INFORMATICS JOURNALS

Online **ISSN :** 3049-3455

Mineral Metal Energy Oil Gas and Aggregate

Contents available at: *www.informaticsjournals.com/index.php/2MEOGA*

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Shifting Political Economy of Energy Resources in the World and Energy Security Implications for Resource Deficient Countries

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Abstract

This article aims to review the changing scenario of fluctuating global energy markets, especially in context of oil supply and demand and the growing imperative to diversify energy sources of countries to ensure energy security and sustainability. The world energy market is no longer a supply driven market, but interdependencies between production and demand has made the market more competitive. Traditional producers are being matched by newer ones aided with technology and newer and cleaner energy sources are getting preference over traditional energy sources. The paradigm shift is a challenge as well as opportunity especially for resource deficient countries to build resilience through strategic energy policies that promote renewable energy adoption, energy efficiency measures, and international cooperation on energy governance to safeguard energy access and promote sustainable development.

Keywords: *Energy security; Oil market; Resource deficiency*

1.0 Introduction

Resource adequacy or deficiency in literature has almost always focused on extractive resources only like metals and minerals and for energy, primarily coal, oil and natural gas. Traditionally energy security of a country would imply adequate, uninterrupted energy supplies[1-3], and the link between energy security and geopolitics would necessarily mean the three-way dynamics between the resource curse of oil-rich nations, intergovernmental relations with oil companies and energy trade and transit issues that got influenced by diplomatic relation between countries[4,5]. However, with rapidly changing implications of its energy consumption on the sustainability of the world economy there has been a paradigm shift in energy choices to attain energy security. Factors like environmental concerns, technology preferences, regulations, international relations, and military security influencing energy choices have been discussed by authors like Sovacool and Mukherjee[6] and Yao and Chang[7].

While a volatile global market poses systematic risk to most economies, the challenge gets more complex for developing or emerging economies which are evolving in terms of their policies and reforms and trying to find their foothold in the global economy. While there is an opportunity for these countries to adjust policies more to the rapidly changing energy economics globally, myopia in the choice of policies can make economies succumb to the problem of path dependence. For a resource-deficient country like India, ensuring energy security for the economy implies ensuring an affordable, environmentally sustainable and accessible energy supply to fuel the rapidly increasing production as well as consumption demand.

The environmental implications of energy use probably have brought in the most challenging complexity to the geopolitics of energy choice. It has been almost 36 years since the COP (Conference of Parties) member countries have been meeting under the UNFCCC annually to address and resolve the problem of climate change. However, the countries are yet to come to a definitive action plan and a foolproof execution process to alter energy choices to reduce global warming. The geopolitics of the debate over who should reduce total emissions, who must target demand-side management of energy consumption, and who would bear the cost of emission abatement have made it difficult to resolve the problem. In the meantime, global warming has not shown any sign of decline and 2010-2019 turned out to be the warmest decade on record.

In 2015 at COP 21 in Paris around 196 nations signed a legally binding international treaty to limit global warming to well below 1.5-2 °C compared to pre-industrial levels. To achieve this the countries are committed to transition to a low carbon economy by 2030 through the Intended Nationally Determined Contribution (INDC) that imposes self-regulation to reduce anthropogenic emissions. For example, India has pledged to reduce the emission intensity of GDP by 30-35% by 2030 by shifting 40% of energy needs to renewables. Such commitments however impose the challenge of planning for a national energy portfolio which ensures an uninterrupted supply of affordable energy while reducing carbon emissions with the least socio-economic impediments like land acquisition, increased cost, access for all and availability of end-use infrastructure[8,9].

Energy security for an economy has connotations both from the demand and supply side. On the demand side, apart from the real increase in energy demand from rising production, income and improving lifestyles of the average population, energy consumption in most developing countries is often characterized by low-end use efficiency. Also, for countries like India that have heavy dependence on coal for their power generation requirements, there is global pressure to plan a quick transition to cleaner fuels. On the supply side, energy security would imply long-term planning on investments for exploration, extraction, infrastructure building, technology adoption and making careful shifts to cleaner energy sources taking into consideration factors like dependence on imports and environmental implications.

