Managing the decline of fossil fuels in the U.K.: lessons for developing countries

As is well-known, hydrocarbons resources are finite and once extracted they are put to use and cannot be replaced. So, what do governments do when faced with geological data that tells them their resources might reach a peak in only a few years or worse, that they have already began to decline? How can these resources be used to transform positively the economy and society if they are only going to be producing benefits for a very few more years?

This question gives a new flavour to the traditional concerns that governments have about attracting scarce investment capital. Some of the very largest investors will look at the geology and say: not for us, thank you. Are there any lessons from countries around the world that might help to shape government policy in response to these pressures? There indeed many examples to draw from however, this paper will focus on the UK experience and lessons that can be drawn from this experience.

In this respect, this paper attempts to summarise a few of these experiences and offer some summary recommendations to governments in Asia and Africa that may wish to consider the policy implications of this inevitable development. It draws on the CEPMLP/Hub Databank of Country Laws and Regulations.

1. Introduction

The need to tackle climate change has seen an increase in national, regional and international initiatives aimed at reducing reliance on fossil fuels. Each country indeed has a different experience with respect to managing the decline and exit of hydrocarbons and the UK provides a good example of this experience. Whereas, these initiatives are optimistic, several reports however indicate that oil, gas and coal will still significantly contribute to the energy mix by 2040.[1] According to a report by Wood Mackenzie, energy demand will keep rising through to 2040. It is estimated that with the rising population growth, energy demand will increase from 13 Btoe in 2018 to 16 Btoe in 2040.[2] That is a growth rate of just 1%, which is half the rate of the past decade.[3] We also note that globally, 2 billion people have no access to modern energy and yet global population is expected to increase by 1.5 billion by 2040.

Although solar and wind energy are expected to play a significant role in tackling energy access challenges, estimates indicate that large populations in countries such as India will still be connected to a grid using a coal-heavy fuel mix. Additionally, it is essential to consider the key sectors influencing the global demand and consumption of energy. Currently, the industrial sector (including the non-combusted use of fuels) consumes around half of all the global energy and feedstock fuels, residential and commercial buildings account for 29%, transport 20%, and other sectors account for the remainder.[4] These sectors are still in the development stage in some Asian and African countries and as such will need more fossil fuels to sustain them.

With the expected increase in demand for hydrocarbons, developing countries are faced with the dilemma of moving towards sustainable energy and at the same time attract the required investments to develop and utilize their hydrocarbons while preparing for the anticipated decommissioning at the end of the oil and gas project.

Taking stock of the above therefore, a question arises as to how developing countries should manage the decline of fossil fuels? Are there some lessons that can be learnt from the UK experience in managing the decline and exit of hydrocarbons? In addressing these questions, this paper employs a four-step framework. In section two, an overview of the hydrocarbon situation in selected Asian and African countries is discussed; in section three, the UK experience is highlighted especially with respect to attracting investments in fossil fuels and with respect to decommissioning of oil and gas installations; in section four, the UK experience is examined to analyse how this can be beneficial to developing countries in Asia and Africa; section five gives the concluding remarks.

2. Hydrocarbon situation in selected African and Asian countries

2.1. Brief situation of hydrocarbons in developing countries

In the Table 1, we briefly highlight the hydrocarbon situation in selected Asian and African countries. The main question to be considered here is, are hydrocarbons still

[1]BP Energy Outlook, 2018, https://www.bp.com/content/dam/bp/en/corporate/pdf/energyeconomics/energy-outlook/bp-energy-outlook-2018.pdf ENERGY OUTLOOK, last accessed on 28th August 2019.
[2]Wood Mackenzie Energy Transition Outlook: The Scalability Challenge, 2019
[3]ibid
[4]ibid

