

Analysis of oil reserves, production and oil price trends in 1995, 2005, 2015

The Mining-Geology-Petroleum Engineering Bulletin
UDC: 553.9:620.9
DOI: 10.17794/rgn.2018.4.10

Review scientific paper



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Abstract

According to analysed oil reserves and oil production worldwide during 1995, 2005 and 2015, a global increase in oil reserves is observed. In 1995, there were 179.1×10^9 m³, in 2005 there were 218.5×10^9 m³ and in 2015 there were 269.9×10^9 m³ oil reserves. According to *British Petroleum* data, oil production is also increasing, but by a smaller ratio. Oil production in the world in 1995 was 10.8×10^9 m³, in 2005 it was 13.0×10^9 m³, and in 2015 14.6×10^9 m³. Oil price trends between 1980 and 2015 were analysed. Many different causes affect the constant oil price fluctuations, but the most influential are the geopolitical crises of the Middle Eastern countries, as well as a great increase in demand for oil and the expansion of the consumption of wealthy countries such as China, India and Brazil, which was not accompanied by a corresponding increase in supply. Modern political relations are full of conflicts, which greatly affect oil prices, and the best example is the short-term rise in oil prices in 2011, when armed conflicts started in Libya, or disablement of production in countries such as Syria and Yemen, which in 2015 can barely capture any production. By comparing reserves, earnings and oil price fluctuations, it is apparent that almost every increase in oil production, after the discovery of oil deposits, was later accompanied by a fall in prices.

Keywords:

oil reserves, oil production, oil prices, oil consumption

1. Introduction

Oil and gas reserves are one of the most precious forms of energy that mankind today possesses, and the management of energy mineral resources is one of the most important factors in the development of each country. Oil and natural gas are the main energy mineral resources and make 60 to 80 % of total energy consumption in most countries. Sudden price changes of oil and other petroleum products through history show that oil price fluctuation is unpredictable and constant estimates of reserves are necessary as well as adjusting strategies for oil exploration. Energy consumption in the '90s of the 20th century gradually and moderately increased, and more intense growth was achieved in the early 21st century. With growth in energy consumption, the demand for oil is also growing and oil has become extremely significant for the industry, and its possession is a prerequisite for further development of the economy of an individual country.

Throughout the history of hydrocarbon exploration, geologists encountered the problem of oil reserves limit as well as their exploitation. In 1956, Marion King Hub-

bert announced forecasts for future reserves and oil exploration in the world and calculated that the world's oil production would begin to decline at the beginning of the 21st century (**Dekanić, 2011**).

According to Hubbert, the curve describing global oil exploration at a time called Hubbert's curve, and maximum exploitation at *Hubbert peak* or *Peak Oil* (**Hubbert, 1969**). Analysed data in this work shows that each of the predictions of Hubbert's followers has proven wrong and that the reserves for the observed years are increasing.

Thus, the total proven oil reserves in the world in 1995 amounted to 179.1×10^9 m³, in 2005 the reserves amounted to 218.5×10^9 m³ and in 2015 they were on the level of 269.9×10^9 m³. Oil production in the years 1995, 2005 and 2015 amounts to 10.8×10^9 m³, 13×10^9 m³, and 14.6×10^9 m³ respectively (**BP, 2016**). This paper presents data on oil reserves and oil capture in the world according to *British Petroleum* data for 1995, 2005 and 2015 and the price trends of oil in the last 30 years.

2. Oil Reserves and Production

The term "oil reserves" refers to the amount of oil in the reservoir that can be technically and economically

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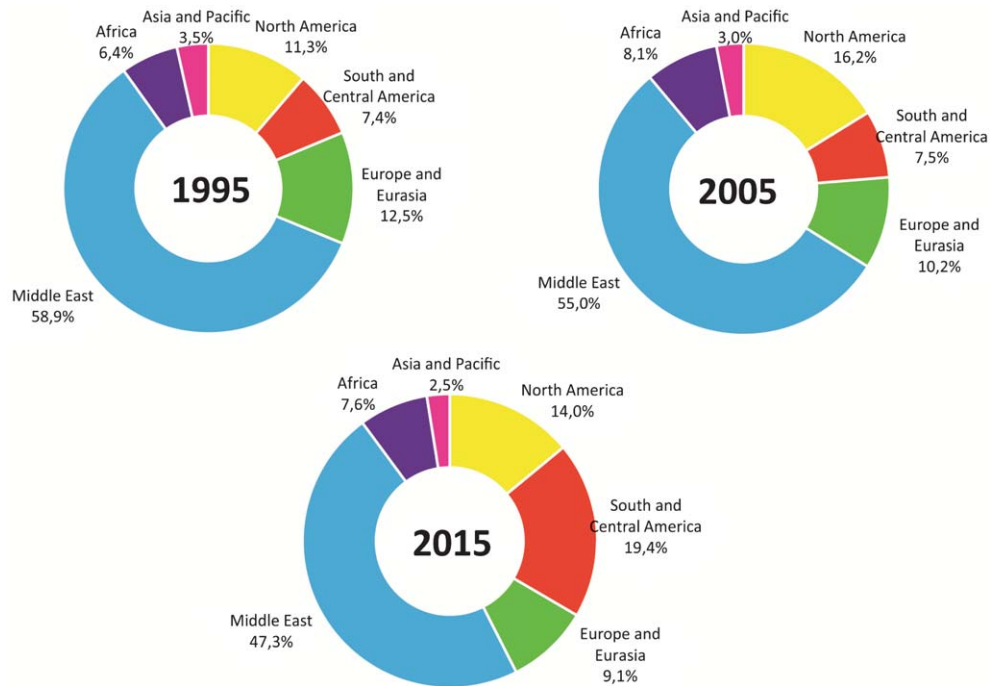


Figure 1: Distribution of Oil Reserves in the world 1995, 2005 and 2015 (adjusted to: BP, 2016)