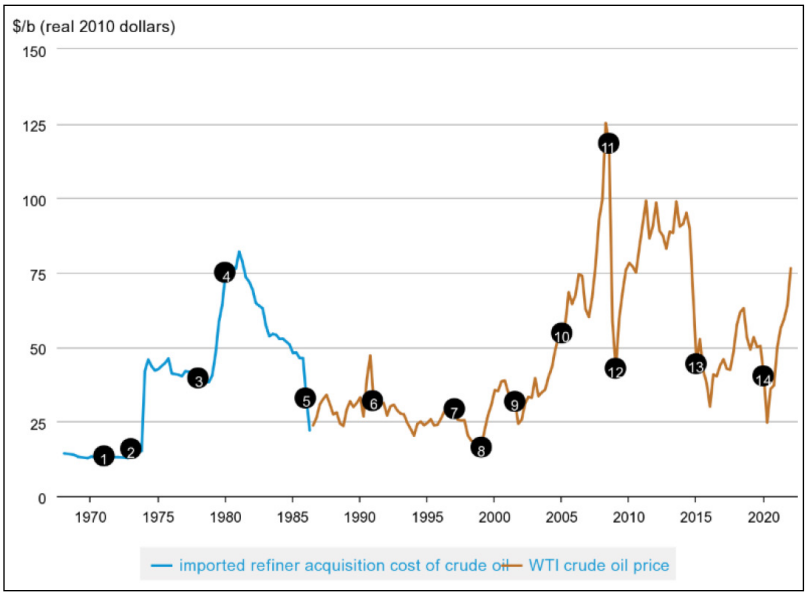
2.0 Energy (In) Security of Oil

Although energy security is an important policy question for any economy, the term has had a very broad definition[10] in energy literature with a focus on different dimensions of security[11,12]. There is a plethora of literature on energy security issues that focus primarily on oil[13,14]. This is not surprising as concerns of oil security surrounding the availability and affordability of oil date back to the oil crises of the 1970s and 1980s which led many countries to rethink their energy policies and take major steps to buffer against such shocks to energy supply. For example, in India, the nationalization of the coal sector was a major policy response to improve the energy self-sufficiency of the country.

Substitutability of oil in transportation and many energy and non-energy industries is extremely limited, making oil scarcity in itself a central issue for the energy sector. With only 5 countries accounting for 51% of total world crude oil production and most of the other countries depending heavily on imports, risks of oil price volatility and supply disruptions have always plagued the world economy and energy markets. Wars, geopolitical disagreements, damages and disruptions in supply and storage infrastructure caused by natural disasters and terrorist attacks have always kept crude oil markets highly volatile. Figure 1 relates the crude oil price fluctuations to various world events. Added to this would be the ongoing Russia-Ukraine war that has again put world energy markets in jeopardy.

These challenges have impacted all countries – developed and developing, energy exporters as well as energy importers. However, for resource-deficient countries, these uncertainties have economy-wide implications through enlarged trade deficits, draining of foreign exchange reserves, inflation, and stunted economic growth.

Oil like other extractive energy sources has very low demand and supply inelasticity at least in the short run as production capacity, available technology and infrastructure for extraction and refining and usage of petroleum products are inflexible in the short run. Any change in usage needs to come from economy-wide changes in both supply and demand environments that take a very long time to develop. Thus energy deficient economies have struggled to ensure energy security and literature has proposed various ways to achieve the same.



