

SCENARIO ANALYSIS FOR FUTURE OIL DEMAND AND
SUPPLY ON THE HORIZON OF 2022

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This study indicates signs of recovery in the oil price beyond 2020 and predicts oil prices will reach \$80 in 2022. This scenario posits an opposite view to a large number of experts who believe that oil prices will remain low for a long time. The second less preferred scenario predicts oil prices of \$60 in 2022 due to a big spread in shale oil production technology worldwide, combined with a significant increase in oil production costs.

Keywords: *conventional oil, oil demand, oil price, oil supply, unconventional oil.*

1. INTRODUCTION

Global oil consumption increases significantly each year. The transportation sector, as well as urbanisation and the increase in the standard of living will be the main forces of oil consumption in the future, especially in developing countries. The increase in the global population also has a crucial impact on the growth of future oil demand. The strong rise in unconventional oil production was the main driver for a recent oil supply glut, which has caused a huge oil price fall since July 2014. This paper emphasises conventional oil depletion in different areas worldwide as well as limitations on unconventional oil production in North America by analysing two different scenarios for future oil prices in 2022.

2. METHODOLOGY

This paper uses scenario analysis to estimate the future oil price in 2022. This is an important tool in the world of finance and economics to make projections for the future. Scenario analysis is a process of analysing possible future events by considering alternative outcomes. As the main method of economic projection, scenario analysis presents several alternative future developments and does not try to analyse

only one exact picture of the future [1]. Unlike forecasts, it does not extrapolate from the past; historical data are not expected to outline future projections. Rather, it takes into account possible developments and turning points connected to the past. Through the development and use of scenarios, we challenge our expectations and are better prepared for the unexpected outcome, when it occurs.

Purpose of the research: This paper aims to describe two scenarios for future oil prices based on future oil demand and supply in 2022 and evaluate the preferred and more probable scenario depending on different factors of supply and demand.

3. RESEARCH AND DISCUSSION

3.1 Future Oil Demand by 2022

The significant key drivers for future oil demand growth are the rising world population, rapid urbanisation, the increase in the living standard (especially in developing countries), and the transportation sector. This last driver is the most important key driver for oil demand growth in the future.

According to the United Nation Department of Economics, the world population is expected to reach 7349 million at the end of 2015 and 8501 million in 2030 [2]. Based on this estimation and current growth trends, the world population is expected to increase about 8 % (around 83 million each year) and reach 7930 million in 2022. The rise appears mainly in developing countries in Asia, Africa, Latin America, and the Middle East. By 2022, the population of India will surpass that of China to become the largest populated country.

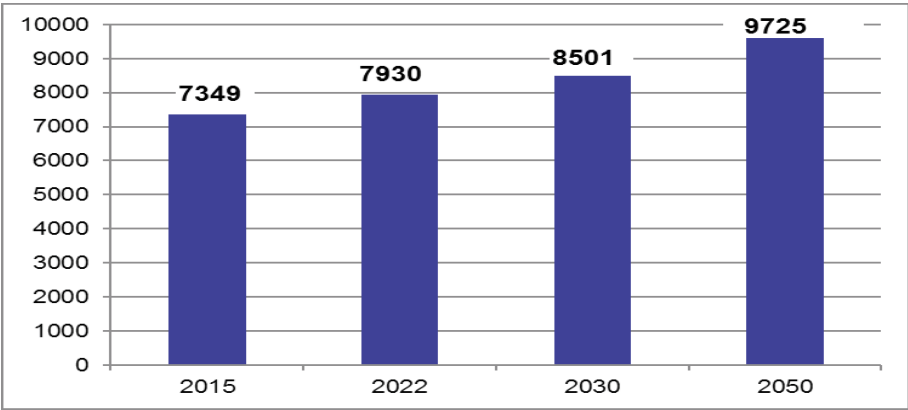


Fig. 1. Expected future world population.

Urbanisation will have very important implications in terms of future oil consumption, since the lifestyle (including vehicle ownership patterns as well as vehicle miles travelled) is closely linked to urbanisation trends. Nowadays, there are more people living in urban areas than in rural areas. The United Nations forecasts that about 54 % of the world’s population in 2014 [3] is living in urban areas and estimates that the world’s urban population will increase to reach 66 % in 2050. Based on this estimation, the world’s urban population is expected to rise respectively to

reach 57 % in 2022. This trend will be stronger in developing countries, especially in Asia and Africa. Worldwide, around 550 million more people will live in urban areas by 2022, in comparison with 2015.