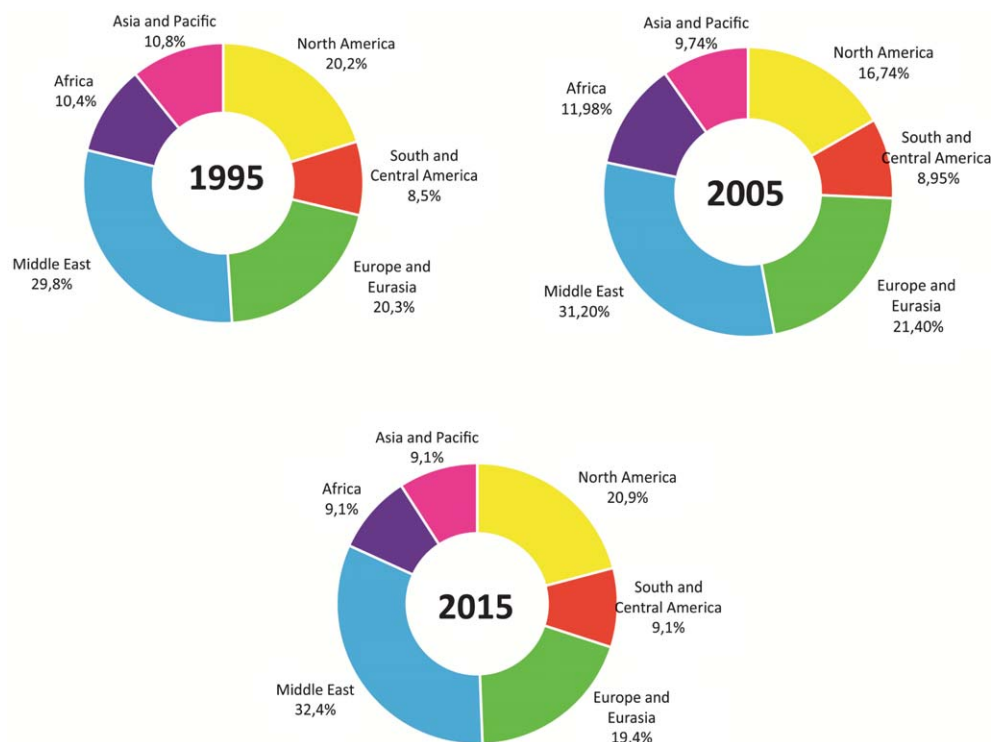


Figure 2: Distribution of Oil Production in the world 1995, 2005 and 2015 (adjusted to: BP, 2016)

feasible obtained at a given moment (Velić et al., 2015). According to BP data from 2015, in the Middle East there is 47.3 % of oil reserves followed by South and Central America with 19.4 % and North America has 14.0 % reserves. Europe has less than 10 % of oil reserves and Eurasia has 9.1 %. Of the total oil reserves, 7.6 % is located in Africa and 2.5 % in Asia and the

Pacific while the remaining countries have only 0.1 % of the total amount of oil reserves in the world (see Figure 1).

Oil capture involves two different, but closely related general systems. These are the *field*, which represents a natural porous space with features for storing and flowing fluid and *artificial creation*, which includes a well,

depth and surface equipment of the well, surface collecting system and equipment for separating and storing fluid. The field supplies a well with oil which with its depth and surface equipment allows oil to flow from the bottom of the well to the surface and allows for oil flow control (Čikeš, 2015).

Oil capture is not proportional to the amount of proven reserves owned by an individual country. Figure 2 shows the distribution of oil production in the world during 1995, 2005 and 2015. Oil production in 1995 amounts to $10.8 \times 10^9 \text{ m}^3$, in 2005 oil production was $13 \times 10^9 \text{ m}^3$, and in 2015 was $14.6 \times 10^9 \text{ m}^3$ (BP, 2016). The reason for the steady increase in oil production can be attributed to increased oil demand in the market because of the needs of the world economy. In the last twenty years, rapid development of the industry has been recorded as well as a rise in global traffic. Saudi Arabia and South and Central America have the most significant growth in production over the years, while Asia and the Pacific and Europe recorded the largest fall in oil production.

2.1 North America

North America has 14 % of oil reserves, the United States owns 3.2 % or $8.7 \times 10^9 \text{ m}^3$ of total oil reserves,

Canada 10.1 % or $27.4 \times 10^9 \text{ m}^3$, and Mexico 0.6% or $1.7 \times 10^9 \text{ m}^3$ (see Figure 3).

In global oil production in 2015, North America has been involved with 20.9 %, whereby the United States exploits the most significant quantities, 13 % or $2.020 \times 10^9 \text{ m}^3$. Comparing oil reserves and oil production in the United States, it can be concluded that production is not sustainable for a longer period of time, but year after year the quantities of exploited oil compensate themselves by new reserves.

Compared to 1995 when the US oil production gained $1.323 \times 10^9 \text{ m}^3$, in 2005, production has fallen slightly and it was $1.097 \times 10^9 \text{ m}^3$ (see Figure 4). Oil exploration in the remaining countries of this region, Canada and Mexico, is much smaller than in the United States, so in 2015, Canada had gained $0.697 \times 10^9 \text{ m}^3$ or 4.9 % of oil, and Mexico $0.411 \times 10^9 \text{ m}^3$ or 2.9 %.

One of the most significant oilfields in the United States is *Prudhoe Bay*, discovered in 1967 within the same basin (Yergin, 1990). The field is an anticline structure located on Barrow Arch, with faulting on the north side of the arch and a Lower Cretaceous unconformity on the east side (Sweet, 2008). The basin is located within the *Sadlerochit*, *Shublik* and *Sag River* formations (Van Poolen et al., 1974). The porosity is

Figure 3: Oil reserves expressed in 10^9 m^3 in North America for 1995, 2005 and 2015 (adapted to: BP, 2016)

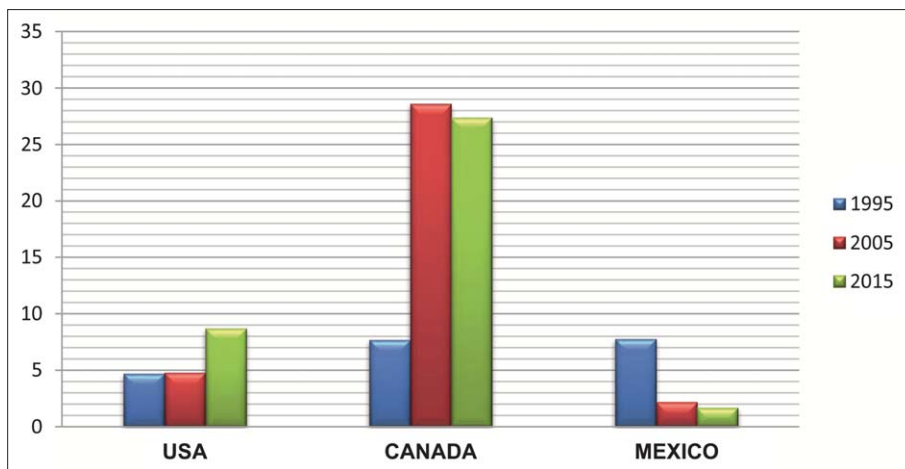
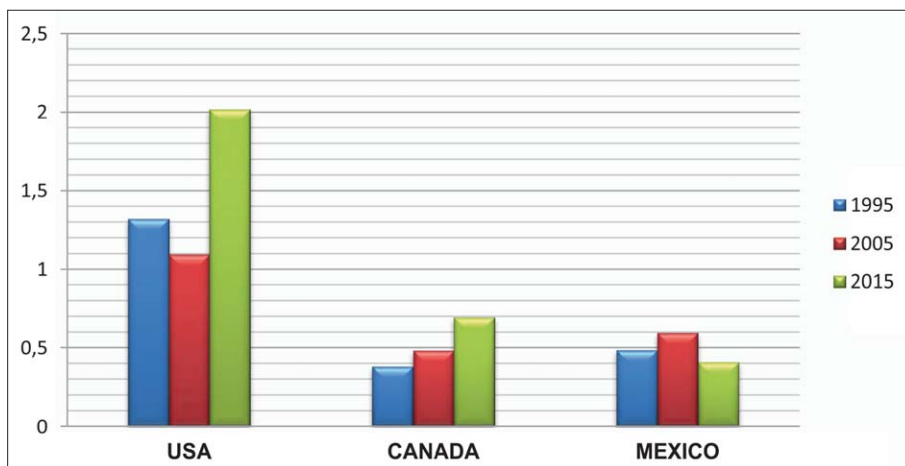