1: US spare capacity exhausted
2: Arab Oil Embargo
3: Iranian Revolution
4: Iran-Iraq War
5: Saudis abandon swing producer role
6: Iraq invades Kuwait
7: Asian financial crisis
8: OPEC cuts production targets 1.7 mmbpd
9: 9-11 attacks
10: Low spare capacity
11: Global financial collapse
12: OPEC cuts production targets 4.2 mmbpd
13: OPEC production quota unchanged
14: Global pandemic reduces oil demand

Source: U.S. Energy Information Administration https://www.eia.gov/finance/markets/crudeoil/spot_prices.php#:~:text=The%20volatility%20of%20oil%20prices,fixed%20in%20the%20near%2Dterm.

Figure 1. Crude oil prices and key geopolitical and economic events.

Countries like China, Australia and India have shifted to coal as a major alternative to oil, especially in developing power generation capacity. Countries in Central and Eastern Europe have also prioritized coal as a major source of energy due to their energy security reasons although there has been pressure from the European Union to move away from coal[15]. Around 40% of global power generation has been from coal-fired plants since the mid-2000s and overall reduction due to penetration of renewables has been only marginal. In 2019, coal contributed to 37% of world electricity production. In 2019, renewables provided almost 27% of global electricity, but rising gas prices led to increased dependence on coal, especially during the latter part of 2021 when the global economy was reviving from the impact of the pandemic[16].

3.0 Demand Side Challenges

Of all energy sources, oil is least substitutable in the transportation sector and also in many other non-energy industries. With rapid urbanization and increasing income, the vehicle market in most of the developing economies is expanding rapidly and transportation demand in general is increasing in the economy. As estimated by Parikh *et al.*[17] for India, "even after employing all domestic energy resources to their full potential" the economy will primarily be dependent on coal and oil. That import dependence will also continue to rise. Based on estimates by the IEA, a major share of world energy demand growth by 2040 is expected to come from India followed by China and Africa and growth in oil demand is also expected to be highest from India followed by Africa and China (Figure 2&3).

Inspite the short-run inelasticity of oil demand, the volatility of oil prices since the 70s has over time brought about some impact on demand through substitution effect. In the developed world this has been achieved

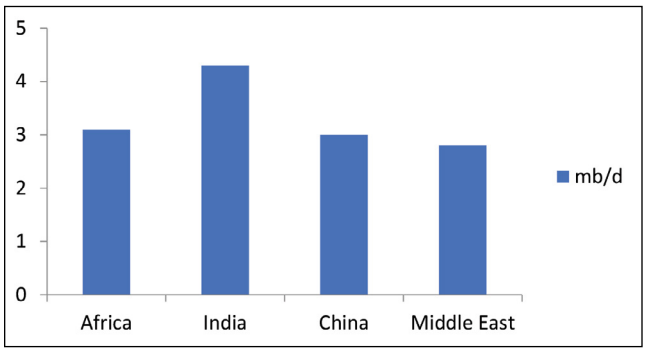


Figure 2. Oil demand in select countries and regions, 2018-2040.

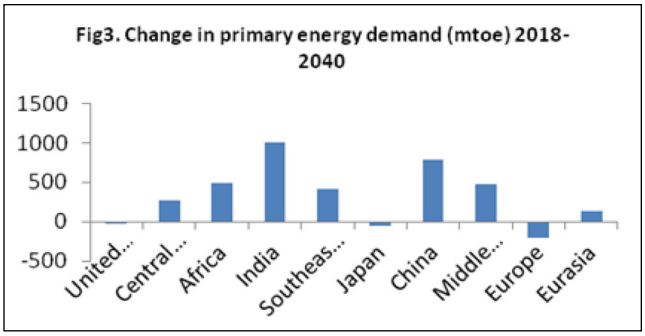


Figure 3. Change in primary energy demand (mtoe) 2018-2040.

through technology bringing about high energy efficiency standards, hybrid cars and shifts to renewables[18-20].