Increases in the living standard in developing countries where economic growth is expected to be above 6 % on average in China and India in the next five years [4] will lead to rapid increases in oil consumption per person in 2022. This trend will appear very strongly in China, India, and Indonesia. Oil demand is rising as hundreds of millions of people in China, India, Indonesia, and other developing countries move out of poverty and turn to a modern lifestyle using increasingly more fuel based transportation.

India and China have increased their oil consumption rapidly in recent years. This trend will continue in the future. Annual oil consumption per capita in China and India is expected to increase very strongly by about 30 % from expected 2.9 and 1.3 barrels/year in 2015 to reach around 3.8 and 1.7 barrels/year in 2022. Whereas in the USA, oil consumption per person is 22.2 barrels/year and this level will remain almost the same in the next seven years. China and India still have a huge gap to fill before reaching the world average of about five barrels/year.¹

The importance of the transportation sector to future oil demand growth appears huge. From demand growth due to social mobility in developing countries, especially in China, and India, there are also growing numbers of automobile users as well as a fast-growing demand for air transport in recent years. This trend will continue in the future.

The transportation sector is a significant key driver of future oil demand growth. On the one hand, the total number of passenger cars is expected to increase rapidly in 2022 by around 260 million (about 23 %) to reach 1.4 billion. This growth will appear prominently in developing countries, with around 200 million cars more over this period of time. The number of heavy and commercial vehicles is also expected to increase strongly (about 24 %) to reach almost 290 million by 2022.² The main influence for this growth will be developing countries. On the other hand, efficiency improvements, the use of alternative fuels such as biofuel, and the adoption of non-oil-based engines, tend to be limited. The number of electric cars reached one million in 2015 worldwide and the potential for this market will be limited in the near future. Thus, the possibility of switching from oil-based engines to battery electric cars will be only visible in the long term, perhaps after 2030.

International tourist arrival is expected to reach almost 1.5 billion in 2022; about 26 % more compared with the expected estimate of 1.185 billion in 2015[5]. This will be a very important indicator for future oil demand growth. In this regard, Airbus Group is expecting a new demand for 32,600 airplanes in the next 20 years [6]: about 13,100 for replacement and 19,500 increasing from 19,000 at the beginning of 2015 to reach 38,500 in 2034. That means the number of airplanes is

¹ Based on the worldwide average for oil consumption about 96 million barrel / day and world population 7349 million.

² This expectation for the reference year 2022 based on different estimations for the total current number of passenger cars and heavy commercial vehicles as well as the potential growth in the future.

expected to increase by about 8,000 to reach 27,000 at the end of 2022 and that will lead to an increase in the oil demand for the aviation sector from the expected 5.5 in 2015 to 7 million barrels per day in 2022.

Our previous experience with various estimations from different international authorities proved, in most cases, to underestimate the future oil demand. The previous estimation in World Oil Outlook from Organization of the Petroleum Exporting Countries OPEC in 2013 for oil demand in 2015 was 91.6 million barrel/day. However, nowadays the current estimation for 2015 is about 92.88 million barrel/day, which is 1.22 million barrels a day higher than previous estimation by the Organization of the Petroleum Exporting Countries OPEC. International Energy Agency (IEA) estimates oil demand about 94.54 million barrel/day on the average and U.S. Energy Information Administration around 93.82 million barrel/day. Based on these estimations from the three different international authorities, oil demand is expected to be about 93.75 million barrel/day in 2015. Taking into consideration the effects of all key drivers of oil demand growth in the future and the assumption for no ambiguity on the demand side in the next seven years, only one scenario will be considered for oil demand in 2022. In this scenario the oil demand is expected to increase about 8 million barrel/day over the time period of 2015–2022, reaching around 102 million barrel/day in 2022. The big question will still remain: are we going to have enough oil supply to satisfy the increase in oil demand?

3.2 Future Oil Supply by 2022

Conventional oil:

The production of conventional oil has remained essentially flat in recent years, while there has been growth in unconventional oil usage in North America. I believe this is the general belief of most experts, but let us consider the ideas of others, who say we have not reached the peak (the concept of limitations on conventional oil production) yet. But that does not mean we are very far from reaching the peak; if we have not reached the peak yet, we will definitely reach the peak very soon.

The existing conventional oil fields are being depleted in increasing numbers of regions worldwide; in the next two decades, without replacement of old fields in depletion areas where constant drilling of new wells are necessary, the global conventional oil production will quickly shrink. In order to keep the oil flowing in the last decade, the oil companies worldwide have invested more than 4 trillion \$ for oil drilling. Around \$2.5 trillion of this was spent on replacing production from existing exhausted oil fields [7].