Figure 4: Oil production expressed in 10^9 m^3 in North America during 1995, 2005 and 2015 (adjusted to: BP, 2016)



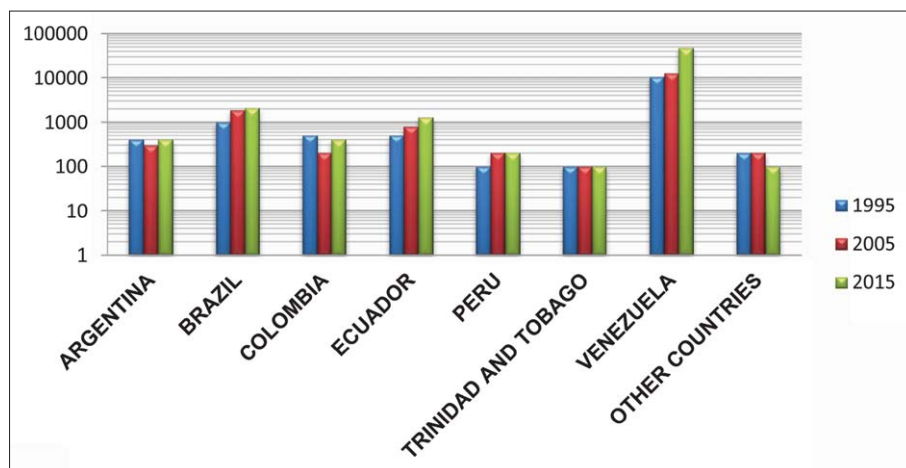


Figure 5: Oil reserves expressed in 10^6 m³ in South and Middle America for 1995, 2005 and 2015 (adapted to: BP, 2016)

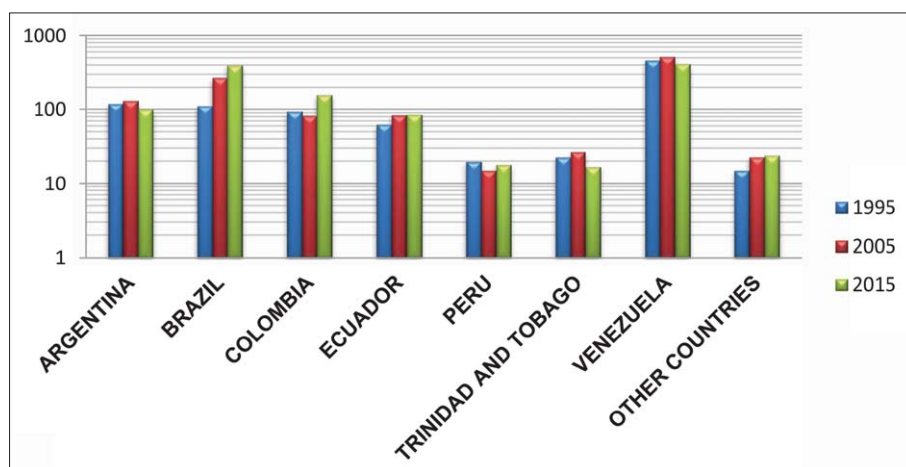


Figure 6: Oil production expressed in 10^9 m³ in South and Middle America during 1995, 2005 and 2015 (adjusted to: BP, 2016)

about 25 % and the permeability is around $0.270 \mu\text{m}^2$ (Jamison et al., 1980).

The next important oilfield in the United States is *East Texas* located within the Cretaceous-age *Woodbin Formation* (Denne et al., 2016). The type of trap for hydrocarbons is stratigraphic. The source rock for the oil in *East Texas* is the overlying *Eagle Ford Shale*.

The *Spraberry Trend*, also known as the *Spraberry Field* is a large oilfield in the Permian Basin of West Texas. All oil is produced from a single enormous sedimentary unit known as the *Spraberry Sand*, which consists of complexly mixed fine sandstone and calcareous or silicate mudstone and siltstone, deposited in a deep water environment distinguished by channel systems and their associated submarine fans, all of Permian age. Oil has accumulated in stratigraphic traps (Wikipedia, 2018).

Canada is rich in hydrocarbons from an unconventional petroleum deposit, so-called oil sands. Estimated oil reserves in these deposits were determined in 2007 on the level of 1127.13×10^9 m³, and more than 95 % of these reserves are located in the province of *Alberta* within the Sandstones from the *Athabasca formation* (Velić et al., 2015).

Two large oilfields are located in Mexico, *Cantarell*, which at the end of the last decade was the second larg-

est field for exploitation, and *Chicontepec*, which is considered as an unconventional oilfield (Velić et al., 2015).

During the Cretaceous asteroid Chicxulub impactor hit the ground and it created the Chicxulub crater and subsequent carbonate-debris breccia, which became the oil reservoir (Barton et al., 2010). There are four blocks in the Cantarell Complex, Akal, Nohoch, Chac and Kutz (Acevedo, 1980).

2.2 South and Middle America

South and Central America own almost 20 % of the world's oil reserves, of which only 17.7 % or 47.8×10^9 m³ of oil is in Venezuela according to 2015 data, which holds the primacy in reserves. Venezuela, with the large amounts of proven reserves of oil in conventional reservoirs, has significant reserves in unconventional deposits. Brazil has 0.8 % or 2.1×10^9 m³ of oil and Ecuador 0.5 % or 1.3×10^9 m³. The remaining countries have less than 1 % of the world's oil reserves. Those are Argentina and Colombia with 0.1 % or 0.4×10^9 m³, Peru with 0.1 % or 0.2×10^9 m³, and with less than 0.1 % in the total world reserves, Trinidad and Tobago, 0.1×10^9 m³ (see Figure 5).

According to BP data from 2015, in the world's total oil production South and Central America participate

Figure 7: Oil reserves expressed in 10^6 m³ in Europe and Eurasia for 1995, 2005 and 2015 (adapted to: BP, 2016)