TABLE: 1: HYDROCARBONS RESOURCES IN DEVELOPING COUNTRIES

Country	Resource	Reserves	Key highlights
Indonesia	Coal	37.34 billion tons of coal reserves, with 20.11 billion proven; Country has the fifth-largest coal production in the world, which is 434.0 million tonnes	Coal contributes to 60% of the country's energy mix; There are ambitious plans to construct 58 coal fired plants through 2027, doubling capacity to 51k MW[7]
South Africa	Coal	Country has an estimated 30 billion tonnes of coal representing 3.5% of the world's coal resources; Accounts for 3.3% of the world's annual coal production	Coal provides 82% of the power generated by state-owned power utility Eskom;[8] 6th largest coal-exporting nation in the world; exports account to 6% of total global exports.[9]
Ghana	Oil	Ghana has approximately 2.5bn barrels of proven oil resources; 94% of the oil resources are located offshore and the remainder onshore	There has been an increase in crude oil exports. Consequently, in 2018, during the period of January to August crude oil exports surpassed cocoa export revenues for the first time.
Mozambique	Gas	approximately 204 750 bcf of proven gas resources, of which 90% are located offshore and the remainder onshore	FDI in the country is expected to highly increase
Angola	Oil and gas	Has approximately 17.6bn barrels of oil resources, almost 95% of which are located offshore; As of 2017, the country had almost 33000bcf gas	oil represents one third of the economy and 95% of exports; SSA's second largest oil producer, with the second largest oil resources

relevant in these countries? How does the decline in investment in hydrocarbons likely to affect the economic and social situation of developing countries? We also need to pay extra attention to the need for more advanced technology aimed at reducing the negative impacts associated with hydrocarbons.[5] For instance, coal is well known for its massive negative environmental impacts. Nevertheless, just looking at the basic facts we notice that as of 2018, there were 1,054,782 million tonnes of coal reserves globally of which Asian countries such as India and Indonesia contributed 9.6% and 3.5% respectively; while African countries such as South Africa contributed 0.9%.[6] Countries across the globe are also endowed with massive oil and gas resources as highlighted in the Table 1.

As illustrated in the table above, the hydrocarbon resources are still significant in these countries' economic development. The list above is obviously not conclusive as there other countries that ought to be considered including Congo-Brazzaville which is SSA's third largest oil producer and third largest holder of oil resources with approximately 5.3bn bbl of resources; Equatorial Guinea, which is the second largest producer of natural gas in SSA; with 14 301 bcf of gas resources as of 2017; Gabon, which holds SSA's fourth largest oil resources and is also the fourth largest oil producer in the region - with 4,922m bbl of proven oil resources, of which 87% are located offshore and 13% onshore; Nigeria which is SSA's largest producer of oil and gas with approximately 92 000bcf of proven gas resources, of which approximately 44% are offshore and 56% onshore. The country also has approximately 30.1bn bbl of proven oil resources, of which almost 70% are located offshore.

2.2. KEY DISRUPTIONS IN THE HYDROCARBON SECTOR IN DEVELOPING COUNTRIES

Although hydrocarbons are expected to play a significant role in the next decade, we have to be aware of some of the key disruptions in the development of this sector in developing countries.[10] There indeed common challenges including the volatile oil price, however, there are some disruptions which are unique to developing countries. These

[5]Coal for instance, the technology aimed at reducing emissions include, high efficiency, low emissions (HELE) and carbon capture storage (CCS) emissions.

[6]Although this paper is focused on developing countries in Asia and Africa, we note that other parts of the globe are also endowed with massive coal resources. For instance, as of 2018, Europe accounted for 12.8% of the global coal reserves while Asia Pacific and North America accounted for 42.2% and 24.5% respectively. See, BP Statistical Review of World Energy, 68th edition, 2019. Can be accessed at https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-coal.pdf.

[7]See, Climate Scorecard, https://www.climatescorecard.org/2019/05/indonesia-plans-to-increase-coal-production/ last accessed on 31st August 2019.

[8]Besides electricity the other sectors that rely on coal include; the liquid fuels manufacture sector; and the basic iron and steel industry. Together, these three sectors account for more than 80% of domestic coal demand in terms of value and approximately 70% in terms of volumes.

[9]Additionally, indirectly, the coal industry is responsible for creating and sustaining over 170,000 jobs outside the industry. See, Chamber of Mines, National Coal Strategy for South Africa, 2018. Can be accessed at,

[10]Africa's proven oil and gas reserves account for 7.5% and 7.1% of global reserves respectively.

include among others; lack of necessary infrastructure; corruption and lack of transparency; regulatory regime just to mention but a few. Some of these disruptions are briefly highlighted below:

- LNG and renewables: The rising global demand for LNG and a transition to a low carbon economy which favors the deployment of renewables is likely to have long term negative impacts on the hydrocarbon developments in Asia and Africa - since these compete with the same available investment opportunities like for hydrocarbons.
- Regulatory uncertainty: Many resource rich countries in the developing world have in recent years enacted or amended their energy laws to reflect the realities in these countries. Some of these laws have had an impact on investments especially with issues relating to taxation of oil and gas activities where local tax regimes are relied on. This has in effect delayed the conclusion of final investment decision (FIDs) on oil and gas project in countries such as Uganda, and in extreme cases the withdrawal of investors in already existing oil and gas projects. Additionally, besides complying with new regulations and acquiring a regulatory licence, multinational energy companies also must ensure that they get the social-economic license to operate. All these developments although they work in the favor of developing countries, can also be a disruption in attracting the necessary investments in the hydrocarbon sectors.
- Corruption and lack of transparency: Corruption not only makes it impossible for local people to benefit from their resources, but it also creates doubt for international energy companies that could consider other investment opportunities in renewables. Some of the most resource rich countries are also ranked the most corrupt according to the Transparency International Corruption Perceptions Index (CPI). For instance, out of the 180 most corrupt countries, oil rich countries were ranked the most corrupt including Somalia, South Sudan, Guine-Bissau, Equatoria Guinea and Angola which ranked 180, 179, 171, 171 and 167 respectively.
- Digitalization: Digitalization has been a marked feature of the hydrocarbon sector, however, we note that some developing countries in Asia and Africa are still behind with respect to digitalization and this in away has the potential of discouraging future investments. For instance, it has been noted that SSA has a large portfolio of 'digitally behind' assets and these risk being left obsolete if digitalization is not embraced.[11]

There indeed several other disruptions in the development of the hydrocarbon sector in Asian and African developing countries. However, the focus of this short Hub paper is to examine the UK experience and highlight lessons that developing countries can draw from this experience.

3. Managing the decline and exit of hydrocarbons in the UK

3.1. A BRIEF OVERVIEW OF THE DECLINE

The U.K. hydrocarbon industry offers some key lessons that developing countries can draw a leaf from. First, we cannot ignore the country's admirable efforts of significantly reducing reliance on coal and in recent years efforts to reduce reliance on oil and gas. In this section therefore, a brief discussion on the exit of coal and oil and gas in the UK will be highlighted. Later the section will focus on decommissioning of oil and gas installations in the UKCS.

3.1.1. Coal decline in the UK

Although oil and gas sources still have a significant role to play in the UK energy mix, we notice that the situation is different for coal. Once a global leader of coal production, the UK has in recent decades transitioned from the use of coal due to the various health and environmental impacts associated with this resource.[12] For instance, in 2017, annual production of coal was only 3 million tonnes which is 100 times lower than the production in 1913: consequently the number of workers employed in the coal industry drastically dropped.[13]

Although there are many reasons that are associated with this decline, the issue of advanced technology stands out. For instance, historically, coal was used for a number of end uses including in industry, railways, gas production and heating in homes; however due to advanced technology these sectors are now electrified and as such coal is basically used for electricity production only and the UK government has plans to completely phase out coal by 2025.[14] Although there are ambitious plans to stop coal production, not much is said to reduce coal importation. Consequently, there have been concerns on the importation of coal from other countries such as Russia, the US and Cambodia. Some might argue that instead of the UK phasing out coal production and relying on imports, it is better off to produce from home and provide jobs to the locals. Additionally, given the country's strong environmental controls, it is better off producing locally than importing from countries which might not have strong environmental protection measures in place.

[11]Deloitte: Africa Oil & Gas State of Play, November 2018. Can be accessed at https://www2.deloitte.com/content/dam/Deloitte/xe/Documents/energy-resources/africa_oil_gas_state_of_play_Nov2018.pdf

[12]With respect to environmental concerns, we note that of all energy sources coal emits the most carbon dioxide emissions.

[13]We also note that the level of employment from the coal industry has significantly reduced. For instance, in the 1920 UK coal employed 1.2 million but this number reduced to only 620 workers in 2017- 2000 times lower. Additionally, deep mined coal production came to an end in 2016 as Kellingley colliery, the UK's last deep coal mine closed in 2015.

[14]In the 1940s, electricity accounted for only 12 percent of UK coal consumption. By 2017 this has increased to over 60 per cent. Nevertheless, natural gas, nuclear and renewables have displaced coal in the energy mix and by 2017 coal's share in the energy supply had fallen to only 5 per cent.