The investment in oil production is expected to decrease about 20 % in 2015 [8] as well as in 2016 because of strongly decreasing oil prices by about 70 % in the last 15 months. Wood Mackenzie energy consultancy said that low oil prices were forcing companies to cancel projects worth \$170 billion which had been planned to be implemented between 2016 and 2020 [9]. In addition, the cost of capital is expected to increase in the near future after the first step since 10 years to increase the discount rate with 0.25 % in the USA in December 2015. Investments in oil

production in the future are going down, which can lead to significant stagnation or limitation in the oil supply in the coming few years. This will tend to limit the ability to increase the conventional oil production in the period of time 2020–2022. The international oil companies have reached their limits; their profits fell rapidly in 2015. Costs for finding and developing new oil fields have tripled since 2005 and the return from these costs has not been enough to cover the costs in 2015 in some cases. Most international oil companies have announced significant reductions in their exploration and drilling programmes in the next few years [10].

Oil fields have similar lifecycles. Upon drilling a well, oil is increasingly extracted until it reaches its optimal production after which it declines due to depleting oil stocks. Technological innovations can extend well life, but depletion is inevitable [11].

The business of estimating oil reserves is controversial and political; most official figures are unreliable. Estimating reserves is a huge challenge; there is a range of genuine uncertainty as well as political manipulations to consider. The discovery of new conventional oil fields has been nearly exhausted in recent years and is expected to be dramatically limited in the future. Based on that assumption, there will be no new discovery for conventional oil in the coming few years. From this we can estimate the time frame for oil depletion in many countries worldwide.³

Table 1

Expected Oil Depletion in Many Countries Worldwide

Country	Proven conventional oil reserve in billion barrel	Production of conventional oil in million barrel / day	Oil consumption in million barrel / day	Estimated time frame for oil depletion
UAS ¹	30	5	19.5	2030–2032
China	25	4.6	11	2028–2030
Brazil ²	15	3	3	2028–2030
Algeria	12	1.7	0.42	2033–2035
Mexico	10	2.8	2	2025–2027
Angola	10	1.75	0.12	2030–2032
Azerbaijan	7	0.9	0.1	2035–2037
India	5.7	1	4	2030–2032
Norway	5.5	1.9	0.22	2023–2025
Oman	5.5	1	0.175	2031–2033
Egypt	4.5	0.7	0.8	2030–2032
Malaysia	4	0.7	0.7	2030–2032
Indonesia	3.7	0.9	1.8	2027–2029
UK	3	0.9	1.5	2025–2027
Argentinian	2.4	0.7	0.8	2025–2027

If we consider the fact that oil will dry up in many areas in the next two decades and there will be redistribution in oil supply, most oil supply in the future will be coming from certain and limited geographical areas. That will dictate a great geopolitical challenge as well as a potential risk for oil supply.

³ These expectations are based on various estimations and different sources of data for 2015.

The major technical modalities of alternative energies (solar and wind energy) face great challenges in respect to being intermittent in nature. Furthermore, we are still lacking the technology to properly store energy.

Considering the fact that we had only a slight increase in investment in the last two years in the alternative energy field, investment in the alternative energy on a large scale needs a political decision, which in most instances lacks popularity.

The importance of the transportation sector, which accounts nowadays for about 58 % of oil consumption worldwide, to future oil demand growth appears largely from demand growth in mobility and the limited fuel switching possibilities. In the next seven years the potential to switch from fuel based engine to electric battery cars will be limited; the total global sales of electric vehicles will be about 500,000, whereas global vehicle sales are projected to reach approximately 89 million units in 2015.

The total number of electric cars is expected in a best case scenario to reach 20 million in 2020 [12] less than 1.5 % of all passenger cars. The adoption of non-oil-based engines will develop strongly in the long term especially beyond 2030.

Unconventional oil:

The highest potential for additional biofuels exists in the US, Europe, and Brazil. The biofuel supply in the medium-term will rise from an expected two barrel/day in 2015 to about 2.7 in 2022. In a long term scenario, it will reach almost 5 million barrel / day in 2035 [13]. Biofuels will remain costly, limited, and may be developed at the expense of feeding people.

Initial estimations for shale oils were amazing and surprising, but nowadays the current estimations have been slimmed down. About \$400 billion [14] has been used to drill shale oil and gas wells in the US, and increase oil sands production in Canada since 2009. North American unconventional oil production constitutes nearly all the growth in oil supply worldwide in recent years.