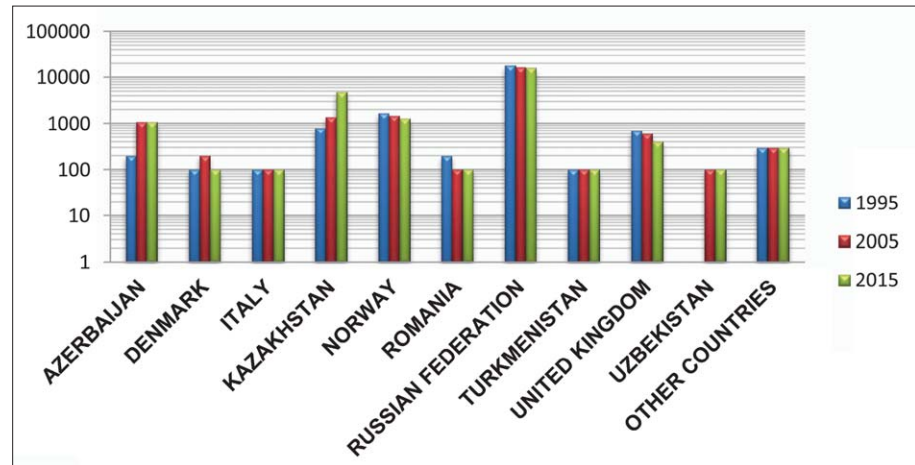
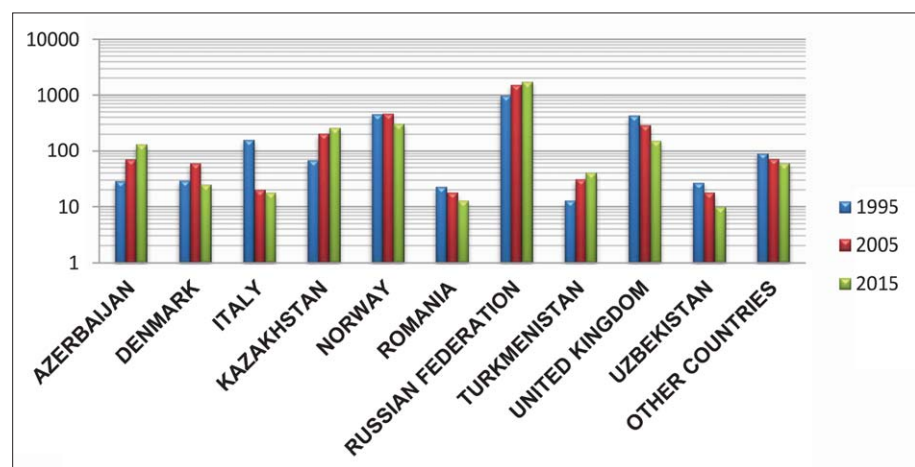


Figure 8: Oil accumulation in Europe and Eurasia during 1995, 2005 and 2015. The production values are expressed in 10^6 m³ (adjusted to: BP, 2016)



with 9.1 % or 1.226×10^9 m³. Oil production in Venezuela was 3.1 % or 0.417×10^9 m³ followed by Brazil, 3 % or 0.402×10^9 m³ and Columbia, 1.2 % or 0.160×10^9 m³. Argentina and Ecuador recorded a production of 0.7 % or 0.101×10^9 m³, 0.086 $\times 10^9$ m³ respectively. The lowest production was achieved in Peru and Trinidad and Tobago. It was about 0.017×10^9 m³ or 0.1 % (see **Figure 6**).

In Venezuela, oil was discovered at the beginning of the 20th century in jungles around the lake *Maracaibo* at a time when Venezuela was a rarely populated agricultural land with the key influence of the military in land management at all levels (**Dekanić et al., 2004**). In early 2011, President Hugo Chavez and the government announced that oil reserves in Venezuela are greater than in Saudi Arabia, and according to BP data, they are over 47.8×10^9 m³. The largest oilfield in Venezuela is *Bolivar Coastal* which was discovered in 1917. 94 % of hydrocarbon reservoirs in the Maracaibo Basin are found within Eocene-Miocene clastic rocks (**Talukdar and Marciano, 1994**). The biggest production was achieved within the *Trujillo* and *Musso* formation, Eocene Age and *La Rosa* and *Lagunillas*, Miocene age. The accumulation of oil within the Miocene part of the reservoir happens in structural traps, while both, structural and strati-

graphic traps are present within the Eocene (**Borger and Lenert, 1959**).

Another significant oil reservoir in Brazil is the field *Lula* or *Tupi*, which was discovered relatively recently, in 2006. The field was discovered in the geological formation known as *Pre-salt*.

2.3 Europe and Eurasia

The largest reserves of Europe and Eurasia in 2015 are in the Russian Federation, 6 % or 16.3×10^9 m³. European oil reserves are located mostly in the North Sea, where Norway and the United Kingdom have the largest share. Norway owns 0.5 % or 1.3×10^9 m³ of the world's oil reserves, while the United Kingdom has 0.2 % or 0.4×10^9 m³ of oil reserves. In Kazakhstan, there are 1.8 % or 4.8×10^9 m³ of oil reserves, in Azerbaijan 0.4 % or 1.1×10^9 m³, while the remaining countries within Europe and Eurasia have much less reserves, about 0.1×10^9 m³ (see **Figure 7**).

In 2015, the Russian Federation produced 12.4 % or 1.746×10^9 m³ of oil, while total production in this region amounts 19.4 % or $2,776 \times 10^9$ m³. Also, Norway has significant production in that year, 0.310×10^9 m³ or 2 %, Kazakhstan, 0.265×10^9 m³ or 1.8 % and the United Kingdom, 0.153×10^9 m³ or 1 %. However, it should be

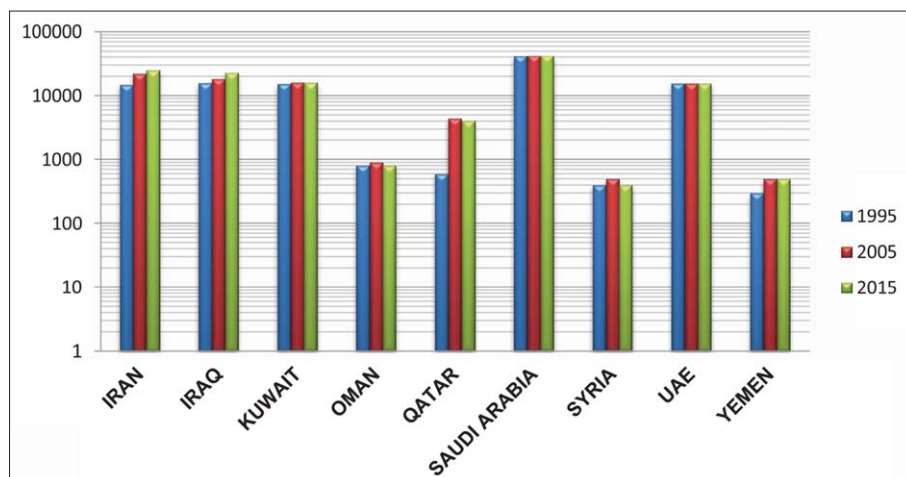


Figure 9: Oil reserves expressed in 10^6 m^3 at Middle East for 1995, 2005 and 2015 (adapted to: BP, 2016)