Around two decades back, energy security implied supply bottlenecks and soaring prices and demand was usually not a problem. However, global primary energy consumption has been steadily declining for around a decade. Even before the pandemic hit the world economy, primary energy consumption rose by only 1.3% and was driven mostly by renewables and natural gas. According to BP Statistics, growth was slower than their 10-year average for all fuels[21]. Major oil demand disruptions primarily from China, the largest consumer of imported oil led to massive instability of resource prices in the international markets. This price instability led to a new dimension of energy (in) security for economies of major energy exporters like Iraq, Iran, Russia and Venezuela.

The massive industrialization drive in China during the first decade of the 21st century led to soaring Commodity prices in the world market of energy, metals and minerals saw a boom in the early part of the 21st century with massive demand coming from China's industrialization drive. China became the world's biggest importer of crude as its demand went up to 7.5 million barrels a day in 2007, from 5.5 million barrels a day in 2003. This triggered investment and capacity expansion in the oil sector all over the world. However, with an economic slowdown and China's capacity expansion in these sectors, demand became sluggish from 2011 onwards.

In contrast, India's demand for liquid fuels grew by 400,000 barrels per day in the first quarter of 2016, which was the fastest in the world, accounting for about 30 per cent of the total global increase[22]. India consumed 48.5 million tons of oil products in the first quarter of 2016, an increase of 7.8 per cent from the same period a year ago, the fastest growth since 2007. Diesel consumption expanded 4.7 per cent to 20.1 million tons and gasoline use increased 10 per cent to 5.9 million tons.

4.0 Supply Side Challenges

The Russia-Ukraine war has already impacted the world energy market as the price of oil crossed $100 p.b. this year, the highest rise since 2014. This has hastened the urgency to make the transition to renewables all across the world. While the USA has reacted by raising the supply of oil and gas, countries in Europe and Asia have again turned to coal. For example, to meet the rising demand for electricity from post-pandemic economic recovery Indian coal mines have been directed to step up production by 50% and utilities to increase imports to meet generation requirements. India's coal production increased by 29% in 2021-22. Although this shift toward fossil fuels may appear as a policy drift away from renewables, however, it needs to be remembered that there is global consensus over the environmental consequences of fossil fuel usage. Hence this dependence on oil gas and coal is more likely to be short-term measures to combat the double impact of a pandemic and a war, than a long-term policy choice. Higher fossil fuel prices also make renewables and cleaner technologies more cost-effective.

However, there is another important implication of all of this development - the affordability of energy. Goal 7 of the Sustainable Development Goals lays down the aim of "access to affordable, reliable, and modern energy services by the year 2030". Hence, the governments would be responsible not only for facilitating supply increase through capacity creation for renewables but also for aiding greater penetration of the use of renewables and supporting technology on the demand side through investments in the usage of clean energy.

5.0 Globalization and the World Oil Market

The dynamics of demand, supply and pricing in the world oil market have seen a major transformation over the past 50 years. The power hold of OPEC over pricing, supply and distribution has diluted due to increased supply from other countries like USA, Canada and Russia. Winds of globalization have disrupted the energy market through:

1. Technology-aided supply enhancement through hydraulic fracturing increased oil production in the US by more than 50% within a decade.
2. Supply increased through capital investments in countries like Africa and Central Asia. Thus oil importers were now looking at other countries apart from the Middle East.
3. Global oil markets matured in the 1990s to hedge against risks of supply volatility through spot trading and futures markets.
4. Many crude oil importers like China, Japan, Malaysia, the Republic of Korea and Thailand have emerged as major refiners and exporters of petroleum products. In 2019, India exported around 1.32 million barrels/day, with diesel being the major export at 635669 barrels/day[23].

The said changes imply that it is much more difficult today to use the "oil weapon" in a seamless world market of crude and petroleum products without causing collateral damage. The world witnessed a price war waged by Saudi Arabia to drive out the US and Iran from oil production. Oil prices started falling drastically in 2014 and continued to fall even before the pandemic-led slowdown happened. The price war in turn had security implications not on oil-importing countries but on economies that are solely dependent on oil exports like Algeria, Venezuela, Kuwait, Iraq and many other countries. Also, in a globalized world, energy security may be more likely to be achieved by being co-dependent in a wide network of energy buyers and sellers.