Tight oil supply from US & Canada is expected to plateau by 2019/2020 [13]. Many experts opine that the tight oil reserves are close to being exhausted and that more expensive unconventional oil reserves such as shale oil and heavy oil, deep-water oil as well as renewable energy sources may need to be exploited.

US production of tight oil production fluctuates in the short term but will register an upward trend as prices recover and technologies improve [8]. US tight oil output is predicted to reach a plateau in 2020, just about 5 million barrel /day, before starting a gradual decline.

Over the past six years, unconventional oil production has undergone a revolution especially in North America with significant increases in production from oil sands in Canada, tight oil, and shale oil in the US. The US has been the main driver of crude production growth recently. Hydraulic fracturing and horizontal drilling technology have enabled large scale extraction to shale oil at relatively economic costs leading to a growth in global oil production [15].

Just 18 months ago, a barrel of crude oil was around US\$110. Nowadays the same barrel of oil is trading for less than \$30, with oil prices lower than \$30 it be-

comes increasingly harder for higher cost shale oil producers to compete with low-cost producers such as those in the Gulf region.

Shale oil production is more complex and expensive than conventional oil production. The International Energy Agency supposes maintaining production at one million barrels per day. The Bakken shale oil field requires 2,500 new wells a year; a large conventional field in southern Iraq needs just 60 [16]. According to a new analysis by Moody's Credit Rating Agency, the median North American shale oil producer needs \$42 per barrel to cover costs [17], in contrast the cost for conventional oil in the Gulf region is about \$13 per barrel, such as Ghawar giant oil field in Saudi Arabia with around 5,000,000 oil barrels output per day, Burgan field in Kuwait with 1,700,000 barrel/day, and Rumaila field in Iraq with 1,300,000 barrel/day. The shale oil industry cannot survive on \$30 oil prices, whereas the Middle East could still gain significant profits.

Lower oil prices have huge implications in the shale oil industry, while production efficiency advancements, which include maximising initial production rates, improving ultimate recovery from each new well, reducing average drilling costs and accelerating drilling time over the past 18 months have pushed down the break-even prices to be as low as \$30 for some US shale producers, in the best areas of already existing oil fields, and significant decreasing of the marginal cost from about \$ 70 two years ago to less than \$50 today on the average.

The low price of crude oil has cut the number of drilling rigs in the United States by almost two-thirds, from 1,600 to almost 500 [18]. Shale drilling is becoming more efficient and less expensive due to benefits from improvements in technology.

Nowadays, lower oil prices have a negative impact on shale oil investor portfolios. In recent years, it has still been relatively easy for shale oil producers in the US to raise capital by selling debt or equities, in spite of the past 18 months' oil price crash caused by a global oil supply glut. At the beginning of 2016, this crash decreased revenue significantly, which currently means some shale oil producers are operating at a loss. Also, the cost of capital has increased gradually after the US Federal Reserve started to raise interest rates. Since December 2015, the amount of debt held by US oil and gas producers has climbed to slightly more than \$200 billion in 2015 [19]. As a consequence, some shale oil producers have seen a huge reduction of their debt rating and are now facing difficulty obtaining financing and face looming bankruptcy. Capital is starting to dry up for US shale oil producers or become distinctly costly, which leads to roughly about a 20 % expected reduction in investment in shale oil industry in 2016 and 2017.

This situation will probably force some shale oil producers to leave the market, which means the US total oil production is expected to decrease by about 700,000 barrel a day on the average in 2016. The U.S. Energy Information Administration (EIA) said in a forecast released recently that U.S. oil production peaked at 9.7 million barrels a day last April 2015, the highest level since 1971. U.S. crude oil production is expected to decrease from an average of 9.4 million in 2015 to 8.7 million in 2016, and is projected to bottom out at 8.5 million barrels a day in 2017 [20].

The production of shale oil damages the environment and does not ensure

security for oil supply in the long term. The Natural Resources Defence Council (NRDC) warns about the danger of shale oil production. The study explores the potential environmental impact of extracting shale oil [21], and makes reference to environmental damage in the water resources [22] as well as in the agriculture sector caused by the chemicals used in the shale oil production. In addition to environmental implications of shale oil production, the big question will remain in the future, whether it makes sense to extract shale oil resources as a substitute for the depleting of conventional oil. Nowadays, there is a huge debate in the US about the environmental damage caused by shale oil production, which will probably limit the spread of shale oil production nationwide or abroad.

