locally. Crude oil exports via pipeline fall under the exclusive jurisdiction of Russia's state-owned pipeline monopoly, Transneft.

In the 1980s, the Western Siberia region, also known as the 'Russian Core', made the Soviet Union a major world oil producer, allowing for peak production of 12.5 million barrels per day in total liquids in 1988. Following the collapse of the Soviet Union in 1991, Russia's oil production fell precipitously, reaching a low of roughly 6 million barrels/day, or around one-half of the Soviet-era peak. According to observers, several other factors are thought to have caused the decline, including the depletion of the country's largest fields due to state-mandated production surges and the lack of investment in field maintenance.

A turnaround in Russian oil output began in 1999 (Figure 4.5). Many analysts attribute the rebound in production to the privatization of the industry following the collapse of the Soviet Union. The privatization clarified incentives and increased less expensive production. Higher world oil prices beginning in 2002, the use of technology that was standard practice in the West, and the rejuvenation of old oil fields also helped raise production levels. Other experts partially attribute the increase to after-effects of the 1998 financial crisis, the fall in oil prices, and the subsequent devaluation of the Ruble.

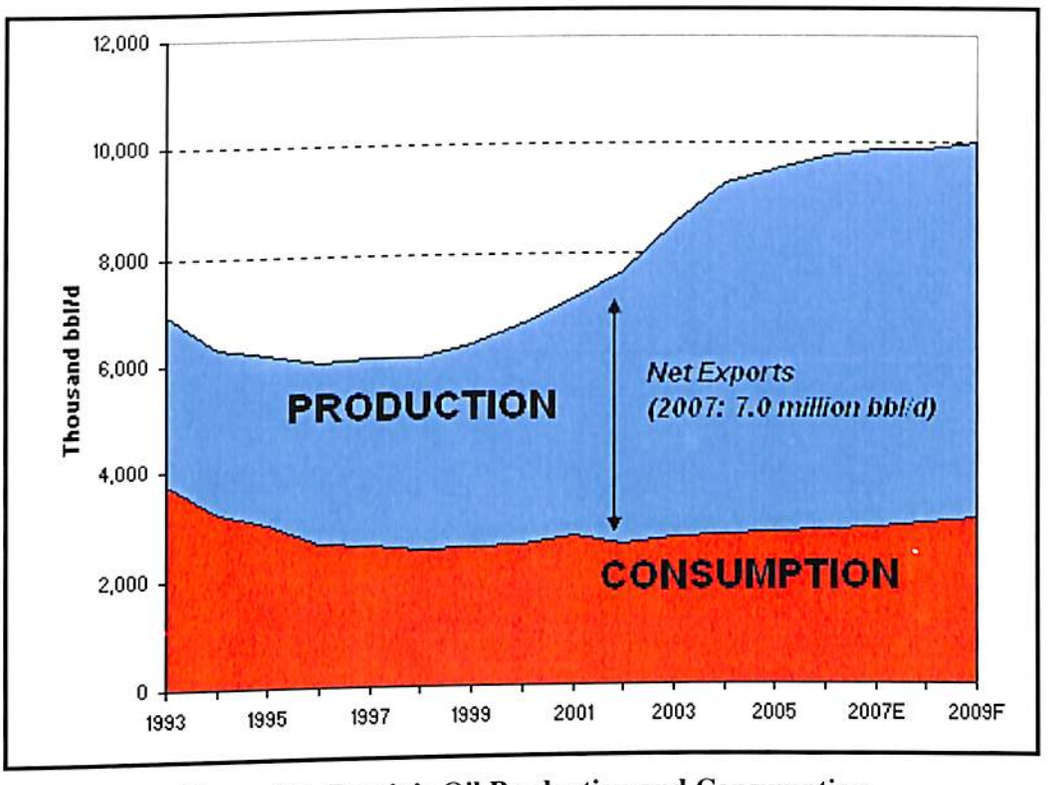

Figure 4.5: Russia's Oil Production and Consumption
Source: US Energy Information Administration (Sep 2009)

4.2.5 Russia: Oil Sector Organization

Russia has 41 oil refineries with a total crude oil processing capacity of 5.4 million barrels/day, but many of the refineries are inefficient, aging, and in need of modernization. According to data from the US EIA, refinery throughput at Russian refineries increased by roughly 4 percent to around 4.6 million barrels/day in 2007. Russian refineries produced around 1.2 million barrels/day of Mazut (heavy fuel oil), 1.3 million barrels/day of middle distillates, and 815,000 barrels/day of gasoline.

4.2.6 Russia: Natural Gas Industry Overview

According to the OGJ's 2009 survey, Russia holds the world's largest natural gas reserves, with 1,680 Tcf, which is nearly twice the reserves in the next largest country, Iran. In 2006 Russia was the world's largest natural gas producer (23.2 Tcf), as well as the world's largest exporter (6.6 Tcf). According to official Russian statistics, production during 2007 totaled around 23.1 Tcf, of which 85 percent (19.4 Tcf) was produced by Gazprom. Russian government forecasts expects gas production to total 31.1 Tcf by 2030 (Figure 4.6).

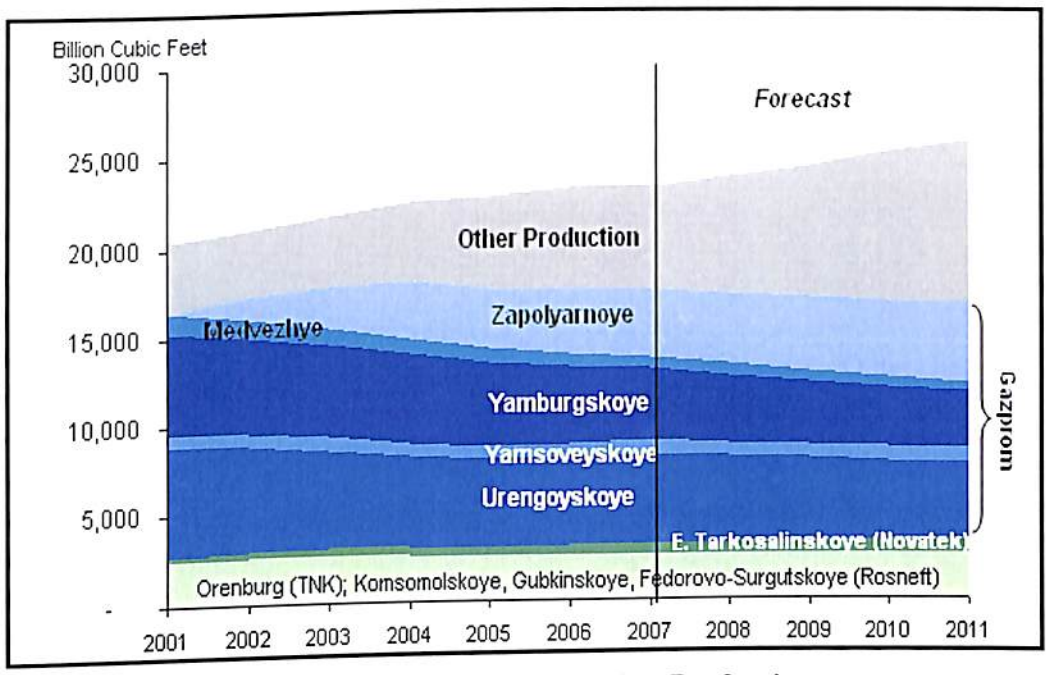

Figure 4.6: Russia's Natural Gas Production
Source: US Energy Information Administration (Sep 2009)

4.3 INDIA: COUNTRY OVERVIEW

India (Figure 4.7), a union of states, is a Sovereign, Secular, Democratic Republic with a parliamentary system of Government has a population of over 1029 Million people as reported in the nationwide census conducted in 2001. The Indian polity is governed in terms of the Constitution, which was adopted by the Constituent Assembly on 26 November 1949 and came into force on 26 November 1950. The President is the constitutional head of Executive of the Union. Real executive power vests in a Council of Ministers with the Prime Minister as head. Article 74(1) of the Constitution provides that there shall be a Council of Ministers headed by the Prime Minister to aid and advise the President who shall, in exercise of his functions, act in

accordance with such advice. The Council of Ministers is collectively responsible to the Lok Sabha, the House of the People.