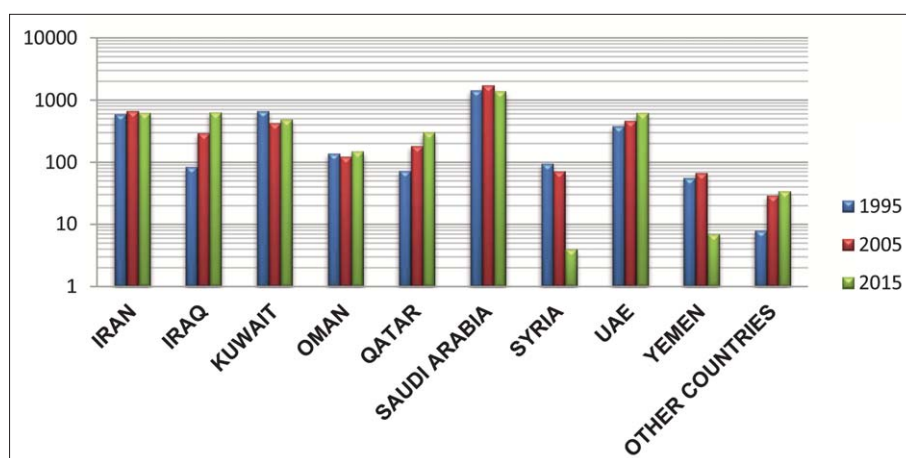


Figure 10: Oil production in the Middle East during 1995, 2005 and 2015. The gain values are expressed in 10^6 m^3 (adjusted to: BP, 2016)

emphasized that the United Kingdom recorded a significant drop in production. During 1995, it was $0.437 \times 10^9 \text{ m}^3$ and 2005 $0.93 \times 10^9 \text{ m}^3$. During the reference years, Azerbaijan recorded a significant increase in production, so in 2015, it was 1 % or $0.134 \times 10^9 \text{ m}^3$ in the global oil exploitation. There is also Turkmenistan with 0.3 % or $0.041 \times 10^9 \text{ m}^3$, Denmark with $0.025 \times 10^9 \text{ m}^3$ or 0.2 %, Italy with $0.018 \times 10^9 \text{ m}^3$ or 0.1 %, Romania with $0.013 \times 10^9 \text{ m}^3$ or 0.1 % and Uzbekistan $0.010 \times 10^9 \text{ m}^3$ or 0.1 % (see **Figure 8**).

The Republic of Croatia has a rich history in oil and natural gas extraction and processing. Currently around 60% of the needs for gas and 20% of the needs for oil are covered by local extraction which is in decline, and in regards to expectations of increasing demand in the future, it will become necessary to import larger quantities (Velić et al., 2016). Oil and natural gas have been produced onshore and natural gas also offshore in Croatia. $1.21 \times 10^9 \text{ m}^3$ of natural gas and $0.85 \times 10^6 \text{ m}^3$ of oil have been produced in Croatia in 2017. Despite all efforts for increasing hydrocarbon production, like the implementation of enhanced oil recovery (EOR) projects, production fell by 4.5% in comparison to 2016 (INA 2018). Croatia will certainly need new supply sources especially for natural gas if it wants to keep the high level of

natural gas security of supply (Karasalihović et al. 2010, Sučić et al. 2011).

2.4 The Middle East

The largest proven oil reserves, according to data from 2015, are in the Middle East, 47.3 %. "The richest" has been Saudi Arabia with 15.7 % or $42.4 \times 10^9 \text{ m}^3$ of oil. Others include Iran with 9.3 % or oil reserves in the world $25.1 \times 10^9 \text{ m}^3$ and Iraq with 8.4 % or $22.8 \times 10^9 \text{ m}^3$ oil reserves. Kuwait possesses 6 % or $16.1 \times 10^9 \text{ m}^3$ of oil reserves, and the United Arab Emirates 5.8 % or $15.5 \times 10^9 \text{ m}^3$. $4.1 \times 10^9 \text{ m}^3$ or 1.5 % of the world reserves has belonged to Qatar, and other countries in the Middle East have had less than 1 % of oil reserves. There has been Oman with 0.3 % or $0.8 \times 10^9 \text{ m}^3$, Yemen with 0.2 % or $0.5 \times 10^9 \text{ m}^3$ and Syria with 0.1 % or $0.4 \times 10^9 \text{ m}^3$ oil reserves (see **Figure 9**).

The Middle East, as the region with the largest reserves of oil, is also the region with the highest oil production with 33 % or $4.785 \times 10^9 \text{ m}^3$ in total world production. Saudi Arabia was the largest producer of oil with $1.910 \times 10^9 \text{ m}^3$ produced oil in 2015. Compared to Saudi Arabia, the remaining countries of the Middle East have far less production. During 1995, Iraq produced $0.084 \times 10^9 \text{ m}^3$, during 2005 it was $0.291 \times 10^9 \text{ m}^3$, and $0.641 \times 10^9 \text{ m}^3$ or

Figure 11: Oil reserves expressed in 10^6 m^3 in Africa for 1995, 2005 and 2015 (adapted to: BP, 2016)

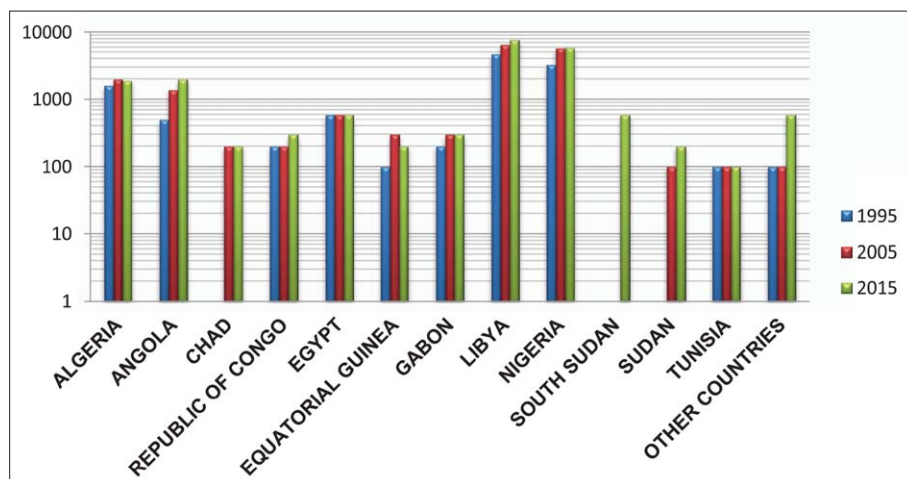
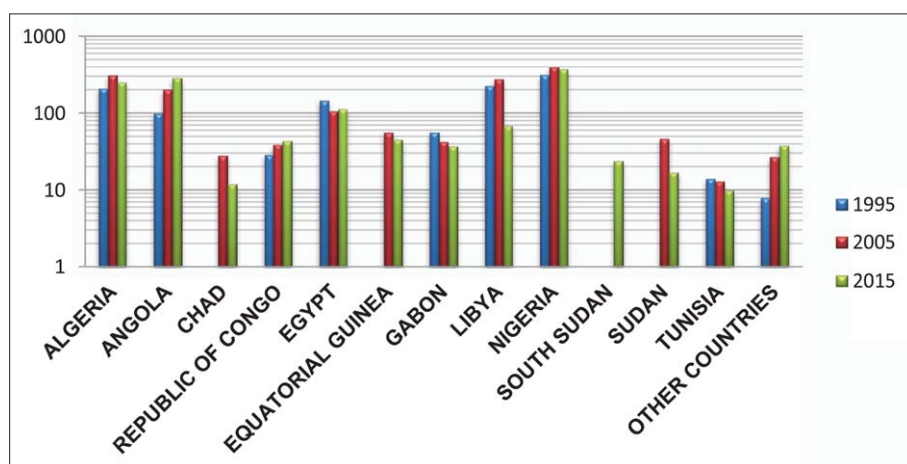


Figure 12: Oil production in Africa during 1995, 2005 and 2015. The gain values are expressed in 10^6 m^3 (adjusted to: BP, 2016)



4.5 % in 2015, which has made Iraq the country with the highest growth in the world. Following was Iran with production of $0.623 \times 10^9 \text{ m}^3$ or 4.2 % in 2015 and the United Arab Emirates with $0.620 \times 10^9 \text{ m}^3$ or 4 %. $0.491 \times 10^9 \text{ m}^3$ of oil was produced in Kuwait, which was 3.4 % worldwide, and $0.302 \times 10^9 \text{ m}^3$ or 1.8 % in Qatar, which has also recorded an increase in production since 1995 up to now. Also, significant production was achieved in Oman, 1.1 % or $0.151 \times 10^9 \text{ m}^3$, while Yemen and Syria gained less than 0.05 % in 2015 (see **Figure 10**).

