

## Some Statical Studies on World Primary Energy Resources with Future and Environmental Aspect

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### ABSTRACT

*Energy is a key interpretative of modern society and economy. The global economy became ambiguous due to COVID-19 and abnormal level of mass protests throughout the world. World primary resources are mainly fossil fuels like crude oil, natural gas and coal which are indispensable sources of energy and necessary for world economic and technological progress. Resources of these fossil fuels are depleting due to increase in demand of energy day by day. Although world proved reserves of fossil fuels increases but production rate so high that these resources may disappears in future.*

**Keywords:** Energy, Environment Crude oil, Coal, Natural Gas.

### INTRODUCTION

Conventional energy resources such crude oil, natural gas, coal and nuclear are finite but still capture most of the energy market. (Sims, 2004, & Gilles Lafforguea et al., 2008). Yet, renewable energy resources such as solar energy, wind energy, biogas/biomass, fuel cells, tidal energy and geothermal energy etc. are clean and abundantly available in nature. (Ram Avtar et al., 2019). But it is very difficult to convert this type of disorganized form of energy into organized form of energy in efficient manner. (Akhtar et al., 2015). Each types of resources have certain advantages and disadvantages for example conventional energy resources are very portable but environmental issues discourage their uses. (Forsberg et al., 2009) Whereas renewable energy resources are environmentally friendly

(Ellabban et al., 2009, & REH, et al., 2004) but their production cost is high at present time. (Brennan et al., 2010). Fossil fuels are extensively used in transportation, to generate electricity, heating homes, and in production industries among others. (Avtar et al., 2019). Growth of global primary energy consumption is 1.3% in 2019 which is less than half the growth rate in antecedent year. (World energy report, 2020).

### MATERIALS AND METHODS

In present research paper a statistical analysis of different energy resources has been done. The resource and reserve volumes confer here are from world leading energy agencies like world economic forum (WEF), OPEC and trusted by most of the lead authors.

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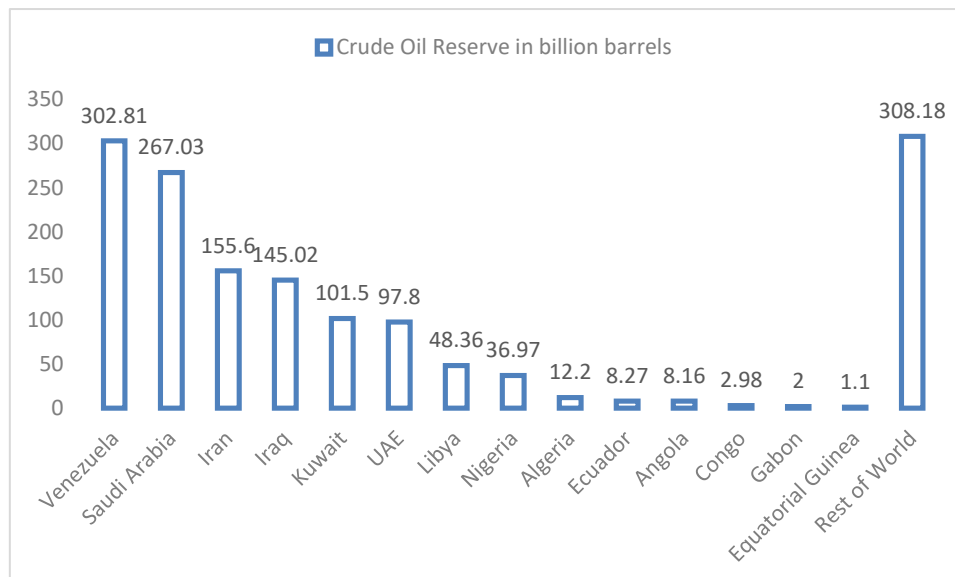
**DISCUSSION****ENERGY RESOURCES AND THEIR SHARE IN PRIMARY ENERGY:**

**Crude Oil:** World 79.4 percent oil reserves are in OPEC whereas only 20.6 percent oil reserves located in rest of world. (OPEC, 2019). Out of OPEC countries Venezuela has