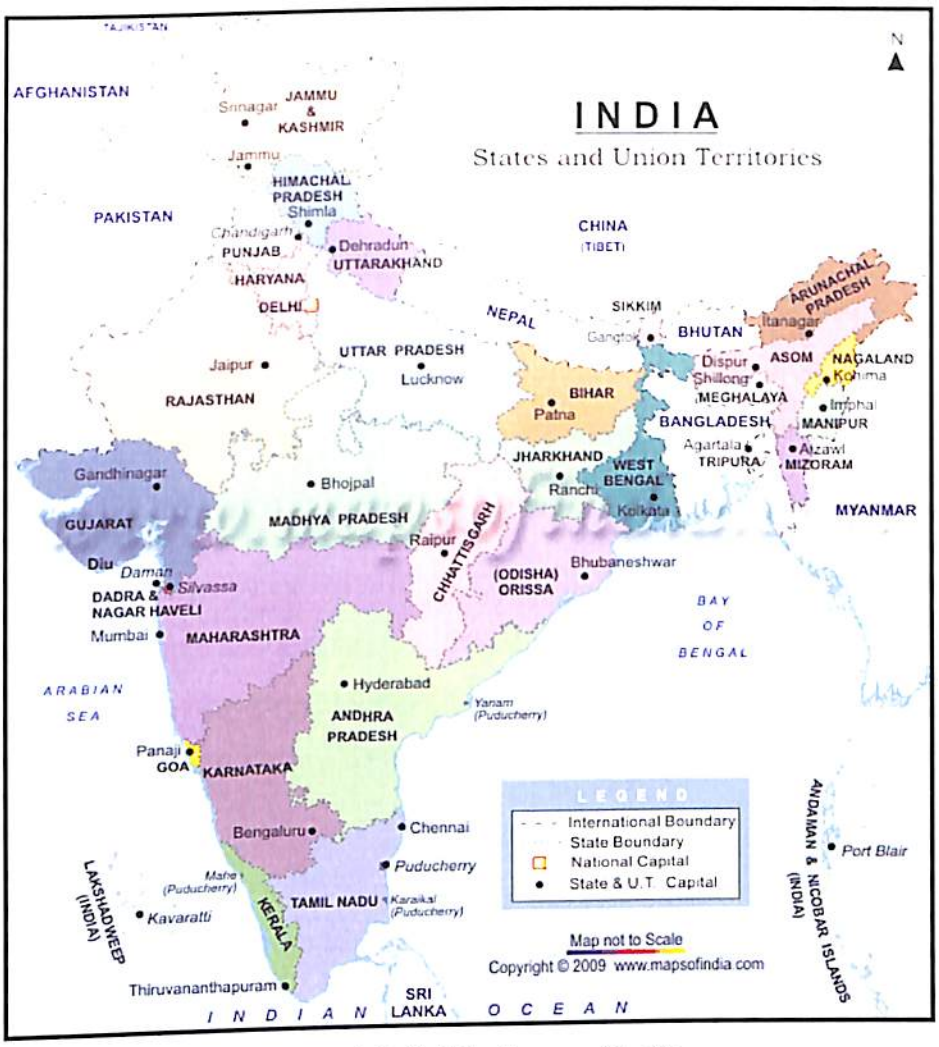

Figure 4.7: Political map of India

In the states, the Governor, as the representative of the President, is the head of Executive, but real executive power rests with the Chief Minister who heads the Council of Ministers. The Council of Ministers of a state is collectively responsible to the elected legislative assembly of the state. The Constitution governs the sharing of legislative power between Parliament and the State Legislatures, and provides for the vesting of residual powers in Parliament. The power to amend the Constitution also vests in Parliament.

The President is elected by members of an Electoral College consisting of elected members of both Houses of Parliament and Legislative Assemblies of the states, with suitable weight age given to each vote. His term of office is five years.

The Council of Ministers comprises Cabinet Ministers, Minister of States (independent charge or otherwise) and Deputy Ministers. Prime Minister communicates all decisions of the Council of Ministers relating to administration of affairs of the Union and proposals for legislation to the President. Generally, each department has an officer designated as secretary to the Government of India to advise Ministers on policy matters and general administration. The Cabinet Secretariat has an important coordinating role in decision making at highest level and operates under direction of Prime Minister. The Legislative Arm of the Union, called Parliament, consists of the President, Rajya Sabha and Lok Sabha. All legislation requires consent of both houses of parliament. However, in case of money bills, the will of the Lok Sabha always prevails.

There are 28 states and seven Union territories in the country. The system of government in states closely resembles that of the Union. State executive consists of Governor and Council of Ministers with Chief Minister as its head. Union Territories are administrated by the President acting to such extent, as he thinks fit, through an Administrator appointed by him.

4.3.1 India: Economic Scenario

The economy of India was under socialist-inspired policies for an entire generation from the time of independence in 1947 until the 1980s. The economy was shackled by extensive regulation, protectionism, and public ownership, leading to pervasive corruption and slow growth. Since 1991, continuing economic liberalization has moved the economy towards a market-based system.

Agriculture is the predominant occupation in India, accounting for 60% of employment. Service sector makes up 28% and industrial sector 12%. The labour force totals half billion people. In terms of output, the agricultural sector accounts for 28% of GDP; the service and industrial sectors make up 54% and 18% respectively. Major agricultural products include rice, wheat, oilseed, cotton, jute, tea, sugarcane, potatoes, cattle, dairy products, sheep, goats, poultry and fish. Major industries include textiles, chemicals, food processing, steel, transportation equipment, cement, mining, petroleum, machinery and the newly emerging knowledge based service industries. India's GDP was estimated to have exceeded 1.089 TUSD, which makes it

the twelfth-largest economy in the world or fourth largest by purchasing power adjusted exchange rates. India's nominal per capita income of USD 977 is ranked 128th in the world. In the late 2000s, India's economic growth has averaged 7½ % a year, which will double the average income in a decade.

Previously a closed economy, India's trade has grown fast. India currently accounts for 1.5% of World trade as of 2007 according to the World Trade Organisation (WTO). According to the World Trade Statistics of the WTO in 2006, India's total merchandise trade (export + import) was valued at 294 billion dollars in 2006 and India's services trade inclusive of export and import was 143 billion dollars. Thus, India's global economic engagement in 2006 covering both merchandise and services trade was of the order of 437 billion dollars, up by a record 72 percent from a level of 253 billion dollars in 2004. India's trade has reached a still relatively moderate share 24% of GDP in 2006, up from 6% in 1985.

Although the Indian economy has grown steadily over the last two decades; its growth has been uneven when comparing different social groups, economic groups, geographic regions, and rural and urban areas. Unemployment rate is 7.2% (2007 estimate).

4.3.2 India: Educational System

Education in India has a history stretching back to the ancient urban centres of learning at Takshashila and Nalanda. Western education became ingrained into Indian society with the establishment of the British rule. Education in the Republic of India falls under the control of both the central government and the states, with some responsibilities lying with the centre and the state having autonomy for others. Special schemes have been initiated by the Government of India for the socially disadvantaged of Indian society, transferable central government employees, and the population in remote rural areas.

The literacy rate has increased from around 3% in 1880 to around 65% in 2001. The net enrolment of 6-10 year old Indians increased from 68 percent to 82 percent between 1992/93 and 1998/99. Yet great challenges remain as half of 10-year-old rural children can't read at a basic level, over 60% are unable to do simple division, and half drop out by the age 14. Fewer than 40 percent of adolescents in India attend secondary schools.

Only one in ten young people have access to tertiary education. From the first Five Year Plan onwards India's emphasis was to develop a pool of scientifically inclined manpower. India's National Policy on Education (NPE) provisioned for an apex body for regulation and development of higher technical education, which came into being as the All India Council for Technical Education (AICTE) in 1987 through an act of the Indian parliament. At the level of the centre the Indian Institutes of Technology (IIT) are deemed of national importance. The Indian Institutes of Management (IIM) are also among the nation's premier education facilities. Several Regional Engineering Colleges (RECs) have been converted into National Institutes of Technology (NIT). The University Grants Commission has inter-university centres at a number of locations throughout India to promote common research.

4.3.3 India: Overview of the Services Outsourcing Industry

From its modest start in the 1980s, India's outsourcing industry that combines low costs with a talented pool of knowledge workers has gradually moved from providing simple code remediation and data entry hub to offering sophisticated IT solutions and IT-enabled business process management. Increasingly, local vendors and global multinationals are locating high-end research and analytics, content and design, and product development activities in India. Today, it is difficult to find functions that India cannot provide for the IT services industry. An unwieldy bureaucracy, a heavy regulatory system and poor infrastructure dampen the country's attractiveness. Also, the very success of the Indian remote services sector is weakening its leadership position. The increasing demand for trained professionals in cities such as Bangalore, Mumbai and New Delhi is pushing wages up by 10 to 20 percent per year. The boom has also raised turnover rates, which in turn increases recruiting and training costs. India's success has also attracted intense scrutiny from rivals and the world's media. High turnover rates and rapid growth have increased the risk of security violations and fraud. Several highly publicized fraud cases have prompted the leading industry association, NASSCOM, to launch a national register for workers in the services export sector and instigate more rigorous background checks on new employees. Another trend is that saturation, congestion and inflation in the large cities is nudging the Indian market toward geographically untapped markets. Already, Tier-2 cities

such as Hyderabad and Pune are showing signs of stress, so companies are eyeing the next lower tier of cities including Ahmedabad, Kolkata, Kochi, Coimbatore and Jaipur that offer lower costs and less competition for resources. The large and increasingly skilled, low-cost labour pool continues to be India's greatest asset and can ensure its leadership for years to come in the IT services outsourcing industry.

4.3.4 India: Oil Industry Overview

According to OGJ, India had 5.6 billion barrels of proven oil reserves as of January 2009, the second-largest amount in the Asia-Pacific region after China. India's crude oil reserves tend to be light and sweet, with specific gravity varying from 38° API in the offshore Mumbai High field to 32° API at other onshore basins.