Ghawar oilfield (located in the province *Al-Ahsi* was discovered in 1948. With 280 km length and 30 km width, it is the largest oilfield in the world and it produces more than half of total oil production in Saudi Arabia. Approximately 60 – 65 % of total Saudi oil production between 1948 and 2000 came from *Ghawar*. There is no more technical information available for this field. Available information is predominantly historical (pre-nationalization), from incidental technical publications, or anecdotal. Reservoir rocks are *Jurassic Arab-D limestones* with exceptional porosity (Velić et al., 2015).

2.5 Africa

Africa possesses 7.6 % of the world's total oil reserves. Libya has the most significant reserves, 2.8 % or

$7.7 \times 10^9 \text{ m}^3$, next is Nigeria with 2.2 % or $5.9 \times 10^9 \text{ m}^3$ and Algeria and Angola with reserves of 0.7 % or approximately $2.0 \times 10^9 \text{ m}^3$, while Egypt and South Sudan possess 0.2 % or $0.6 \times 10^9 \text{ m}^3$. The Republic of Congo and Gabon have 0.1 % or $0.3 \times 10^9 \text{ m}^3$ of oil reserves, and Chad, Equatorial Guinea and Sudan 0.1 % or $0.2 \times 10^9 \text{ m}^3$, while the lowest oil reserves own Tunisia, 0.1 % or $0.1 \times 10^9 \text{ m}^3$ or less than 0.1 % in the world's oil reserves (see **Figure 11**).

The biggest production for most of the countries of this region was achieved in 2005 and it was $1.560 \times 10^9 \text{ m}^3$, while in 2015, it was $1.332 \times 10^9 \text{ m}^3$ and the lowest production was in 1995, $1.131 \times 10^9 \text{ m}^3$. Nigeria has the highest production in this region, $0.374 \times 10^9 \text{ m}^3$, or 2.6 % in the total world production. In the world's total oil production, Angola is involved with 2 % or $0.289 \times 10^9 \text{ m}^3$, and Algeria with 1.6 % or $0.252 \times 10^9 \text{ m}^3$. Libya is the country with the greatest oil reserves in Africa and during 1995 and 2005, it achieved a significant production of $0.229 \times 10^9 \text{ m}^3$ or $0.277 \times 10^9 \text{ m}^3$. However, due to the difficult economic situation and the war in 2011, during 2015 there was a recorded decrease in exploitation of about 75 % and it was only $0.069 \times 10^9 \text{ m}^3$. Significant production was made in Egypt, $0.115 \times 10^9 \text{ m}^3$ or 0.8 %, Equatorial Guinea, the Republic of Congo and

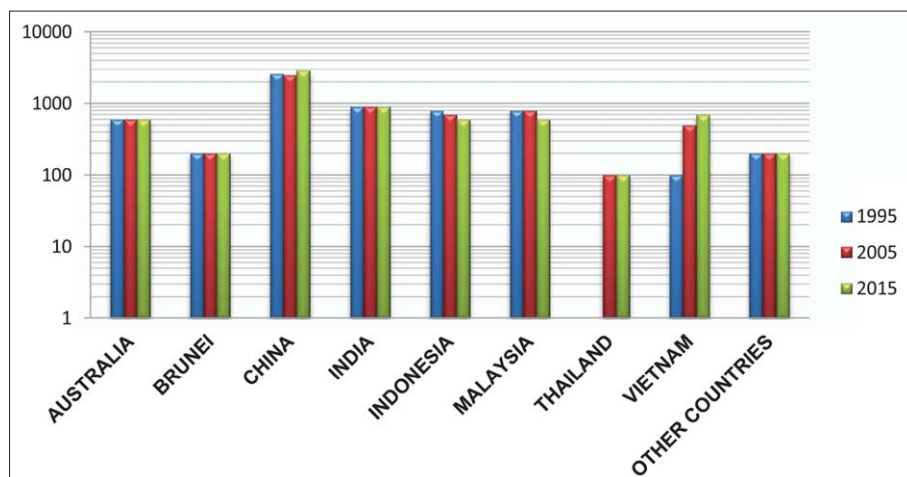


Figure 13: Oil reserves expressed in 10^6 m³ in Asia and Pacific for 1995, 2005 and 2015 (adapted to: BP, 2016)

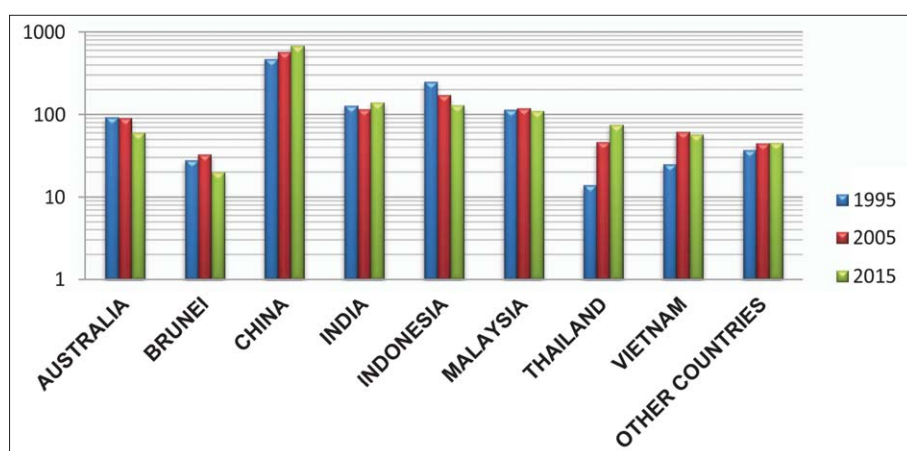


Figure 14: Oil production in Asia and the Pacific during 1995, 2005 and 2015. The gain values are expressed in 10^6 m³ (adjusted to: BP, 2016)

Gabon participate in the overall oil production with 0.3 % or 0.046×10^9 m³, Equatorial Guinea with 0.044×10^9 m³, and the Republic of Congo and Gabon with 0.037×10^9 m³. According to the BP report from 2016, there is no data for South Sudan production during 1995 and 2005, while in 2015, it amounted to 0.024×10^9 m³ or 0.2 %. Following was Sudan with production of 0.017×10^9 m³ or 0.1 % in 2015, but that was a decline of 64 % compared to 2005 when it produced 0.047×10^9 m³. The countries with the lowest production in this region are Chad with 0.012×10^9 m³ of oil and Tunisia with 0.010×10^9 m³ of oil, each participating in the global oil production with 0.1 % (see **Figure 12**).