6.0 Threat or Opportunity for Resource Deficient Countries?

As resource economist Erich Zimmerman once said "Resources are not, they become". The relevance of resources changes over time with the changing needs of mankind and with changes in discoveries and technology. The wisdom of a resource owner is best reflected in the words credited to the Saudi Arabian oil minister, Sheikh Zaki Yamani, almost thirty years back that "the Stone Age did not end for lack of stone, and the Oil Age will end long before the world runs out of oil." The present global scenario indicates that the world has reconciled to the reality that the world does not have any choice but to make a transition away from fossil fuels. The uncertainty of the oil market coupled with the global imperative of transitioning to a cleaner energy source is creating a level playing field for all players in the energy market – both resource-rich and resource-deficient. Policymakers as well as market drivers across the world are presently at the crossroads of making socio-technical choices across the increasingly diverse energy options – from cleaner non-renewables, like in the case of the UK and Finland to renewable energy like South Korea[5,24]. There are examples, from both developed and developing countries, where market forces have driven out fossil fuels in favour of cleaner energy. Coal has been replaced with cheaper natural gas from shale deposits in the highly developed US and with hydropower in developing countries like Nepal, the Democratic Republic of Congo, Namibia, and Paraguay[25]. India held the second position in the 2017 "Renewable Energy Attractiveness Index" released by Ernst and Young[26] and the government is committed to installing an additional 175 GW of renewable energy capacity by 2022, mostly through enhanced capacity addition of 160 GW in solar and wind energy.

7.0 New Complexities

The world is also witnessing a major change in the geographical centres of energy "resources". While the US is emerging as an oil and gas exporter, countries like Russia and Saudi Arabia are making massive investments in renewables. Major emerging economies like China and India are becoming lead players in the "clean energy race".

Thus, the current energy policy scenario for a country seems to be more about focusing on strengths to convert threats into opportunities by making strategic decisions of energy investments that are aligned with its economic growth rather than a compromise of it in favour of reduced emissions. Renewable power generation is often seen by countries not only to achieve environmental goals but also to gain competitiveness in an emerging market for low-carbon technologies. Lachapelle *et al.* (2017) observe that there seems to be a drift away from the initial dependence on collective actions and regulations to nudge economies into clean energy pathways to a more market-driven investment-returns incentive system for states. The focus on renewables has allowed resource-deficient countries to gain self-sufficiency in energy.

The renewable sector in turn may however create new dependencies on resources like rare earth metals and natural graphite and a power shift to countries with these reserves. Bolivia-Argentina-Chile "lithium triangle" accounts for 63% of lithium reserves and the countries are building their economic policy on expansion and production of lithium with foreign investments. American and South Korean companies have made huge investments in Argentina. South Korean company Posco aims to produce 100,000 tonnes of lithium per year - double what Australia, the world's leading producer of lithium, mined in 2020 - from the Hombre Muerto mine[28]. On the other hand, China's attempt to extend the China-Pakistan Economic Corridor (CPEC) to Kabul may imply its possible control over trillions of dollars worth of mineral reserved in Afghanistan including possibly the world's largest reserves of lithium as estimated by American geologists[29].

Apart from ownership over physical resources like lithium, graphite and rare earth, penetration and adaptation to cleaner energy forms also imply competitive advantage from investments in R and D, innovations and new technology and governance structure to ensure IP protection to all developers. Additionally, markets for renewable energy are often subsidized by local governments to promote larger usage, technology and innovation. At the same time, there is reluctance to extend these subsidies to imported technology resulting in inefficiencies locally and trade disputed internationally. For example, as estimated by Probst *et al.*[30] when India imposed Local Content Requirement (LCR) on solar photovoltaics in India between 2014 and 2017 it resulted in around 6% per kWh increase in the cost of power generated from those projects and Indian solar panels remained around 14% more expensive than international panels. In 2019 India won a major trade dispute against the US at the World Trade Organization, for subsidies and mandatory local content requirements instituted by eight American states[31].