India produced roughly 880 thousand barrels/day of total oil in 2008, of which approximately 650 thousand barrels/day was crude oil, with the rest of production resulting from other liquids and refinery gain. India has over 3,600 operating oil wells, according to OGJ. Although oil production in India has slightly trended upwards in recent years, it has failed to keep pace with demand and is expected by the US EIA to decline slightly in 2010.

India's oil consumption has continued to be robust in recent years. In 2007, India consumed approximately 2.8 million barrels/day, making it the fifth largest consumer of oil in the world (Figure 4.8). Demand grew to nearly 3 million barrels/day in 2008. US EIA anticipates consumption growth rates flattening in 2010 largely due to slowing economic growth rates and the recent global financial crisis.

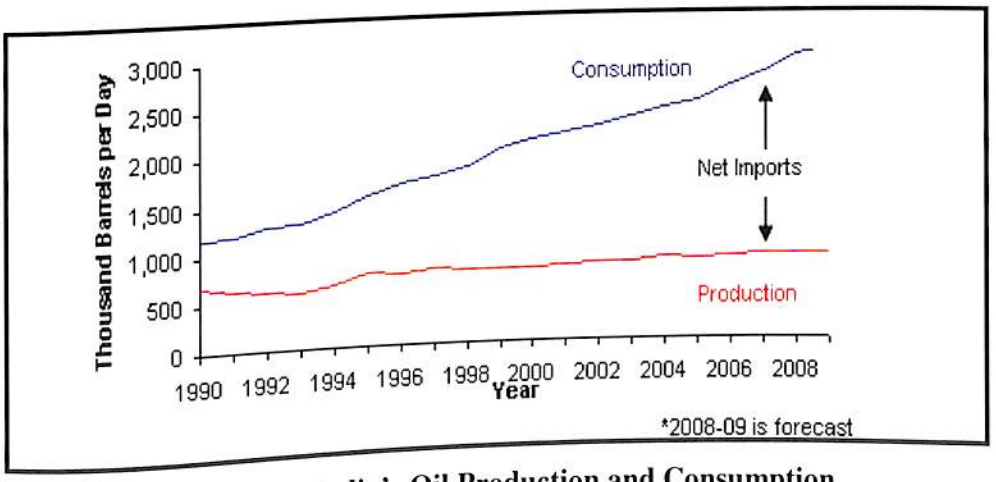

Figure 4.8: India's Oil Production and Consumption
Source: US Energy Information Administration (Sep 2009)

4.3.5 India: Oil Sector Organization

India's oil sector is dominated by state-owned enterprises, although the government has taken steps in recent years to deregulate the hydrocarbons industry and encourage greater foreign involvement. India's state-owned Oil and Natural Gas Corporation (ONGC) is the largest oil company. ONGC is the dominant player in India's upstream sector, accounting for roughly 71 percent of the country's oil production in 2007, according to Indian government estimates. State-owned Oil India Limited (OIL) is the next largest oil producer, having accounted for approximately 28 percent of oil production during the same year. Other major state-run players include the Indian Oil Corporation (IOCL) and the Gas Authority of Indian Limited (GAIL), although these companies are primarily involved in downstream activities such as petroleum refining and gas pipelines and distribution, respectively. In addition, the private Indian firm, Reliance Industries Limited, is also becoming a significant operator in the oil sector and is the largest private O&G company in the country. Cairn India, a branch of UK-based Cairn Energy, and BG Exploration are also important private sector operators in the industry.

As a net importer of oil, the Indian government has introduced policies aimed at increasing domestic E&P activities. Economic reform and other efforts to open up the country have led to increased foreign investment in India. As part of an effort to attract oil majors with deepwater drilling experience and other technical expertise, the Ministry of Petroleum and Natural Gas created the New Exploration License Policy (NELP) in 2000, which for the first time permitted foreign companies to hold 100 percent equity ownership in oil and natural gas projects. International O&G companies operate only a relatively small number of fields at this time, however.

India's downstream sector is also dominated by state-owned entities, although private companies have increased their market share in recent years. The Indian Oil Corporation (IOCL) is the largest state-owned company in the downstream sector, operating 10 of India's 18 refineries and controlling about three-quarters of the domestic oil pipeline transportation network. Reliance Industries, a private Indian firm, opened India's first privately-owned refinery in 1999, and has gained a considerable market share in India's oil sector.

4.3.6 India: Natural Gas Industry Overview

Despite major new natural gas discoveries in recent years, India is considering large-scale imports via pipelines and Liquefied Natural Gas (LNG) terminals to help meet growing demand. According to OGJ, India had 38 Tcf of proven natural gas reserves as of January 2009. US EIA estimates that India produced approximately 1.1 Tcf of natural gas in 2007, up only slightly from 2006 production levels (Figure 4.9). The bulk of India's natural gas production comes from the western offshore regions, especially the Mumbai High complex. The onshore fields in Assam, Andhra Pradesh, and Gujarat states are also significant sources of natural gas. The Bay of Bengal has also become an important source of natural gas for the country.

In 2007, India consumed roughly 1.5 Tcf of natural gas, approximately 100 Bcf more than in 2006, according to EIA estimates. Natural gas demand is expected to grow considerably, largely driven by demand in the power sector. The power and fertilizer sectors account for nearly three-quarters of natural gas consumption in India. By 2030, US EIA expects Asian demand for natural gas to more than double, and India is expected to be responsible for a sizeable part of that growth. Natural gas is expected to be an increasingly important component of energy consumption as the country pursues energy resource diversification and overall energy security.

Although India's natural gas production has consistently increased, demand has already exceeded supply and the country has been a net importer of natural gas since 2004. India's net imports reached an estimated 353 Bcf in 2007. India imports natural gas via liquefied natural gas (LNG).

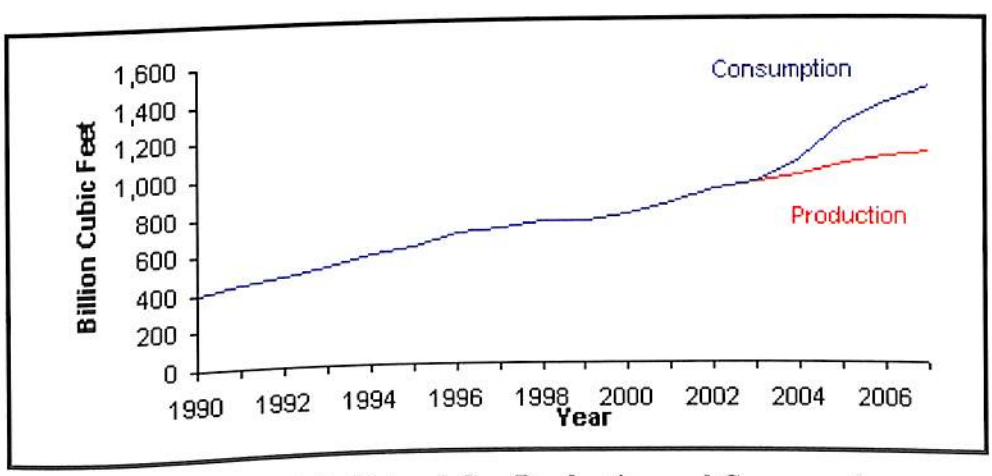

Figure 4.9: India's Natural Gas Production and Consumption
Source: US Energy Information Administration (Sep 2009)

As in the oil sector, India's state-owned companies account for the bulk of natural gas production. State-run companies ONGC and OIL are the main producers of natural gas in the country. According to government statistics, ONGC accounted for 69 percent of natural gas production in the country in 2007. In addition, some foreign companies participate in upstream developments in joint-ventures and Production Sharing Contracts (PSCs). Privately-owned Reliance Industries will also have a greater role in the natural gas sector in the coming years, as a result of a large natural gas find in 2002 in the Krishna-Godavari basin.

The Gas Authority of India Ltd. (GAIL) holds an effective monopoly on natural gas transmission and distribution activities. In December 2006, the Minister of Petroleum and Natural Gas issued a new policy that allows foreign investors, private domestic companies, and national oil companies to hold 100 percent equity stakes in pipeline projects. While GAIL's monopoly in natural gas transmission and distribution is not guaranteed by statute, it will continue to be the leading player in the sector because of its existing natural gas infrastructure. The country has a number of major domestic pipelines in its domestic transmission network with ambitious plans to extend them further. GAIL's current natural gas trunk pipeline network extends roughly 4,100 miles, according to the company and, according to Strategic advisors on global energy PFC Energy, the Government of India plans to spend about 9 BUSD to upgrade the transmission network and extend the system.

4.4 CHINA: COUNTRY OVERVIEW

With an area exceeding 9.6 million square Kilometres, People's Republic of China (China, refer Figure 4.10) is one of the largest countries in the world. China currently has the highest population in the world with over 1.3 billion people. State power within the government of the People's Republic of China is divided among three bodies: the Communist Party of China, the state, and the People's Liberation Army (PLA). All positions of important power in the state structure and in the army are occupied by members of the Communist Party of China which is controlled by the Politburo Standing Committee of the Communist Party of China, a group of 5 to 9 people, usually all men, who make all decisions of national significance. As the role of the Army is to enforce these decisions in times of crisis, support of the PLA is important.