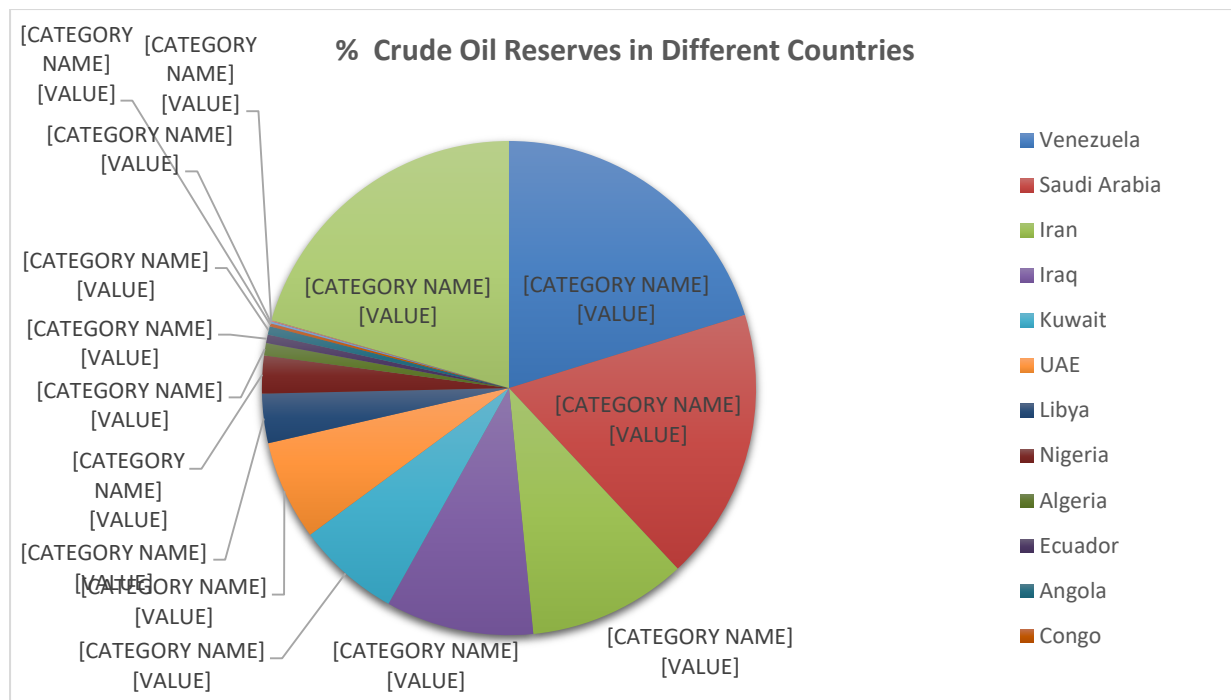
maximum oil reserves 302.81 billion barrels. Other leading countries are Saudi Arabia 267.03 billion barrels, Iran 155.60 billion barrels, Iraq 145.02 billion barrels, Kuwait 101.50 billion barrels. Table: 1 show the world estimated crude oil reserve in 2018.

**Table 1: World estimated crude oil reserve [Source: OPEC (2019) Annual statistical bulletin]**

SR. No.	Country	Crude Oil Reserve in billion barrels
1	Venezuela	302.81
2	Saudi Arabia	267.03
3	Iran	155.60
4	Iraq	145.02
5	Kuwait	101.50
6	UAE	97.80
7	Libya	48.36
8	Nigeria	36.97
9	Algeria	12.20
10	Ecuador	8.27
11	Angola	8.16
12	Congo	2.98
13	Gabon	2.00
14	Equatorial Guinea	1.10
15	Rest of World	308.18