8.0 Conclusion

The global energy scenario has changed enormously over the past half a century It started with insecurities related to oil supply, import dependence on oil, price uncertainty resulting from global geopolitics and the general fear of running out of depletable resources. However, since the 1990s the world has been grappling with the problem of global warming and the dire need to move away from fossil fuels to cleaner energy. This has brought about a major paradigm shift and new meaning to the concept of energy security. The new energy scenario needs answers to several questions related to

i. Continuity of investments in exploration and extraction of fossil fuels, socio-economic cost of a structural shift away from non-renewable industry with its enormous capital, employment, institutions, infrastructure and value chain spanning the entire globe.
ii. Necessity of backup power sources like natural gas, hydro or nuclear to transition from high carbon energy sources to renewables, adequate storage infrastructure and resulting social and environmental concerns related to hydro and nuclear.
iii. Making appropriate energy choices taking into account land requirement, generation cost, carbon emissions and reliability of generation taking into account long-term demand for energy.
iv. Possible creation of competitive advantage through new kinds of resources, technology and know-how.
v. Emerging geopolitics of ownership of new resources and shift in international power dynamics.
vi. R and D costs, new technology, the role of governments, role of markets to facilitate them.
vii. Regulation of market power to keep clean energy prices low for all consumers.
viii. International trade laws related to extractive industries and intellectual property to ensure fair energy trade.

9.0 References

1. Yao L, Chang Y. Energy security in China: A quantitative analysis and policy implications. Ener Poli. 2014; 67:595-604. https://doi.org/10.1016/j.enpol.2013.12.047
2. Bielecki J. Energy security: Is the wolf at the door? Q Rev Econ Financ; 2002. p. 235-50 https://doi.org/10.1016/S1062-9769(02)00137-0
3. Chang Y, Lee JL. Electricity market deregulation and energy security: A study of the UK and Singapore electricity markets. Int J Glob Energ Iss. 2008; 29(1/2):109. https://doi.org/10.1504/IJGEI.2008.016344
4. Van de Graaf T, Sovacool BK, Ghosh A, Kern F, Klare MT. The Palgrave Handbook of the International Political