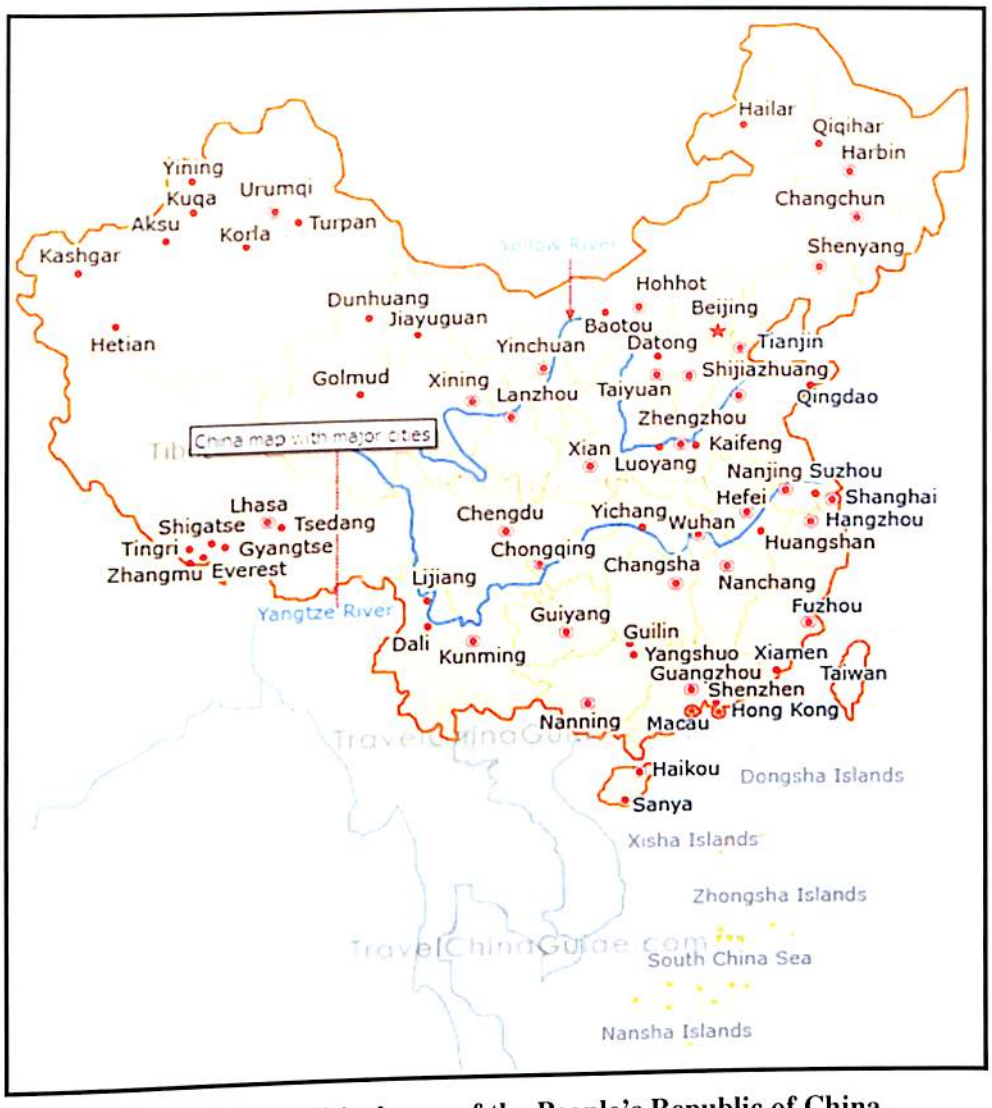

Figure 4.10: Political map of the People's Republic of China

The primary organs of state power are the National People's Congress (NPC), the President, and the State Council. Members of the State Council include the Premier, a variable number of vice premiers (now four), five state councillors (protocol equal of vice premiers but with narrower portfolios), and 29 ministers and heads of State Council commissions. The President and Vice President are elected by the NPC for five-year terms. The President is the head of state. The office was created by the 1982 Constitution. Formally, the President is elected by the NPC in accordance with Article 62 of the Constitution. In practice, this election falls into the category of 'single-candidate' elections. The candidate is recommended by the Presidium of the NPC. The State Council is the chief administrative authority of the People's Republic of China. It is appointed by the NPC and is chaired by the Premier and includes the heads of each governmental department and agency. There are about 50 members in the

Council. In the politics of the People's Republic of China, the Central People's Government forms one of three interlocking branches of power, the others being the Communist Party of China and the People's Liberation Army (PLA). The State Council directly oversees the various subordinate People's Governments in the provinces, and in practice maintains an interlocking membership with the top levels of the Communist Party of China creating a fused centre of power. The Central Military Commission (CMC) exercises the command and control of the PLA and is supervised by the Standing Committee of the NPC. The state CMC is nominally considered the supreme military policy-making body and its chairman, elected by the NPC, is the commander-in-chief of the armed forces. In reality, command and control of the PLA, however, still resides with the CMC of the Chinese Communist Party Central Committee—the 'party CMC'.

4.4.1 China: Economic Scenario

China's economy during the past 3 decades has changed from a centrally planned system that was largely closed to global trade to a more market-oriented economy that has a rapidly growing private sector and is a major player in the world markets. Reforms started in the late 1970s with the phasing out of collectivized agriculture, and expanded to include the gradual liberalization of prices, fiscal decentralization, increased autonomy for state enterprises, the foundation of a diversified banking system, the development of stock markets, the rapid growth of the non-state sector, and the opening to foreign trade and investment. China has generally implemented reforms in a gradualist or piecemeal fashion, including the sale of minority shares in four of China's largest state banks to foreign investors and refinements in foreign exchange and bond markets in 2005. After keeping its currency tightly linked to the US US dollar for years, China in July 2005 re-valued its currency by 2.1% against the US dollar and moved to an exchange rate system that references a basket of currencies. Cumulative appreciation of the Chinese Renminbi (RMB) against the US dollar since the end of the Dollar peg was more than 20% by late 2008. The restructuring of the economy and resulting efficiency gains have contributed to a more than tenfold increase in GDP since 1978. Measured on a PPP basis that adjusts for price differences, China in 2008 stood as the second-largest economy in the world after the

US, although in per capita terms the country is still lower middle-income. The official nominal GDP figure was 4.222 TUSD and on a PPP basis is 7.8 TUSD. Annual inflows of foreign direct investment in 2007 rose to nearly 84 BUSD. By the end of 2007, nearly 7,000 domestic Chinese enterprises had made an aggregate 118 BUSD in direct investments in 173 countries and regions around the world. Economic development has been more rapid in coastal provinces than in the interior, and approximately 200 million rural labourers and their dependents have relocated to urban areas to find work. One demographic consequence of the 'one child' policy is that China is now one of the most rapidly aging countries in the world. The Chinese government seeks to add energy production capacity from sources other than coal and oil. In late 2008, as China commemorated the 30th anniversary of its historic economic reforms, the global economic downturn began to slow foreign demand for Chinese exports for the first time in several years. The government vowed to continue reforming the economy and emphasized the need to increase domestic consumption in order to make China less dependent on foreign exports for GDP growth in the future.

4.4.2 China: Educational System

In China, the education is divided into three categories: basic education, higher education, and adult education. The Compulsory Education Law stipulates that each child have nine years of formal education. Basic education in China includes pre-school education, primary education and regular secondary education. Lower middle school graduates wishing to continue their education take a locally administered entrance exam, on the basis of which they will have the option either of continuing in an academic upper middle school or of entering a vocational secondary school. Vocational schools offer programs ranging from two to four years and train medium-level skilled workers, farmers, and managerial and technical personnel. Technical schools typically offer four-years programs to train intermediate technical personnel. 'Schools for Skilled Workers' typically train junior middle school graduates for positions requiring production and operation skills. The length of training is typically three year. Higher education at the undergraduate level includes two-and three-year junior colleges (sometimes also called short-cycle colleges, four-year colleges, and universities offering programs in both academic and vocational subjects. Many

colleges and universities also offer graduate programs leading to the master's or Ph.D. degree.

Chinese higher education at the undergraduate level is divided into three-year and four-year programs. The former is offered not only at short-cycle colleges, but frequently also at four-year colleges and universities. The latter is offered at four-year colleges and universities but do not always lead to the bachelor's degree. In 2007, there were 2,236 schools of higher learning in China, accommodating over 18.9 million undergraduates and 1.2 million postgraduates. A UNESCO report published in 2004 states that China's adult literacy rate is over 91%.

4.4.3 China: Overview of Services Outsourcing Industry

China is positioning itself as an alternative destination for services outsourcing due to its low cost base and many experts agree the technical skills of China's new generation are on par with any country. According to McKinsey research, China's outsourcing and offshoring services currently account for less than 10 percent of the global market. But, if developed, China could generate about 56 BUSD in outsourced services annually by 2015. However, several 'proceed with caution' signs appear as companies examine China's outsourcing capabilities. For example, much of McKinsey's predictions on the growth of China's outsourcing sector involve Japan and Korea. China has about two million Japanese and Korean language speakers but English speakers are far fewer English language skills, which cannot be developed overnight, put China's technical talent at an outsourcing disadvantage to India, where English is an official language and is widely spoken. Despite a low-cost telecommunications infrastructure, China is new when it comes to servicing the western world. China's R&D and large manufacturing base for high-tech verticals, such as semiconductors, demonstrate success in the global marketplace. However, many see drawbacks to taking advantage of the country's manufacturing capabilities. China's poor track record of protecting intellectual rights has made many manufacturers hesitate to outsource the production of goods to China. Some worry that the lack of protection of intellectual property could translate into lack of data protection as well.

