WHO STOLE OUR OCEANS?

A LITERATURE REVIEW OF THE SOCIOECONOMIC CONSEQUENCES OF OFFSHORE OIL AND GAS ACTIVITIES ON SOUTH AFRICA

Executive Summary

Despite the claims that the establishment of an offshore oil and gas industry in South would bring significant economic developments, our research finds that the growth of an oil and gas industry is unlikely to have positive benefits, either nationally or locally. The development of an oil and gas industry is likely to further entrench South Africa as a minerals resource-based exporter, exacerbating the negative features documented by the National Planning Commission. We find that there is scant evidence from elsewhere in Africa that the exploitation of oil and gas resources naturally leads to improvements in the lives of those living and working in oil and gas rich areas. In fact, as this report will reveal, it normally leads to a wholesale deterioration in living conditions for the vast majority of citizens who live and work in such areas.

In 2014, Operation Phakisa was launched as a 'fast results delivery programme' designed to boost economic growth and create jobs within the context of the government's National Development Plan (Department of Planning, Monitoring and Evaluation (DPME), 2014). One of its focus areas is the Oceans Economy. But rather than focusing on the stewardship of the ocean and the sustainable use of ocean resources, Operation Phakisa has prioritised the establishment of an offshore oil and gas industry. In doing so, it exposes the policy contradictions between the government's international climate change commitments, against the backdrop of the ongoing loss of ocean biodiversity, and its continued pursuit of fossil fuels. It was predicted that the Oceans economy would contribute R177 billion to South Africa's GDP, and create one million jobs by 2033, but the Oceans Economy has not delivered these economic gains. The contribution of the Oceans Economy to South Africa's GDP has declined as a percentage of GDP, from 4.4% (R110 billion) in 2010, to 4.2 % (R130 billion) in 2019.

Research into twelve Sub-Saharan African countries which had exploited oil and gas deposits between 2001 and–2020, indicates that in all twelve countries forecasted benefits were not met, especially those relating to government revenues. The economic outlook of these countries has changed following these disappointments, with many of them facing a debt-repayment crisis.

The research is framed by the phenomenon of the paradox of plenty, also known as the resource curse. Seriously compounding the problem of the resource curse, is the phenomenon known as 'Dutch Disease'. The paradox is that, on average, countries with an abundance of non-renewable resources tend to have lower levels of economic development and growth than those without such resources. The resource curse is characterised by negative economic, social, environmental and governance impacts, often concentrated at locations were extraction takes place.

To determine the economic impacts of oil and gas, an economy-wide model developed by Wait et al (2015) indicates that a 20% short or long-run increase in the production of crude oil, petroleum, and gas in South Africa will increase real national GDP by 0.15% in the short run, and decrease GDP by 0.12% in the long run. This decrease in real GDP in the long run raises concerns as to the economic viability of investing in an oil and gas industry for South Africa. The Wait et al model notes that investment in the South African oil and gas industry will not deliver significant tax revenue for the fiscus. In the short term, it may form a platform for job creation and employment, with minor wage increases, but only if the capital equipment necessary for extraction is produced in South Africa. A report by Standard Bank that assumes an oil price of $110/per barrel of oil, notes that 20 500 skilled and 33 000 unskilled jobs would be needed to service the oil and gas sector. However, Wait et al notes that in the long run, real wages will decrease marginally and there will be a long-term shift to skilled rather than unskilled labour.

Multiple studies show that the oil and gas industry's promises of job creation from the drilling of natural gas have been greatly exaggerated. Many of the jobs that are created are short-lived or have gone to out-of-area workers who have the necessary skills. In addition, up to 75% of workers will likely become redundant in the future due to automation (Deloitte, 2021). Analysis by OGUK (2021) highlights the gender-bias of the oil and gas industry – with only 3.6% female representation amongst the total offshore workforce.

Experience closer to home indicates that job projections and actual job creation do not necessarily match. In terms of jobs creation to date, Phakisa has been a failure. Freight News (2019) reported that Phakisa has 'failed dismally to generate the number of jobs it anticipated'. Between 2014 and 2019, while over R40 billion had been invested in targeted maritime sectors, less than 10 000 of the 77 000 direct jobs promised had been created (Freight News, 2019). This lower than forecast job creation rate has been attributed to the mismatch between skills available and skills required – especially in the offshore oil and gas sector which requires highly specialised skills. (Freight News, 2019).