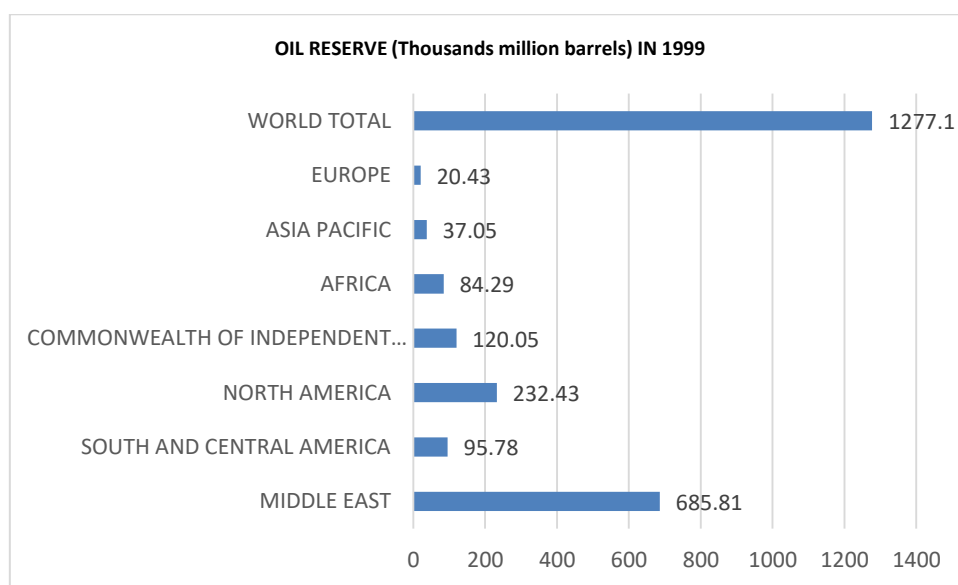
**Fig. 1: Crude oil reserves of OPEC country and world**



**Fig. 2: Percentage wise Crude oil reserves of OPEC country and world**

**Crude Oil Cumulative Production vs Net Addition:** During the era 2009 to 2018 OPEC members countries crude oil net addition to reserves is 186.2 billion barrels whereas to net addition to reserve is 24.6 billion barrels by rest of world. Cumulative production by OPEC in this was 113.8 billion barrels whereas cumulative production by rest of world was 152.1 billion barrels. (OPEC, 2019).

**Distribution of crude oil proved reserves:** From last three decades Total world crude oil proved reserves continuously increasing in 1999 reserves was 1277.1 thousand million barrels, in 2009 these were 1531.8 thousands million barrels and in 2019 these were 1733.92 thousands million barrels. (WEF, 2020).