4.4.4 China: Oil Industry Overview

China consumed an estimated 7.8 million barrels per day (barrels/day) of oil in 2008, making it the second-largest oil consumer in the world behind the United States. During that same year, China produced an estimated 4.0 million barrels/day of total oil liquids, of which 96 percent was crude oil. China's net oil imports were approximately 3.9 million barrels/day in 2008, making it the third-largest net oil importer in the world behind the United States and Japan. US EIA forecasts that China's oil consumption will continue to grow during 2010, with oil demand reaching 8.2 million barrels/day in 2010 (Figure 4.11). This anticipated growth of over 390,000 barrels/day between 2008 and 2010 represents 31 percent of projected world oil demand growth in the non-OECD (Organisation for Economic Co-operation and Development) countries for the 2-year period according to the July 2009 Short-Term Energy Outlook of US EIA. By contrast, China's oil production is forecast to remain relatively flat at 4 million barrels/day in 2009. According to OGJ, China had 16 billion barrels of proven oil reserves as of January 2009.

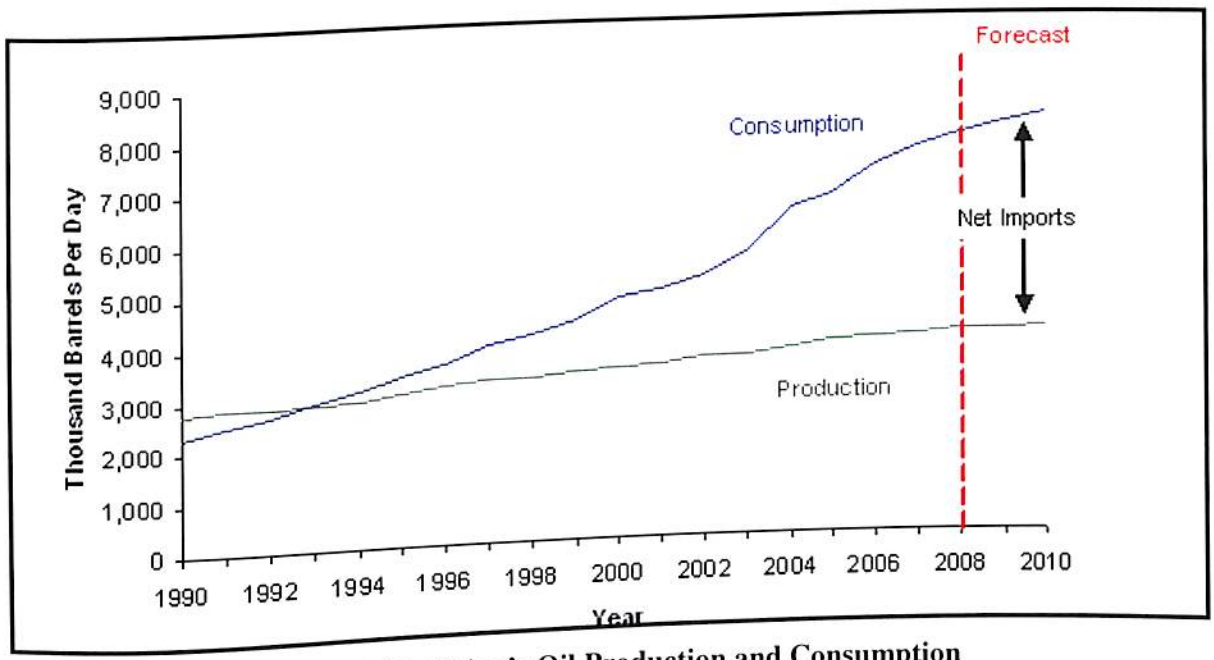

Figure 4.11: China's Oil Production and Consumption
Source: US Energy Information Administration (Sep 2009)

4.4.5 China: Oil Sector Organization

China's National Oil Companies (NOCs) wield a significant amount of influence in China's oil sector. Between 1994 and 1998, the Chinese government reorganized most state-owned O&G assets into two vertically integrated firms: the China National

Petroleum Corporation (CNPC) and the China Petroleum and Chemical Corporation (Sinopec). These two conglomerates operate a range of local subsidiaries, and together dominate China's upstream and downstream oil markets. CNPC remains the much larger and influential NOC and is the leading upstream player in China. CNPC, along with its publicly-listed arm PetroChina, account for roughly 60 percent and 80 percent of China's total O&G output, respectively. Sinopec, on the other hand, has traditionally focused on downstream activities such as refining and distribution with these sectors making up 76 percent of the company's revenues in 2007.

Additional state-owned oil firms have emerged in the competitive landscape in China over the last several years. The China National Offshore Oil Corporation (CNOOC), which is responsible for offshore oil E&P, has seen its role expand as a result of growing attention to offshore zones. Also, the company has proven to be a growing competitor to CNPC and Sinopec by not only increasing its E&P expenditures in the South China Sea but also extending its reach into the downstream sector particularly in the southern Guangdong Province through its recent 300 billion yuan investment plan. The Sinochem Corporation and CITIC Group (China International Trust and Investment Company) have also expanded their presence in China's oil sector, although their involvement in the oil sector remains dwarfed by CNPC, Sinopec, and CNOOC. The government intends to use the stimulus plan to enhance energy security and strengthen Chinese NOCs' global position by offering various incentives to invest both upstream and downstream.

China had 6.4 million barrels/day of crude oil refining capacity at 53 facilities as of January 2009, according to OGJ. Other sources report higher refinery capacity at end-2008. China's goal is to raise refining capacity to 8.8 million barrels/day by 2011. According to the BP Statistical Review of World Energy, refinery utilization in China increased from 67 percent in 1998 to 89 percent in 2008.

Sinopec and CNPC are the two dominant players in China's oil refining sector, accounting for 50 percent and 35 percent of the capacity, respectively. However, CNOOC entered the downstream arena and commissioned the company's first refinery, the 240,000 barrels/day Huizhou plant, in March 2009 in order to process the

high-sulphur crudes from its Bohai Bay fields. Sinochem has also proposed a number of new refineries, and national oil companies from Kuwait, Saudi Arabia, Russia, and Venezuela have also entered into joint-ventures with Chinese companies to build new refining facilities. Sinopec and PetroChina plan to commission about 450,000 barrels/day and 400,000 barrels/day, respectively, of expansion and greenfield capacity by 2011 according to industry sources. In light of the recent economic downturn, some firms have postponed launching refinery projects until product demand picks up again. Also, the National Development and Reform Commission (NDRC) outlined in May 2009 that it plans to eliminate refineries of 20,000 barrels/day with inefficient equipment and ban any new projects in efforts to encourage economies of scale and energy efficiency measures. In addition, CNPC is recently branching out to acquire refinery stakes in other countries in efforts to move downstream and secure more global trading and arbitrage opportunities. The company recently purchased a 45.5 percent stake in Singapore Petroleum for 1 BUSD, and received approval to purchase 49 percent of Nippon Oil's Osaka refinery in Japan in June 2009.

The expansive refining sector has undergone modernization and consolidation in recent years, with dozens of small refineries (teapots), accounting for about 20 percent of total fuel output, shut down and larger refineries expanding and upgrading their existing systems. Domestic price regulations for finished petroleum products have hurt Chinese refiners, particularly smaller ones, because of the large gulf between international oil prices and China's relatively low domestic rates. In 2008, Sinopec and CNPC reportedly had refining losses of nearly 29 BUSD before the Chinese government provided direct subsidies to partially cover the losses.

4.4.6 China: Natural Gas Industry Overview

Although Natural Gas use is increasing in China, it only comprised 3 percent of the country's total energy consumption in 2006. Historically, natural gas has not been a major energy source in China, but its share in the country's consumption mix is slowly increasing. According to OGJ, as of January 2009, China had 80 Tcf of proven natural gas reserves, having risen significantly since 2006. While proven reserves

have increased, China's production and demand of natural gas has also risen substantially. In 2007, China produced 2,446 Bcf of natural gas while the country consumed 2,490 Bcf, and for the first time in almost 2 decades, the country became a net natural gas importer (Figure 4.12). Consumption for 2007 rose from 2006 levels by about 25 percent, and the country began importing LNG, amounting to nearly 140 Bcf in 2007, to fill the gap. Although a majority of the gas consumption is dominated by industrial users the recent growth of gas consumption in the past few years is attributed to all sectors: industrial and petrochemical, power, and residential. The industrial sector including chemicals consumed over 40 percent of the market share of gas in 2007 according to FACTS Global Energy (FGE), and future gas growth will be led by the power and residential/commercial sectors. The Chinese government anticipates boosting the share of natural gas as part of total energy consumption to 10 percent by 2020 to alleviate high pollution from the country's heavy coal use. EIA projects gas demand to nearly triple by 2030, growing about 4.5 percent per year according to the 2009 International Energy Outlook. To meet this anticipated shortfall, China is expected to continue importing natural gas in the future via LNG and is considering a number of potential import pipelines from neighbouring countries.