3.1.2. Oil and gas decline in the UK

The UK has experienced both the positives and challenges of developing and managing the decline of oil and gas. The challenges that the sector has faced have in the past mostly been associated with the low oil prices, high cost of operation, uneconomic fields, and high taxes. For instance, after oil prices fluctuated between US$100–115 per barrel from 2011 to 2013, Brent prices collapsed in 2014, reaching lows of below US$30 per barrel by January 2016.[15] Due to the low prices, the total operating expenditure in the UKCS rose by 8% between 2013 and 2014 from £8.9 to £9.6 billion.[16] Additionally, the sector generated a negative cash flow and as such the 2014 deficit in cash flow was d£5.3 billion compared to d£0.4 billion in 2013.[17] We note that the last time the industry experienced a negative cash flow was 40 years ago when most of the large UKCS assets were only being developed.[18] The low prices coupled with decommissioning expenditure also led to a decline in government revenues to £-24m in 2015/16 as compared to the £2.15 billion in 2014/15.[19]

Drawing from the discussion above, we note that the UK has had the challenge of reshaping its policy to tackle a marked decline in production; as such the question we ask here is whether there are some lessons that developing countries can learn from this experience. Of interest to this paper are the various initiatives that have been set up in the UK to slow down and even reverse the decline of hydrocarbons. All the initiatives cannot be exhausted in this short paper and as such the focus will be on tax incentives, production efficiency and later a discussion on decommissioning oil and gas installations.

3.2. Measures to address the decline of fossil fuels

3.2.1. Tax incentives

Although the UK presents itsself as a champion of tackling climate change and has in recent years put massive efforts in deploying low carbon energy sources such as renewables: the country has nevertheless not completely given up its oil and gas sector and as such there have been several tax incentives aimed at attracting more investors in the sector.

For instance, in November 2017, Chancellor Phillip Hammond announced further tax incentives for North Sea Oil and gas sector in the 2017 budget. We however note that, before this announcement, the UK government was already handing out £665 million per year to support North Sea oil and gas production. Additionally, subsidies to the transport sector, including tax breaks for diesel, amounted to £7.4 billion per year on average between 2014 and 2016.[20] Moreover, in 2018, the government promised to remove tax barriers to the tune of £3bn to further encourage North Sea investment especially the offshore decommissioning projects. Besides the willingness to amend the Petroleum Revenue Tax laws to simplify the sale of older UK oil and gas fields to new investors - there was also an introduction of transferable tax history mechanism for oil and gas companies intended to attract more investors in the sector.[21] All these tax incentives therefore reflect some of the government's efforts to manage the decline and exit of fossil fuels.

Table 2: Highlights of production efficiency in the UK

Overall production losses in 2018 fell by 6 million barrels of oil equivalent to 196 mmboe (from 202 mmboe in 2017),
Plant losses rose significantly with an 14% increase in 2018
Well losses across the UKCS fell by 21% in 2018
Floating platforms had the biggest increase (5%) in overall PE compared to the previous year

3.2.2. Production efficiency

Basically, production efficiency is the volume of oil and gas extracted in a year as a percentage of the potential maximum amount that is thought to be economically viable. In the UKCS, there was a 1% improvement in production efficiency in 2017 as it rose to 74% as compared to 2016. In 2018, it reached 75% consequently leading to an increase in the UKCS production. The Table 2 highlights some of the benefits of production efficiency in the UK.[22]

3.3. Decommissioning oil and gas installations in the UK

Decommissioning has become a very important topic in the oil and gas sector, it presents both business opportunities and challenges. Basically, decommissioning involves the safe plugging of the hole in the earth's surface and disposal of the equipment used in offshore oil production. The decommissioning process is long and cost-intensive, it also requires the involvement of various stakeholders including, operators, contractors, government and environmental departments.

In the UK North Sea, a significant number of offshore oil and gas installations have either exceeded or are approaching the end of their designed economic life. In the early stages of decommissioning, there were various challenges faced in the UK especially with respect to the high costs involved. Additionally, operators and contractors lacked adequate experience in executing decommissioning projects. Consequently, suggestions to establish a decommissioning

[15]Ahiaga-Dagbui, D.D., Love, P.E., Whyte, A. and Boateng, P., 2017. Costing and technological challenges of offshore oil and gas decommissioning in the UK North Sea. *Journal of Construction Engineering and Management*, *143*(7), p.05017008.

[16]Ahiaga-Dagbui, D.D., Love, P.E., Whyte, A. and Boateng, P., 2017. Costing and technological challenges of offshore oil and gas decommissioning in the UK North Sea. *Journal of Construction Engineering and Management*, *143*(7), p.05017008.

[17]ibid

[18]Oil and Gas U.K. 2015a.