The *Sarir field* was discovered in southern Cyrenaica during 1961 and is considered to be the largest oil field in Libya.

2.6 Asia and Pacific

Asia and the Pacific have the lowest oil reserves, only 2.5 %. In 2015, China had reserves of 1.1 % or 2.9×10^9 m³, with significant reserves, but less than 0.3 % were India, 0.9×10^9 m³, Vietnam, 0.7×10^9 m³ and Australia and Malaysia with 0.6×10^9 m³. Brunei owned only 0.2×10^9 m³, while Thailand had 0.1×10^9 m³ of oil reserves (see **Figure 13**).

Asia and the Pacific in total world production during 2015 participate with 9.1 %. China produced 4.9 % or 0.685×10^9 m³. Next were India and Indonesia with a production of 0.9 % in 2015, or 0.139×10^9 m³ for India and 0.131×10^9 m³ for Indonesia. In comparison with 1995, when Indonesia produced 0.251×10^9 m³, and 2005 and oil production of 0.117×10^9 m³, Indonesia recorded a significant decline. Malaysia produced 0.110×10^9 m³ or 0.7 % oil in 2015, Thailand 0.076×10^9 m³, Australia 0.061×10^9 m³ and Vietnam 0.058×10^9 m³ or 0.4 %. The lowest production in 2015, 0.1 % or 0.020×10^9 m³ was in Brunei (see **Figure 14**).

3. Reserves to Production (R/P) Ratio

The R/P ratio is the number of years during which an individual country or region with today's exploitation would exhaust the present reserves, assuming that neither the total amount of reserves nor the production of oil are changed. **Figure 15** shows the R/P ratio in 2015 in the world. Since both parameters are very variable in practice, the R/P ratio is intended exclusively for an estimation of global oil supply (**Dekanić and Karasalihović Sedlar, 2016**).

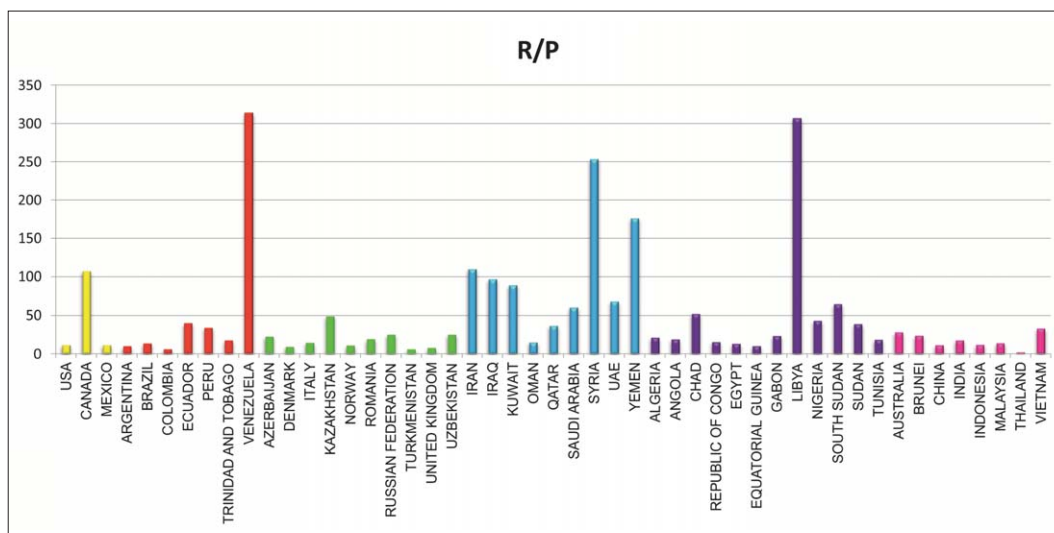


Figure 15: The R/P ratio in the world in 2015 (adapted to: BP, 2016)

4. The Oil Prices

Energy raw materials are economic goods with their value and price, which depends on their distribution and quantity. The oil market is represented with supply or exploitation of oil on one side and refinery processing or petroleum products consumption on the other (Nosić et al., 2017). When it comes to oil prices in the market, it is thought of the value of oil expressed in USD per barrel at a certain point on a particular market (Dekanić et al., 2004). The minimum oil price is always determined by maximum production costs, increased for profit. The same law applies to the lower oil price limit. This limit will always determine the costs of exploiting the most expensive unit of produced oil. Unlike the minimum oil price, which is determined by the cost of oil production, the maximum price is determined by the consumer’s readiness for oil derivatives (Grubišić, 2009). The value of oil reserves is an indicator for future profit of their production, as well as an indicator for judgment for the future management of energy companies because the value of the reserves enters into the value of the company’s core capital. The production cost of a single oil barrel is the most important component during the determination of profitability of exploitation and it ranges according to both, petroleum properties and drilling methods.

The main crude oil markets in the world are the North Sea, West Africa, the Mediterranean market, the Persian Gulf, the Asian region and the East and West coast of the United States. Depending on the market, there are several markers for crude oil price, such as Dated Brent, Dubai/Fateh, West Texas Intermediate (WTI), Alaska North Slope, (ANS) and Tapis & Minas (Nosić et al., 2017). Figures 16, 17, 18 and 19 show oil price trends of the above mentioned oil types from 1980 to 2015.

In 1979, a gradual rise in oil prices had started, as a result of production and export quotas of OPEC mem-

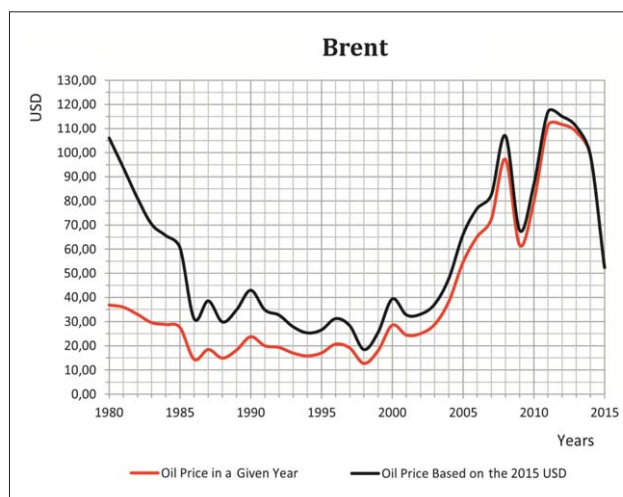


Figure 16: Brent oil price trends from 1980 to 2015 according to BP data (2016)

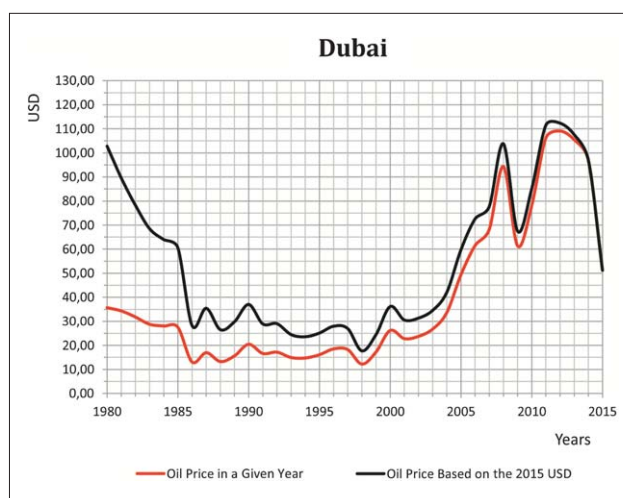


Figure 17: Dubai oil price trends from 1980 to 2015 according to BP data (2016)