Scenario I:

Global supply of oil is currently expected to be about 1.5 million barrels per day on average. The expected decline in the total US oil production in 2016 and probably also the decline in non-OPEC oil production in the coming two years as a result of the crash in oil prices (as well as the huge reduction in investment) will eliminate the current oil supply glut in 2017/2018, and lead, probably, to a shortage in oil supply beyond 2020 as the demand increases strongly in developing countries such as China, India, and Indonesia.

According to most forecasters, global oil demand is growing annually more than 1 million barrels a day on the average in the next seven years reaching about 102 million barrel a day in 2022, which must be met from an increase in supply somewhere. According to the EIA ("Short-Term Energy Outlook", August 2015), US oil production has held up surprisingly well in the face of a fall in prices, but is expected to be lower at the end of both 2015 and 2016 than at the end of 2014.

Rising interest rates as well as a wave of expected bankruptcies will increase the cost of capital; decreasing conventional oil production by non-OPEC producers such as in the North Sea and Gulf of Mexico and increasingly shift to expensive oil such as shale and deep-water oil to replace depleting fields. This will increase the marginal cost of production. In addition, shale oil production will not be able to compensate for the expected decline in US conventional oil production beyond 2020, so most oil supply in the future will be coming from geographically limited areas, mainly the Middle East, Venezuela, and Russia. However, the estimates for the future oil supply have not taken into consideration the potential of future geopolitical challenges which seem inevitable. We are just seeing now the changes in East Europe and the ongoing turmoil in the Middle East. Taking into consideration the turmoil in these regions, which is expected to continue in the future and adding risk premium for probable disturbances in future oil supply to future oil prices, we come up with the following first scenario:

Expected preferred scenario for oil price is to fluctuate around \$ 80 in 2022.

Scenario II:

The second scenario is based on the following two positive assumptions for oil supply: 1. significant growth in conventional oil production outside as well as inside Organization of the Petroleum Exporting Countries (OPEC) will continue. 2. The continuation of techniques pioneered for shale oil production to other areas in

the United States and abroad to countries such as China, Russia, and Argentina. In places other than the US and Organization of the Petroleum Exporting Countries, growing oil production requires major investment to offset decline rates from existing wells and add extra output. Taking into consideration the expected rise of the cost of capital in the near future as well as the expected increase in the marginal cost as a negative factor for an increase in oil production cost will lead to the following second scenario:

Expected less preferred scenario for oil price is to fluctuate around \$60 in 2022.

4. CONCLUSION

This study revealed two possible scenarios for future oil prices based on the analysis of expected future oil demand and supply in 2022, taking into consideration, on the one hand, the depletion of conventional oil supply in some geographical areas worldwide; and on the other, the potential and limitations of the unconventional oil supply, especially in North America. Oil is a limited resource, and the remaining accessible reserves are consumed more rapidly each year. Remaining reserves are increasingly more technically difficult to extract and therefore more expensive.

The depletion of conventional oil in different areas worldwide and the limitation on the unconventional oil production due to environmental damage, the higher cost of production and the expected reduction in investment in oil sector worldwide in the coming few years will lead to the elimination of the oil supply glut by 2018. This will stabilise the oil market for some time and lead to a significant recovery of oil prices in 2022. Future extraction of oil reserves will be extremely costly.

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NAFTAS PIEPRASĪJUMA UN PIEDĀVĀJUMA IESPĒJAMO SCENĀRIJU ANALĪZE LĪDZ 2022. GADAM

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K o p s a v i l k u m s

Publikācija apkopo autora individuāla pētījuma rezultātus, kas veikts Emirātu Tehnoloģiju koledžā (Abū Dabī, AAE) un Šārdžas Universitātē (Šārdža, AAE). Pirmoreiz pētījums prezentēts „Pasaules tendenču, ideju un biznesa kontaktu forumā” (Rīga, Latvija, 2014. gada 10.–11. aprīlis). Attiecībā uz pirmo vēlamā scenāriju par naftas cenu atvērēšanos pazīmēm pēc 2020. gada, tiek secināts, ka 2022. gadā tās sasniegs 80 ASV dolārus. Šis scenārijs nesakrīt ar daudzu ekspertu viedokli, kuri paredz, ka zemas naftas cenas saglabāsies vēl ilgu laiku. Savukārt otrs, mazāk vēlamais scenārijs paredz naftas cenu celšanos 2022. gadā līdz 60 ASV dolāriem. Tas tiek skaidrots ar iespējamu slānekļa naftas ražošanas tehnoloģiju izplatību visā pasaulē, kas norisinātos vienlaikus ar naftas ražošanas izmaksu pieaugumu.

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