Economy of Energy. London: Palgrave Macmillan UK; 2016. https://doi.org/10.1057/978-1-137-55631-8
5. Kuzemko C, Lawrence A, Watson M. New directions in the international political economy of energy. Rev Int Polit Econ. 2019; 26(1):1-24. https://doi.org/10.1080/09692290.2018.1553796
6. Sovacool BK, Mukherjee I. Conceptualizing and measuring energy security: A synthesized approach. Energ. 2011; 36(8):5343-55. https://doi.org/10.1016/j.energy.2011.06.043
7. Yao L, Shi X, Andrews-Speed P. Conceptualization of energy security in resource-poor economies: The role of the nature of the economy. Energ Polic. 2018; 114:394-402. https://doi.org/10.1016/j.enpol.2017.12.029
8. Rej S, Nag B. Energy crossroads and prioritization of energy choices: The case of India. OPEC Energ Rev. 2021; 45(1):135-58. https://doi.org/10.1111/opec.12201
9. Rej S, Nag B. Land and clean energy trade-off: estimating India's future land requirement to fulfil INDC commitment. Int J Energ Sect Manag. 2021; 15(6):1104-21. https://doi.org/10.1108/IJESM-12-2020-0006
10. Löschel A, Moslener U, Rübbelke DTG. Indicators of energy security in industrialised countries. Energ Polic. 2010; 38(4):1665-71. https://doi.org/10.1016/j.enpol.2009.03.061
11. Winzer C. Conceptualizing energy security. Energ Polic. 2012; 46:36-48. https://doi.org/10.1016/j.enpol.2012.02.067
12. Kruyt B, van Vuuren DP, de Vries HJM, Groenenberg H. Indicators for energy security. Energ Polic. 2009; 37(6):2166–81. https://doi.org/10.1016/j.enpol.2009.02.006
13. Meckling J, Kong B, Madan T. Oil and state capitalism: government-firm coopetition in China and India. Rev Int Polit Econ. 2015; 22(6):1159-87. https://doi.org/10.1080/09692290.2015.1089303
14. Vivoda V. Resource nationalism, bargaining and international oil companies: Challenges and change in the new millennium. New Polit Econ. 2009; 14(4):517-34. https://doi.org/10.1080/13563460903287322
15. Mikulska A. Poland, Europe and the coal conundrum. Policy Digest. RiEnergia; 2018.
16. IEA [Internet]. 2022. [cited on 2022 Jun 6]. Available from: https://www.iea.org/reports/world-energy-balances-overview/world
17. Parikh KS, Karandikar V, Rana A, Dani P. Projecting India's energy requirements for policy formulation. Energy. 2009 Aug; 34(8):928-41. https://doi.org/10.1016/j.energy.2008.11.010
18. Sovacool BK, Brown MA. Competing dimensions of energy security: An International perspective. Annu. Rev. Environ. Resour. 2010; 35:77-108. https://doi.org/10.1146/annurev-environ-100809-125604
19. Wolfram C, Shelef O. How will energy demand develop in the developing world? J. Econ. Perspect. 2012; 26(1):119-38. https://doi.org/10.1257/jep.26.1.119
20. Gillingham K, Palmer K. Bridging the energy efficiency gap: Policy insights from economic theory and empirical evidence. Rev. Environ. Econ. Policy. 2014; 8(1):18-38. https://doi.org/10.1093/reep/ret024
21. BP Statistics. Statistical Review of World Energy, 2020 | 69th edition. Accessed at https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2020-full-report.pdf
22. Cunningham N. India Putting Floor Beneath oil Prices as Demand Continues to Soar, Retrieved from http://oilprice.com/ on June 7, 2016.
23. PPAC (2021), https://www.ppac.gov.in/content/3_1_Petroleum.aspx, accessed in January, 2021.
24. Paik KW. South Korea's energy policy change and the implications for its LNG imports. 2018. [cited 2019 Sep 18]. Available from: https://www.oxfordenergy.org/wpcms/wp-content/uploads/2018/06/South-Koreas-Energy-Policy-Change-and-the-Implications-for-its-LNG-Imports-NG132.pdf
25. Fox J. Why President Trump's coal comeback keeps falling short. Bloomberg Opinion; 2018.
26. NITI Aayog, (2017). Draft National Energy Policy. Government of India. https://niti.gov.in/writereaddata/files/new_initiatives/NEP-ID_27.06.2017.pdf (accessed 28835 December 2022).
27. Lachapelle ER, MacNeil, Paterson M. The political economy of decarbonisation: from green energy 'race' to green 'division of labour'. New Political Economy. 2017; 22(3):311-27.
28. Latine, 2022. https://latina.com/argentina-is-doubling-down-on-its-lithium/ Accessed on 6th June, 2022.
29. BBC. Afghanistan minerals fully mapped [Internet] 2012. [cited on 2022 Jun 6]. Available from: https://www.bbc.com/news/science-environment-18882996
30. Probst B, Anatolitis V, Kontoleon A, Anadón LD. The short-term costs of local content requirements in the Indian solar auctions. Nat Energ. 2020; 5(11):842-50. https://doi.org/10.1038/s41560-020-0677-7
31. Economic Times. India wins solar case against the US in WTO; 2019.