[19]U.K. Revenue and Customs (HMRC 2016)

[20]ODI, 2017 https://www.odi.org/news/843-chancellor-announces-tax-incentives-north-sea-oil-and-gas-2017-budget-odi-statement

[21] See, Section 4.105 of the 2018 UK budget

[22] https://www.ogauthority.co.uk/data-centre/benchmarking/ukcs-production-efficiency-2018/

forum were made, the forum was anticipated to facilitate the sharing of experience and knowledge, particularly regarding cost information so that operators and contractors can ameliorate the planning and management of the decommissioning process.[23]

In recent years, the unstable oil prices coupled with the current moves to decarbonize the energy sector have forced operators to question their decisions whether to keep investing in the sector or just initiate decommissioning and abandonment? In the UK, a total of £1 billion had been expended on decommission activities in the North Sea in 2014 compared to the £470 million that was spent in 2013.[24] Due to the high costs involved, operators are required to include in the decommission programme they have to submit to the Department of Energy and Climate Change (DECC), a comparative assessment of alternative scenarios of removal of offshore installation. The experience of the UK in handling decommissioning and in keeping investments flowing in the hydrocarbon sector offers some lessons to Asian and African countries which are still heavily reliant on fossil fuels.

4. What lessons can Asian and African countries draw from the UK experience?

There are several lessons that can be leant from the UK experience, these are briefly highlighted below:

Utilize all the available energy resources

First, we note that the UK has in the distant past extensively used its fossil fuel resources including oil, gas and coal to achieve economic development and also address energy access and security challenges. In this respect, Asian and African countries should utilize all the available resources at their disposal to eradicate poverty in their countries. Indeed, goal 1 of the UN SDGs emphasizes the need to eradicate poverty in all its forms.[25] However, in utilizing oil, gas and coal resources, emphasis should be put on employing clean technology to utilize these resources. In this respect, Asian and African countries should consider coal washing: this is one of the methods of clean coal technology that purifies the coal before it is burnt which in effect produces cleaner gas. Carbon capture is also one of the technologies identified to ensure clean coal. It involves several methods including: pre-combustion capture;[26] post-combustion capture[27] and oxy-fuel combustion.[28]

Plan ahead for decommissioning

Asian and African countries should also learn from the UK experience especially with respect to decommissioning oil and gas installations in the North Sea. From the UK experience, we note how cost-intensive the decommissioning programme is. In this respect, Asian and African countries should put money aside and ensure that all the relevant stakeholders are able to effectively remove oil and gas installations at the end of the project.

Set up the required legal and institutional framework

Another lesson that can be learnt from the UK experience is to ensure that the energy laws and regulations address the constant changes in the sector. Additionally, competent institutions must be established in Asian and African countries to manage and govern the energy sector. Additionally, in an effort to keep the investments flowing in the fossil fuels, governments have to ensure that investment friendly laws are enacted.

Transparency and accountability

Transparency and good governance of the energy sector should also be embraced in Asian and African countries. The UK through its laws encourages transparency of all oil and gas dealings in the country. Additionally, oil companies should be accountable for the negative impacts their activities cause to the local communities where they operate from.

Embrace clean energy

The UK experience also highlights the need to embrace clean energy such as solar, wind and hydropower. It is accepted for Asian and African countries to continue developing their hydrocarbons, however, these countries should equally invest and take advantage of the abundant renewable energy sources they have in their countries.

Environmental protection

Asian and African countries should also ensure that there are strong measures to protect the environment. Environmental impact assessments should be submitted by oil companies and government organs should ensure the implementation of the various environmental laws.

5. Concluding remarks

As discussed in the discussion above, the UK has employed various initiatives to ensure that it manages the decline of fossil fuels at a time when many countries are focusing on transitioning to a low carbon economy. These therefore provide a lesson and inspiration for developing countries such as in Asia and Africa to deploy different measures including tax incentives to ensure that investments in the oil and gas sector keep flowing into their countries.

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[23] Ahiaga-Dagbui, D.D., Love, P.E., Whyte, A. and Boateng, P., 2017. Costing and technological challenges of offshore oil and gas decommissioning in the UK North Sea. *Journal of Construction Engineering and Management*, *143*(7), p.05017008.

[24] Oil and Gas U.K. 2015a

[25] UN Sustainable Development Goals (SDGs), can be accessed at https://www.undp.org/content/undp/en/home/sustainable-development-goals.html

[26] This involves gasification of a feedstock (such as coal) to form synthesis gas, which may be shifted to produce a H_2 and CO_2-rich gas mixture, from which the CO_2 can be efficiently captured and separated, transported, and ultimately sequestered.

[27] This refers to capture of CO_2 from exhaust gases of combustion processes.

[28] Fossil fuels such as coal are burnt.