**Fig. 3: World proved oil reserves in 1999**

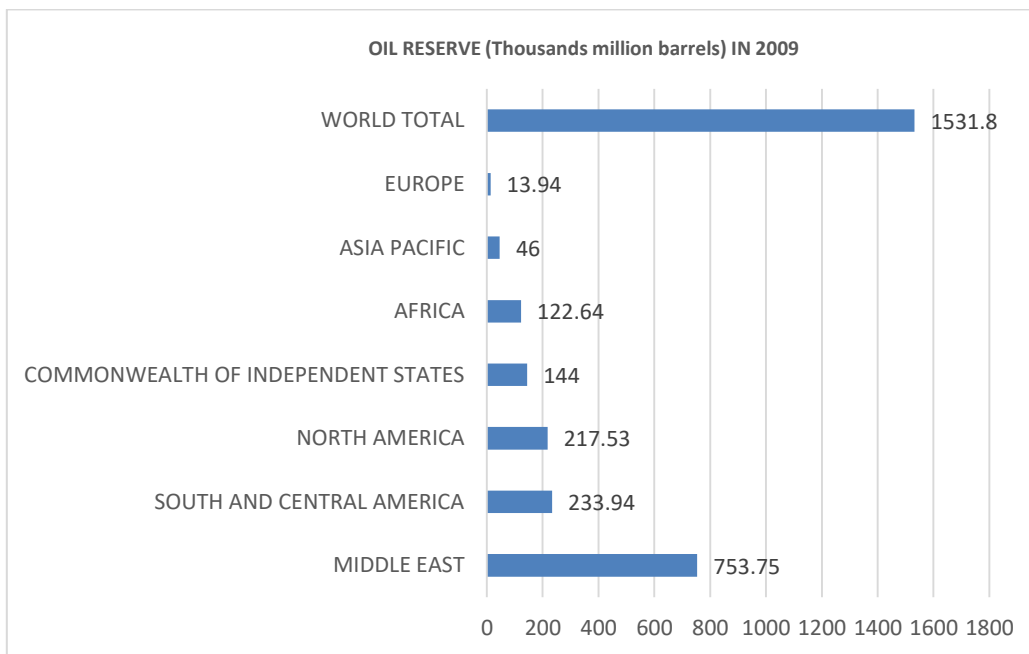


Fig. 4: World proved oil reserves in 2009

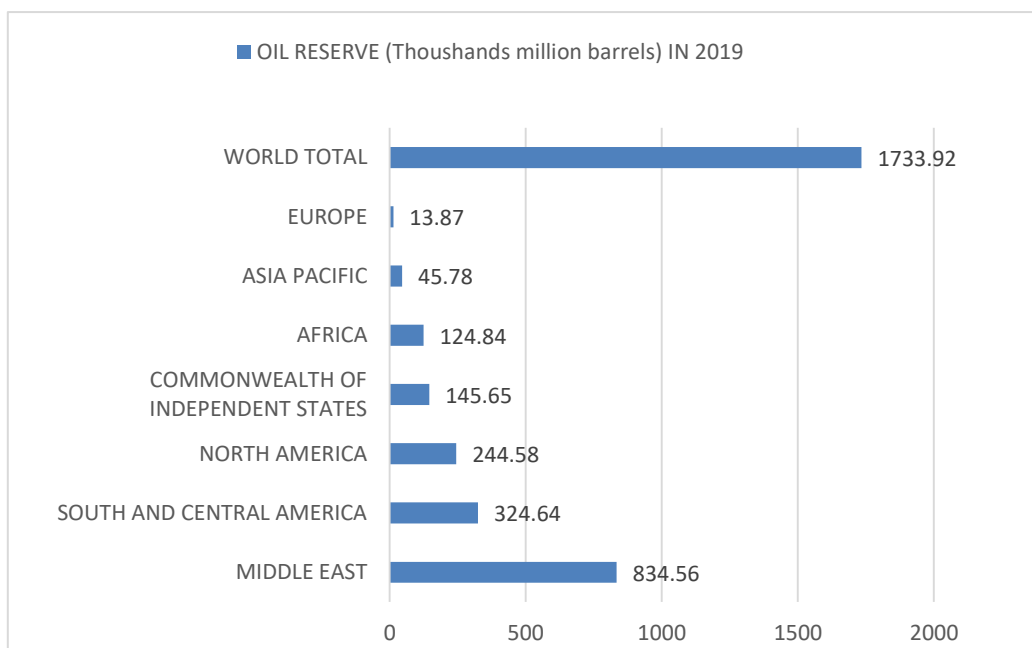


Fig. 5: World proved oil reserves in 2019

**NATURAL GAS:** Total world natural gas proved reserves continuously increasing in 1999 reserves was 132.8 trillion cubic metre. In next decades world natural gas proved reserves increases significant manner and it

was 170.5 trillion cubic metre in the end of 2009. From 2009 to 2019 there was slow increases of world natural gas proved reserves and, in the end of 2019, proved coal reserves was 198.5 trillion cubic metre. (WEF, 2020).