Figure 18: Nigerian Forcados oil price trends from 1980 to 2015 according to BP data (2016)

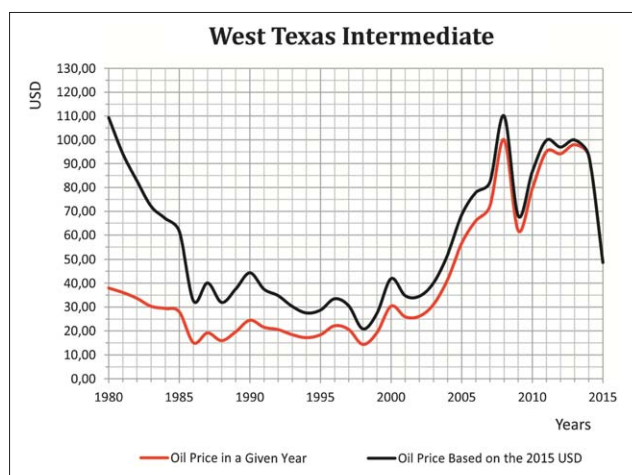


Figure 19: West Texas Intermediate oil price trends from 1980 to 2015 according to BP data (2016)

bers. In the 1980s, oil business began at the *New York Stock Exchange*. Oil has become a good for exchange and sold well in the market, but the prices have become unstable and unsafe. Customers have been able to buy oil at a certain price, and producers could sell oil, even before its production (Yergin, 1991). After the first crisis in 1973 and the other crisis in 1979, with an excessive supply of oil in 1986, the oil price fell below 30 USD per barrel. After that, oil prices rose steadily up to the end of the 1990s. The beginning of 2000s was characterized by a significant increase in oil prices. Thus, in 2008 the price of an oil barrel was over 100 USD. Energy consumption grew until 2007, and after the financial crisis in the United States and the economic recession (Dekanić, 2011). After the decline of oil prices at the beginning of 2009 to 70 USD for barrel, prices began to rise again, and at the end of 2009 and early 2010, the price was between 65 and 90 USD per barrel. During 2011 and 2012, the price of oil was above 100 USD, and fell to 50 USD in 2015. Various causes have influenced the constant change of oil prices, yet the most prominent

have been the geopolitical and economic crises of oil producers, wars and the huge increase in demand for the most populous countries in the world (such as China, India and Brazil). Oil prices depend primarily on geopolitical conditions, R/P ratio and surpluses of unused refinery capacities and oil reserves (Cerić, 2012). Hence, BP predicts that countries of rapid economic development, China and India, will play the leading role in increasing energy consumption in the coming years. Predictions are that demand for energy will rise 37 % until 2035, i.e. the increase will be 1.4 % per annum. According to BP's estimates, the oil market will grow by 0.8 % per annum.

5. Discussion and Conclusion

The contemporary world and economy are unimaginable without a constant energy supply. Among the primary forms of energy, the most important are oil and gas, which have almost completely changed human lifestyle.

At the beginning of the 20th century, oil penetrated in energy consumption and became a part of everyday life, economy and politics. Today, it is clear that economic and political power coincides with the main pillars of energy geopolitics. Humanity, however, does not have long-term fixed and secure supplies of energy with regard to the current mode of its use (Topić, 2017).

Although BP's data shows a global increase in oil reserves, which were $179.1 \times 10^9 \text{ m}^3$ in 1995, $218.5 \times 10^9 \text{ m}^3$ in 2005, and $269.9 \times 10^9 \text{ m}^3$ in 2015, continuing its current use for energy, the oil reserves might disappear within half a century. The reason for this are numerous unconventional oil fields such as those in Alberta, Canada, but those alternatives have not been technologically or commercially suitable for environmentally suitable use, yet. By analysing oil reserves, oil production and movements of oil prices, it can be concluded that almost every increase in oil production, after the discovery of oil deposits, was later accompanied by a decrease in prices. In other words, the discovery of oil would stimulate prosperity, and then the oil price crashes. That decline in oil prices will lead to a fall in production. In addition, political instability and tensions, as well as war threats, have an impact on raising the uncertainty of oil production.

Due to the growing demand and demand of energy, there will be an increase in exploitation capacity, which will result in new research in deeper parts of the Earth's surface, in the underwater or in polar regions. Most of the world's future productions are expected in developing countries, because they have the most profitable production capacities and facilities.

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SAŽETAK

Analiza kretanja rezervi, pridobivanja i cijena nafte u svijetu 1995., 2005. i 2015. godine

Prema analiziranim podacima rezervi i pridobivanja nafte u svijetu 1995., 2005. i 2015. godine zabilježen je globalni porast rezervi nafte koje 1995. godine iznose $179,1 \times 10^9 \text{ m}^3$, 2005. godine $218,5 \times 10^9 \text{ m}^3$, a 2015. godine $269,9 \times 10^9 \text{ m}^3$. Prema podacima koje donosi *British Petroleum* pridobivanje nafte jednako tako raste u razmatranome razdoblju, ali s manjom stopom porasta. Tako pridobivanje nafte u svijetu 1995. iznosi $10,8 \times 10^9 \text{ m}^3$, 2005. godine $13 \times 10^9 \text{ m}^3$, a 2015. godine $14,6 \times 10^9 \text{ m}^3$. Kretanje cijena nafte analizirano je u razdoblju od 1980. do 2015. godine. Mnogo različitih uzroka utječe na konstantne promjene cijena nafte, ali najutjecajniji čimbenici jesu geopolitičke krize u zemljama Srednjega istoka, velik porast potražnje za naftom i ekspanzija potrošnje u državama s velikim brojem stanovnika poput Kine, Indije i Brazila koja nije praćena odgovarajućim porastom ponude. Suvremeni politički odnosi puni su sukoba, što uvelike utječe na cijene nafte, a najbolji su primjer za to kratkotrajni porast cijena nafte 2011. godine, kada su u Libiji, koja u ukupnome svjetskom pridobivanju sudjeluje s 0,5 %, započele oružane aktivnosti, ili onemogućavanje pridobivanja u državama poput Sirije i Jemena koje u 2015. godini jedva bilježe pridobivene količine. Usporedbom podataka o rezervama, pridobivanju te kretanju cijena nafte razvidno je da je gotovo svaki porast pridobivanja nafte, kasnije bivao popraćen padom cijena.

Ključne riječi:

rezerve nafte, pridobivanje nafte, cijene nafte, potrošnja nafte

Authors' contribution

Marija Ledenko (MS. in Geology) made this research as part of her graduate thesis. **Josipa Velić** (Prof. Emerita) participated in the geological analysis of reservoir geology and time vs. production. **Daria Karasalihović-Sedlar** (Assoc. Prof.) analysed the petroleum engineering aspect of data vs. time and regions.