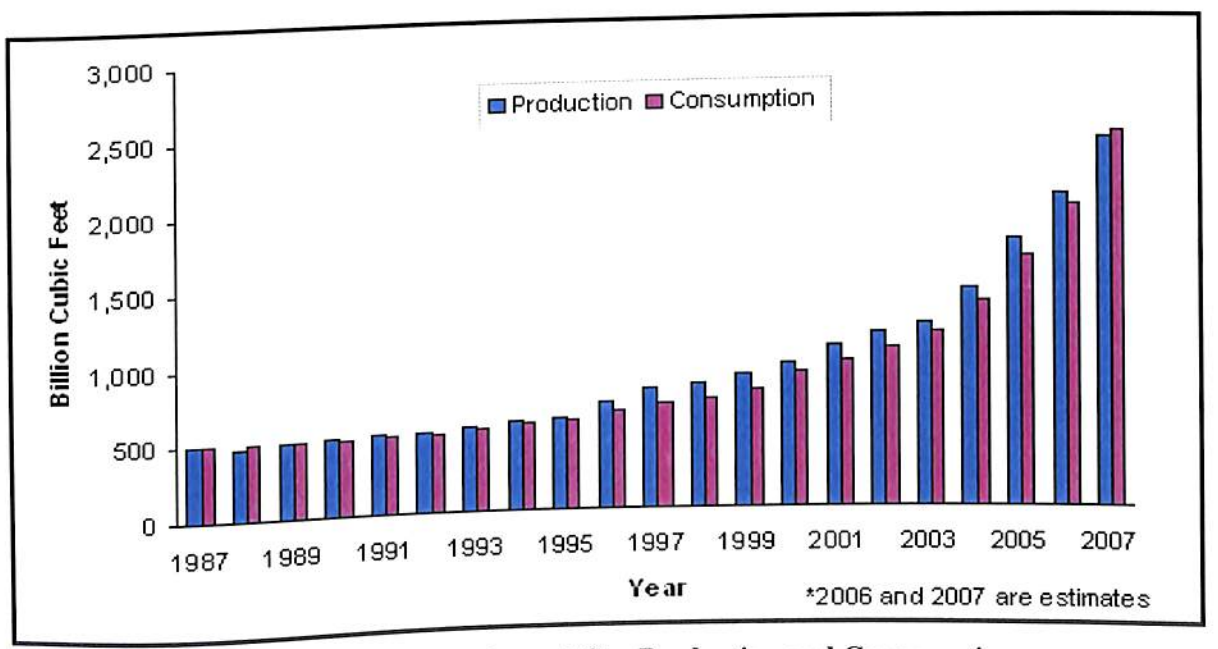

Figure 4.12: China's Natural Gas Production and Consumption
Source: US Energy Information Administration (Sep 2009)

As with oil, the natural gas sector is dominated by the three principal state-owned O&G companies: CNPC, Sinopec, and CNOOC. CNPC is the country's largest natural gas company in both the upstream and downstream sectors. In 2008, CNPC data shows that the company accounted for over three-fourths of China's total natural gas output. Sinopec and CNOOC are also playing an increasing role in the natural gas sector. Sinopec operates the Puguang natural gas field in Sichuan Province, one of China's most promising upstream assets. CNOOC led the development of China's first two LNG import terminals at Shenzhen in Guangdong Province and Fujian and manages much of the country's offshore production.

4.5 OVERVIEW OF THE ACTIVITIES IN O&G ENGINEERING SERVICES (O&G ES)

O&G ES companies undertake engineering, design and construction activities when they are requested by their clients to apply engineering and technology expertise to design a plant or facility, manage the project, procure the equipment, manage and execute construction and often commission and start up of the client owned industrial asset. These ES companies are often also contracted by the client to undertake repair, maintenance and installation in the daily operation and upkeep of the plant that they have designed and engineered. The amount of involvement from ES companies during pre- and post-contract award varies. Some contracts require the ES company to invest heavily in the design before the contract, whereas another client may pay the contractor to undertake the design of the facility. The range of services start from exploration (Onshore and Offshore) including exploration and extend to extraction, terminals, refinery, gas making and treatment facilities and downstream petrochemicals.

Figure 4.13 illustrates the typical stages in the project life cycle and how the ES industry contributes to the overall value chain.

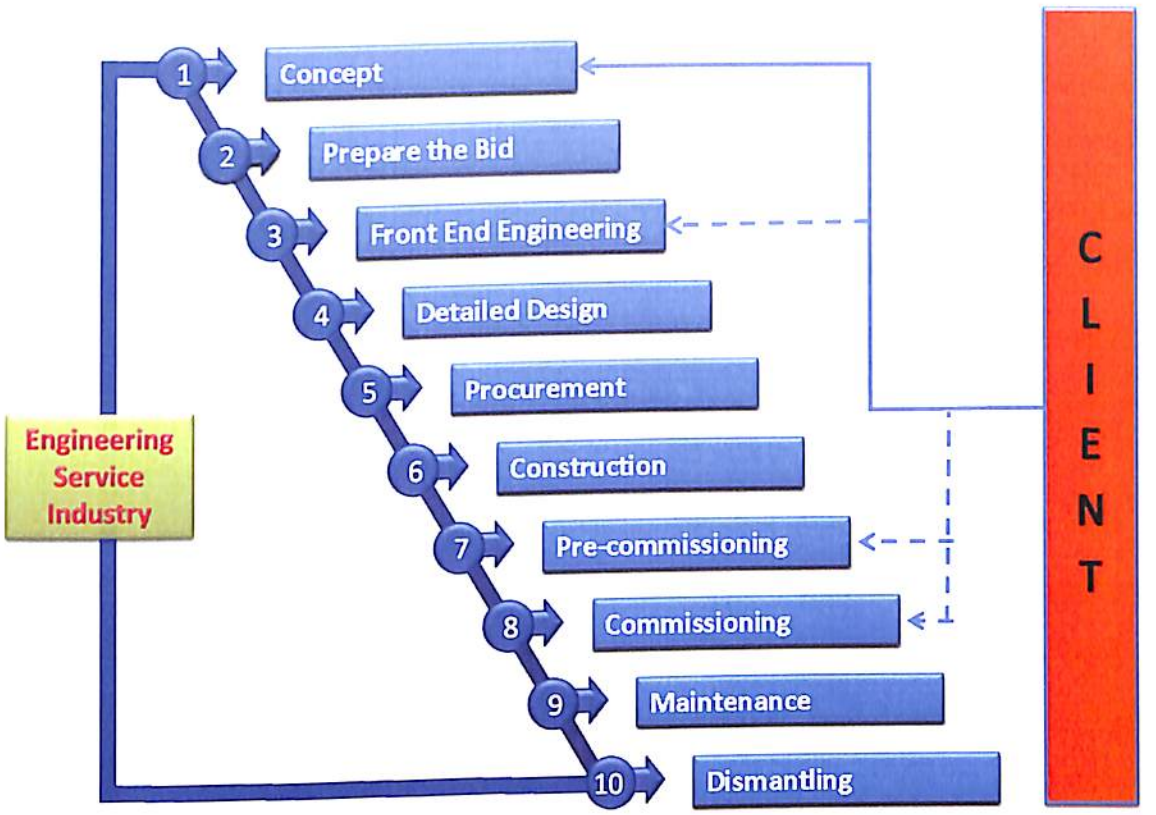

Figure 4.13: Typical Asset Lifecycle of an O&G project and involvement of the ES industry
Source: Adapted from Business, Innovation and Skills/UK Commission for Employment and Skills - The Engineering Construction Industry, Strategic Skills Cluster Report (2009)

The typical processes in an O&G asset life cycle are described in the table below:

1. **Concept:** Usually done by end-users, and often with advice from specialist ES consultancies, the concept stage involves defining the financial, market and technical aims for the project. Many Multinational ES majors (e.g. Bechtel Inc., Foster Wheeler etc.) have matured over the years to completely take up this activity.
2. **Bid Preparation:** In response to a client request, an ES company will bid for a contract to provide a specific service or production asset. Bidding is usually a high-intensity activity where in a short time a contract of work is prepared and offered to the client. This contract has to be technically accurate and commercially viable as well as committing the supplier to a high volume of output. Bids submitted by ES companies require greater accuracy and often carry additional risk due to the larger scope of activity involved. In comparison with other civil construction sectors, for example, this type of bidding entails the

higher value of the contract process and longer project times i.e. long lead-in and onsite time. A clear definition of the outputs and a sufficiently competitive budget to win the contract from the client is critical at this stage.