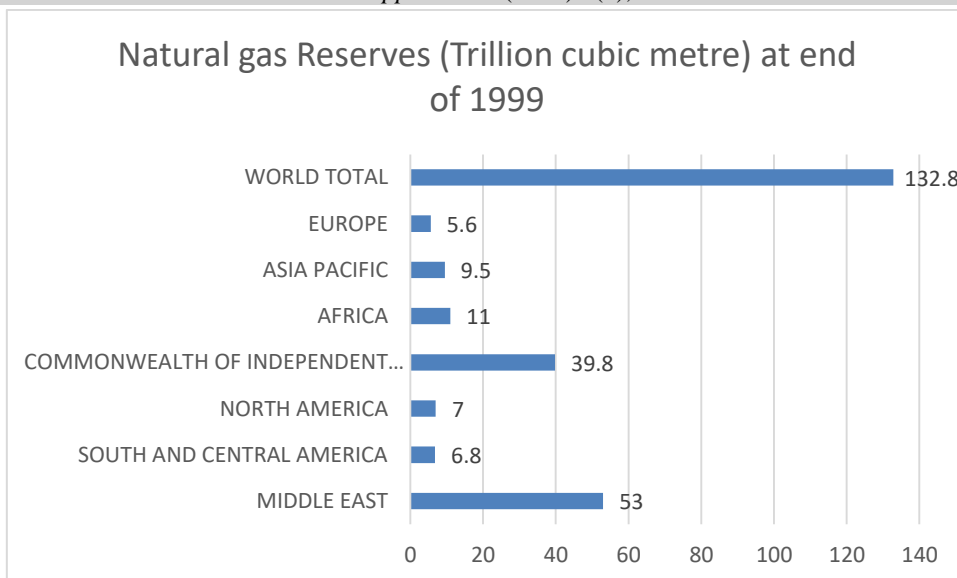


Fig. 6: World proved natural reserves in 1999

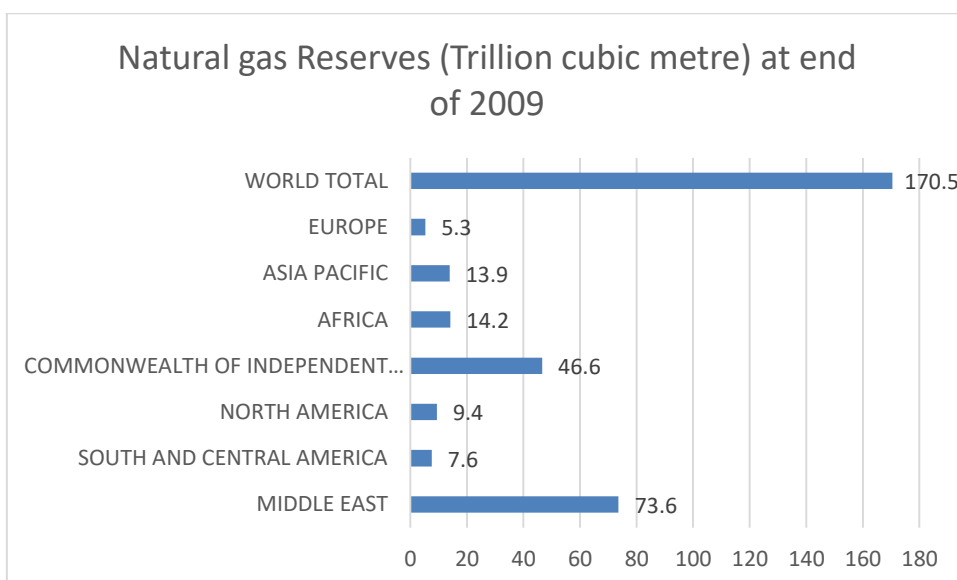


Fig. 7: World proved natural gas reserves in 2019

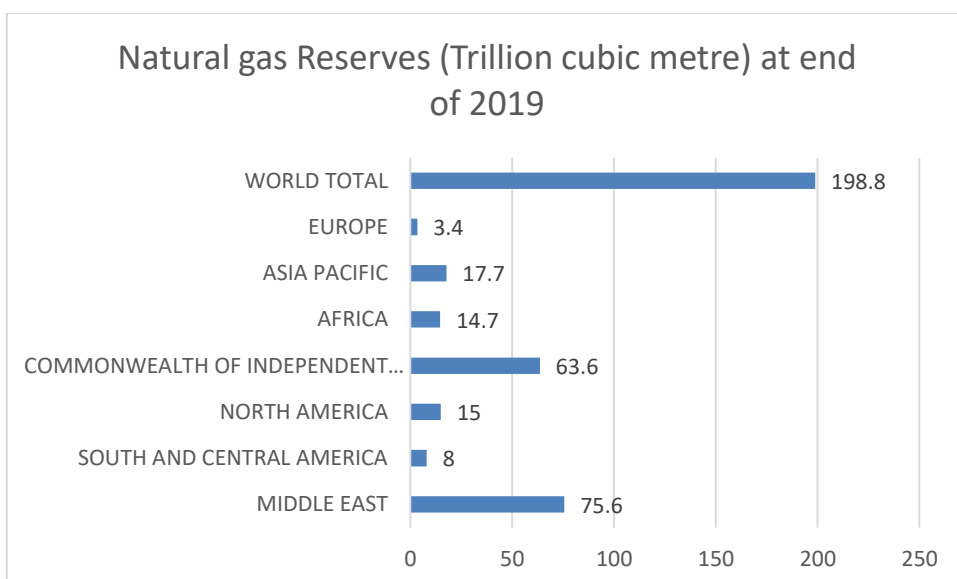


Fig. 8: World proved natural gas reserves in 2019

**COAL:** Total world coal proved reserves in 1999 was 1058811 million tone. In next decades world coal proved reserves decreases and it was 928238 million tone in the end of

2009. From 2009 to 2019 there was significant increases of world coal proved reserves and, in the end of 2019, proved coal reserves was 1069636 million tonnes. (WEF, 2020).

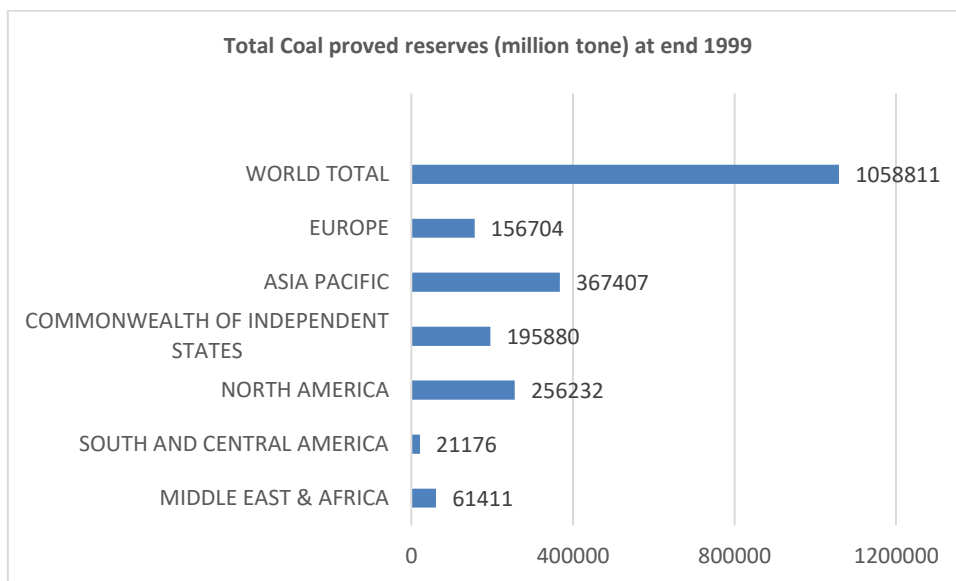


Fig. 9: World proved coal reserves in 1999

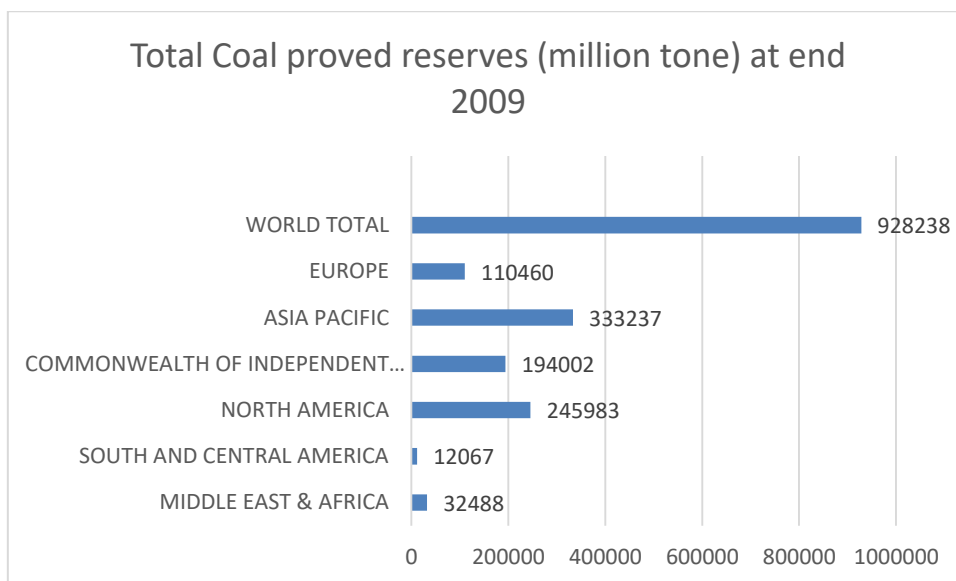


Fig. 10: World proved coal reserves in 2009

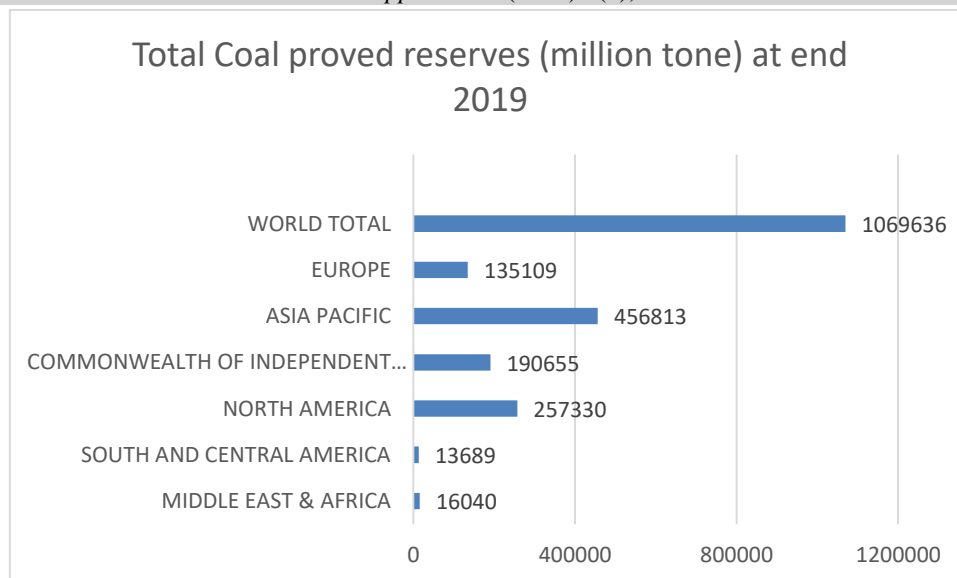


Fig. 11: World proved coal reserves in 2019

**FUTURE ASPECT:** The global reserve to production ratio indicates that oil reserves in 2019 accounted for 50 years of current production. Regionally, South & Central America have the highest reserve to production ratio (144 years) while Europe indicate the lowest reserve to production ratio (12 years). World total proved gas reserves jumped from 1.7 trillion cubic metre to 198.8 trillion cubic metre in 2019. China shows maximum increments in gas reserves ratio (2 trillion cubic metre) followed by Azerbaijan (0.7 trillion cubic metre). Whereas Indonesian reserves decline by 1.3 trillion cubic metre. The current global reserve to production ratio shows that gas reserves in 2019 accounted for 49.8 years of current production. The Middle East reserve to production ratio was (108.7 years) and Commonwealth Independent States was (75.8 years). World coal reserves in 2019 stood at 1070 billion tonnes and are heavily concentrated in just a few countries: US (23%), Russia (15%), Australia (14%) and China (13%). Most of the reserves are anthracite and bituminous (70%). The current global reserve to production ratio shows that coal reserves in 2019 accounted for 132 years of current production. North America shows highest reserve to production ratio (367 years) and followed by Commonwealth Independent States (338 years).

**ENVIRONMENTALASPECT:** Fossil fuels have greatest contribution to impact the environment. Crude Oil pollute the environment at every state from production to refineries. When oil split in sea it have an adverse effect on marine life and ecosystem (Akash Mirajkar et al., 2019, G. Alaa El-Din et al., 2017). Coal give maximum contribute in  $\text{CO}_2$  emission. All fossil fuels are responsible for green house gas emission and global warming.

### CONCLUSION

Demand of world energy increases day by day whereas fossil fuels are not in renewable in nature so one day they became disappears. Also, fossil fuels are not environment friendly so to overcome these difficulties world need to encourage the production of renewable energy by developing new and advanced technology.

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