3. **Front-End Engineering Design (FEED):** At this stage, the concept is tested and a detailed specification generated. The project requires scientists, engineers and project managers to design the asset and establish the detailed programme to construct it. It may be undertaken by a specialist ES company, a client or a partnership of the two.
4. **Detailed Design:** The specification for the asset is turned into a workable design, again by a highly qualified team. It is critical at this stage to ensure the technical, construction and project plan is precise and correct. Errors will mean the asset will not be as productive or cannot be built to the planned budget.
5. **Procurement or Procurement Management:** This is another important activity of the project life cycle. Typical activities during this stage include issuance of enquiry, bid tabulation and evaluation on behalf of the client, placement of orders, inspection services of partial/finished goods, arranging transportation and insurance, customs clearance of imported equipment and expediting.
6. **Construction or Construction Management:** The design is turned into a physical reality using a range of engineering professions and skilled trades. It is critical at this stage to manage the programme since major scale construction projects can rapidly slip behind plan. Overspend is likely if the project team fail to appropriately control activities, people and expenditure. Without proper risk analysis, sites risk mitigation and safety management could become inherently unsafe.
7. **Pre-Commissioning:** This is to ensure the asset can achieve its acceptance criteria agreed at earlier engineering and design stages. It is usually done by the ES Company under close supervision of the client.
8. **Commissioning:** This is where the processing plant is handed over to the owner operator. It is critical at this stage to ensure communication between contractors, the client and their operations team. When well-briefed and well-trained, the

operation team will hit productivity targets quickly. Otherwise, the result is a slow start and potential loss of production, which may threaten the commercial viability of the plant.

9. **Maintenance:** This is the repair and renewal of parts of the asset, either on an ongoing basis or as a refit (often a large project in its own right). It is critical at this stage to understand the performance of the processing plant and know how to respond to increase its productivity.
10. **Dismantling:** When the facility is dismantled and removed, the process includes ensuring that the land is returned to an uncontaminated state and is ready for re-use.

4.6 OPPORTUNITY ASSESSMENT FOR O&G ESO

The global construction market continues to boom and large international contractors and designers are reaping the benefits. The demand for big-ticket projects, from petroleum production facilities and power plants to major infrastructure upgrades and signature buildings, has made the demand intense for world-class contractors with the size and expertise to deliver these projects. As a result, big firms around the world are scrambling to grow, either organically or through acquisition, to meet this demand. The scope of the hot market can be seen from the revenue figures of these firms. Research by McGraw-Hill Construction Engineering News Record (ENR) in 2008 showed that the 'Top 225' International Contractors (by revenue) generated combined revenues of 826.96 BUSD in 2007 and booked orders exceeding 981 BUSD in this period. The revenue figure represented a 27.1% increase over that of the previous fiscal year (650.66 BUSD in 2006). Out of the total revenues, the 'Top 225', as a group generated 310.25 BUSD in revenues from projects outside their respective home countries. This represented a 38.3% growth over the corresponding figures for the year 2006 (224.4 BUSD). 167 firms out of the 225 reported higher backlog at the end of the fiscal than the previous year. The revenues from the O&G industry exceeded 80 BUSD IN 2007. The data and the market analysis are represented in Table 4.1.

Table 4.1: 'Top 225' International Contractors at a glance and their revenue from Petroleum market

Volume

	DOMESTIC $ BIL.	DOMESTIC % CHG.	INTERNATIONAL $ BIL.	INTERNATIONAL % CHG.	TOTAL $ BIL.	TOTAL % CHG.
REVENUE	616.7	+21.1	310.2	+38.2	927.0	+27.0
NEW CONTRACTS	561.8	+22.6	420.0	+39.9	981.8	+29.4

Profitability

	NUMBER OF FIRMS REPORTING PROFIT	NUMBER OF FIRMS REPORTING LOSS	AVERAGE % OF PROFIT	AVERAGE % OF LOSS
DOMESTIC	154	20	7.2	NA
INTERNATIONAL	167	12	8.0	NA

Professional Staff

	NUMBER OF FIRMS REPORTING DOMESTIC	NUMBER OF FIRMS REPORTING INT'L	AVERAGE % OF DOMESTIC	AVERAGE % OF INT'L
INCREASE	121	131	18.7	36.2
DECREASE	13	9	10.0	15.3
SAME	62	47	NA	NA

Backlog

	NUMBER OF FIRMS REPORTING	AVERAGE %
HIGHER	167	44.8
LOWER	11	11.7
SAME	22	NA

Market Analysis

TYPE OF WORK	REVENUE $ MIL.	PERCENT OF TOTAL
BUILDING	73,955.0	23.8
MANUFACTURING	7,081.3	2.3
INDUSTRIAL	15,330.5	4.9
PETROLEUM	80,039.9	25.8
WATER	8,637.6	2.8
SEWER/WASTE	4,818.7	1.6
TRANSPORTATION	79,377.7	25.6
HAZARDOUS WASTE	605.0	0.2
POWER	17,180.6	5.5
TELECOMMUNICATIONS	3,323.4	1.1
OTHER	19,897.3	6.4

International Regions

	NUMBER OF FIRMS	REVENUE $ MIL.	PERCENT OF TOTAL
CANADA	44	8,281.3	2.7
U.S.	63	36,906.1	11.9
LATIN AMERICA	92	19,240.6	6.2
CARIBBEAN ISLANDS	38	2,007.2	0.6
EUROPE	136	96,448.8	31.1
MIDDLE EAST	141	62,894.9	20.3
ASIA/AUSTRALIA	155	55,309.5	17.9
NORTH AFRICA	114	13,174.6	4.2
SOUTH/CENTRAL AFRICA	82	15,420.8	5.0
OTHER	4	464.0	0.1

Source: McGraw-Hill Construction ENR (2008)

Out of this, the Top 10 in the O&G markets are Saipem, Technip, Bechtel, Fluor Corporation, Chiyoda Corporation, Consolidated Contracto's Group, JGC Corporation, Tecnicas Reunidas, Foster Wheeler Ltd., Petrofac which had a combined revenue of 55.8 BUSD.

Another important analysis is that of the 'Top 200' International design firms. The revenue of the design firms represented 'pure design/engineering' revenue that is excluded from the total engineering spend of the contracting companies (e.g. from EPC projects). The 'Top 200' generated 43.02 BUSD in design revenue from projects outside their respective home countries in 2007, a 31.7% increase from 2006. The 'Top 200' also capitalized on their local markets, enjoying a 17.6% increase to 57.37 BUSD in 2007 from projects in their respective home countries. 136 firms out of the 200 reported higher backlog at the end of the fiscal than the previous year. The 'pure design/engineering' revenues from the O&G industry exceeded 14.6 BUSD IN 2007. The data and the market analysis are represented in Table 4.2.

Table 4.2: 'Top 200' International Design Firms at a glance and their revenue from Petroleum market

Volume

	DOMESTIC $ BIL.	DOMESTIC % CHG.	INTERNATIONAL $ BIL.	INTERNATIONAL % CHG.	TOTAL $ BIL.	TOTAL % CHG.
REVENUE	57.4	+17.5	43.0	+30.1	100.4	+22.6

Profitability

	NUMBER OF FIRMS REPORTING PROFIT	NUMBER OF FIRMS REPORTING LOSS	AVERAGE % OF PROFIT	AVERAGE % OF LOSS
DOMESTIC	161	6	9.5	NA
INTERNATIONAL	151	11	11.2	NA

Professional Staff

	NUMBER OF FIRMS REPORTING DOMESTIC	NUMBER OF FIRMS REPORTING INT'L	AVERAGE % OF DOMESTIC	AVERAGE % OF INT'L
INCREASE	154	142	19.8	36.2
DECREASE	7	4	4.1	20.5
SAME	27	27	NA	NA

Backlog

	NUMBER OF FIRMS REPORTING	AVERAGE %
HIGHER	136	31.0
LOWER	7	33.2
SAME	31	NA

Market Analysis

TYPE OF WORK	REVENUE $ MIL.	PERCENT OF TOTAL
BUILDING	6,607.7	15.4
MANUFACTURING	664.6	1.5
INDUSTRIAL	3,540.1	8.3
PETROLEUM	14,699.7	34.2
WATER	1,932.5	4.5
SEWER/WASTE	1,664.3	3.9
TRANSPORTATION	6,764.4	15.7
HAZARDOUS WASTE	1,965.6	4.6
POWER	3,239.4	7.5
TELECOMMUNICATIONS	160.1	0.4
OTHER	1,756.3	4.1

International Regions

	NUMBER OF FIRMS	REVENUE $ MIL.	PERCENT OF TOTAL
CANADA	71	4,047.0	9.4
U.S.	52	4,792.2	11.1
LATIN AMERICA	113	1,872.0	4.4
CARRIBEAN ISLANDS	71	513.6	1.2
EUROPE	130	11,120.2	25.9
MIDDLE EAST	163	8,445.5	19.6
ASIA/AUSTRALIA	166	8,860.5	20.6
AFRICA	125	3,302.3	7.7
ARCTIC/ANTARCTIC	6	31.2	0.1

Source: McGraw-Hill Construction ENR (2008)

Out of this, the Top 10 in the O&G markets are Fluor Corporation, Worley Parson's Ltd., Fugro NV, KBR, Bechtel, Jacobs, Tecnicas Reunidas, The Shaw Group Inc., URS Corporation and Foster Wheeler Ltd. which together had a combined revenue of 12.42 BUSD. United States continues to be the leader with over 78 firms in the total list of 200 with these 78 firms having a revenue share of over 40% of the total revenues earned by the 200 companies.

Since the United States continues to be the major engineering services location a separate study was instituted by McGraw-Hill Construction ENR to study specifically about the US firms and their revenues from pure design and engineering services. The 'Top 500' US design firms generated combined revenues of 80.62 BUSD in 2007, up 15.8% from 69.61 BUSD in 2006. This growth was reflected in domestic and international markets, with U.S. projects yielding revenue of 60.95 BUSD in 2007, up 11.4% from 2006. Revenue from projects outside the U.S. grew 32% for the 'Top 500', to 19.67 BUSD. 259 firms out of the 500 reported higher backlog at the end of

the fiscal than the previous year. The O&G/Petroleum segment contributed to 13.73 BUSD out of the total revenues of 80.62 BUSD representing a share of 17% of the total. The data and the market analysis are represented in Table 4.3.

Table 4.3: 'Top 500' US Design Firms at a glance and their revenue from Petroleum market

Volume

	DOMESTIC $ BIL.	% CHG.	INTERNATIONAL $ BIL.	% CHG.	TOTAL $ BIL.	% CHG.
REVENUE	60.9	+11.4	19.7	+32.0	80.6	+15.8

Profitability

	NUMBER OF FIRMS REPORTING PROFIT	LOSS	AVERAGE % OF PROFIT	LOSS
DOMESTIC	449	11	10.3	NA
INTERNATIONAL	159	36	12.3	NA

Professional Staff

	NUMBER OF FIRMS REPORTING DOMESTIC	INTL.	AVERAGE % OF DOMESTIC	INTL.
INCREASE	338	97	15.0	60.5
DECREASE	47	6	10.9	28.5
SAME	94	65	NA	NA

Backlog

	NUMBER OF FIRMS REPORTING	AVERAGE %
HIGHER	259	23.8
LOWER	86	14.5
SAME	104	NA

Market Analysis

TYPE OF WORK	REVENUE $ MIL.	PERCENT OF TOTAL
BUILDING	19,799.6	24.6
MANUFACTURING	1,584.1	2.0
INDUSTRIAL	4,163.9	5.2
PETROLEUM	13,732.8	17.0
WATER	4,693.6	5.8
SEWER/WASTE	5,051.3	6.3
TRANSPORTATION	14,200.7	17.6
HAZARDOUS WASTE	7,568.3	9.4
POWER	7,238.4	9.0
TELECOMMUNICATIONS	729.5	0.9
OTHER	1,853.4	2.3

International Regions

	NUMBER OF FIRMS	REVENUE $MIL.	PERCENT OF TOTAL
CANADA	117	3,213.4	16.3
LATIN AMERICA	141	928.1	4.7
CARRIBEAN ISLANDS	97	357.1	1.8
EUROPE	141	5,041.8	25.6
MIDDLE EAST	138	4,386.3	22.3
ASIA/AUSTRALIA	169	4,679.6	23.8
AFRICA	75	1,035.3	5.3
ARCTIC/ANTARCTIC	2	28.1	0.1

Source: McGraw-Hill Construction ENR (2008)

Out of this, the Top 20 in the O&G markets are Fluor Corporation, Jacobs, Bechtel, KBR, The Shaw Group Inc., CH2M Hill Cos., Foster Wheeler Ltd., CB&I, Mustang Engineering, URS Corporation, AMEC, S&B Holdings Ltd., Worley Parson's Corp., Englobal Corp., CDI Engineering Solution, Fugro NV, BE&K Inc., Universal Ensco Inc., Parsons and Gulf Interstate Engg. Company which together had combined revenues of 15.3 BUSD.

A study of the in-house R&D expenditure of end-user O&G majors and OFS companies also points to the fact that this is a major market opportunity that is yet to be untapped by the ESO companies. Almost 100% of the R&D activities are done in-house and in captive engineering/design centres and is yet to find way to the BRIC nations. International Oil Companies (IOCs) have dramatically increased

their investments in R&D and technology development focusing on new themes like heavy oil and ultra deep water operations. Figure 4.14 illustrates the in-house R&D spending of 4 select IOCs and 3 select OFS that shows that their combined R&D expenditure exceeded 4 BUSD in the year 2007. The combined R&D expenditure of O&G end user companies and OFS companies in the year 2007 that figured in the Forbes Fortune 500 list of Year 2007 exceeded more than 50 BUSD out of which over 35 BUSD was from companies in North America and Western Europe that is traditionally the major market for ESO companies in the O&G domain.

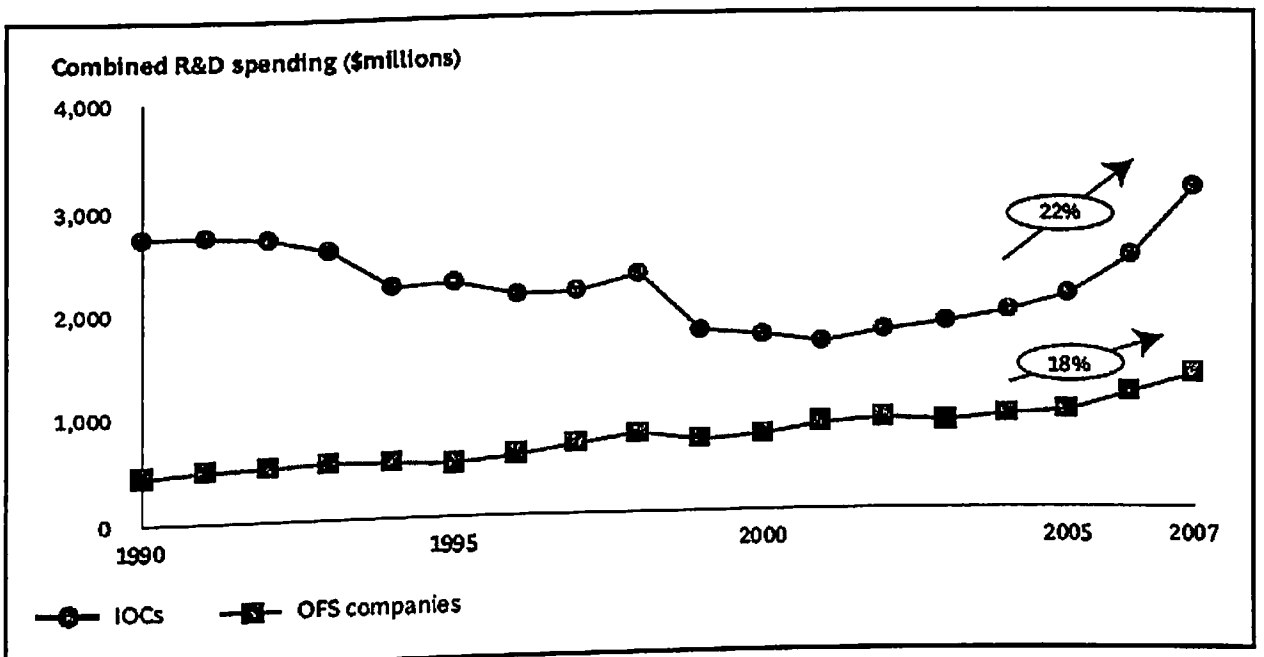

Figure 4.14: Combined R&D spending of select International Oil Companies (BP, Chevron, Exxon Mobil and Shell) and select Oil Field Service Companies (Baker Hughes, Halliburton, Schlumburger)
Source: Upstream O&G - An Evolving Eco-System, BCG (2009)

My analysis of the above figures show that the combined design/engineering spend of end-user O&G companies for in-house technical services/R&D projects, Technology Licensing companies, OEMs, Global EPCs and design firms exceeds 100 BUSD which is the total market opportunity available for the Engineering Service companies in the O&G domain. A break-up of this is listed in Table 4.4.

Table 4.4: Global Engineering Spend in the O&G industry

Category of Engineering/Design spend	Value in BUSD/annum
Global EPCs	40 BUSD
Global Design Firms	15 BUSD
Technology Licensors, R&D and In-house engineering	35 BUSD
Engineering spend by OEMs (Original Equipment Manufacturers)	10 BUSD
Grand Total	**100 BUSD**

Source: McGraw-Hill Construction ENR (2008), Author analysis of industry data

Many of the International companies have begun to recognize the capabilities and talent available at offshore locations and are increasingly tending to outsource activities like product design, plant design, process engineering, enterprise asset management and plant automation services. A study by NASSCOM and Booz Allen Hamilton (2006) reports that only 2% of the total engineering spend by International firms reach the emerging markets – a tiny fraction of the total opportunity. Brazil, Russia, India and China are major markets that have the capacity and size to capture a larger share of this engineering spend. NASSCOM estimates that the ES outsourcing pie is expected to grow to 15 to 20% by year 2020. India currently has a share of 12% in the Global ESO market and had a share of 240 MUSD in year 2006 in the O&G ESO market. India's biggest competitors in the ESO business are the BRIC nations since other players like Israel that have significant domain expertise in certain areas are restricted by lack of scale. The O&G Engineering services spend is estimated to grow from 100 BUSD currently to 150 BUSD in year 2020 as the global engineering services spend grows from 750 BUSD to 1.1 TUSD in the same period. The NASSCOM-BAH study reports that India's share in the global ESO market could be as high as 50 BUSD in the year 2020. In order to achieve this, India must aim for a higher share (25 to 30%) in the available O&G ESO market space too (estimated at 20 BUSD in year 2020). Going by this analysis, India's O&G ESO share in year 2020 could be as much as 6 BUSD if the right actions are in place.