Deloitte (2021) observes that the oil and gas industry is not a reliable employer due to mass layoffs, often caused by price volatility. Moreover, offshore work has been deemed precarious because of inadequate government regulation, the challenges of offshore collective organising, and market instability.

There are a number of other pitfalls that could befall South Africa: analysts and economists caution that there is a substantial decline in demand for fossil fuels – together with an excess in supply. Moreover, the climate-related financial risks such as transition risk; stranded assets; the negative impact on our trade and competitiveness, and physical climate risks should all be taken into account prior to investing in resource extraction. This is especially so because these factors have become increasingly important when analysing or insuring projects and are seen by the world's central banks as one of the biggest threats to global financial stability, and pose a direct threat to financial opportunities for South Africa.

The localised influx of capital and labour can lead to serious social issues. Extensive migration into oil-producing areas places strain on public infrastructure and results in increased poverty rates, poor healthcare, high rates of child mortality, gender and economic inequality and crime. Research also shows how 'Dutch disease' both causes and contributes to the conflicts that occur in these countries A growing population clearly demands increased infrastructural support in terms of basic municipal services such as health, education, emergency services, water and sanitation, electricity, and transport. The sad reality is that most municipalities in South Arica will be entirely incapable of dealing with the increases in demand for public services and environmental protection services that will come with the emergence of an oil and gas sector in South Africa.

Evidence shows that non-renewable resource booms both entrench existing weak governance institutions, and weaken effective governance institutions where they exist. Thus, the 'rentier state' becomes possible because non-renewable resource rents can be extracted that do not demand the same levels of public accountability as taxes do. This results in political leaders having little incentive to encourage economic development, provide public goods, or seek sustainable state revenues via taxation. The non-renewable resource rents that can be extracted also have the effect of entrenching rule, because they enable leaders to increase patronage to buy off potential challengers and invest in repression (Frynas & Buur, 2020; Gillies, 2020; Ross, 2015). Gillies (2020) makes the important point that it is not just governments that engage in this behaviour, as private actors from across the world have been implicated numerous times in corrupt practises relating to the extraction of oil and gas.

These research findings do not bode well for South Africa. South Africa's Corruption Watch recently stated that the country had been characterised by 'looting, incompetence and malfeasance' in recent years. The current Judicial Commission into State Capture is revealing how important state institutions necessary for the survival and florishing of democracy have been hollowed out.

It is time for South Africa to shift away from an extractive mindset, acknowledging that an accelerated adoption of renewable energy, coupled with increased energy efficiency, could really be the real 'game changer'. Moreover, the commodification of the ocean around South Africa as a site for yet more capital accumulation must be rejected in favour of a view of the ocean that sees it as a Commons that provides immeasurable social, cultural and climate benefits to us all. A Commons that must be protected by a broad coalition of citizens and organisations with accountable government, against the predation of the oil and gas industry.

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But while the land is ravaged

And our pure air poisoned

When streams choke with pollution

Silence would be treason…

Ken Saro-Wiwa[1]

[1] From 'Keep out of Prison', a poem by Ken Saro-Wiwa.

Glossary

Blue or Oceans Economy: An economic term which draws attention to how the sustainable exploitation of the oceans can potentially contribute to economic growth.

Carbon border adjustment mechanisms (carbon border tax): An economic incentive to reduce emissions of greenhouse gases and help countries reach their commitments under the Paris Agreement by imposing a charge on imports into the countries of certain goods from countries with high carbon emissions.

Carbon neutral targets: The amount of CO_2 emissions a country or company emits is the same as the amount of CO_2 emissions they remove from the atmosphere i.e., their impact is neutral, zero such s Net Zero by 2050.

Decommissioning: As oil and gas fields reach the end of their lifespan, they must be decommissioned so that the site must is restored to its original state viz. the wells and platforms must be safely dismantled and removed.

Direct employment: People employed by companies operating in the extraction of oil and gas and associated services.

Dutch disease: An economic term for the negative consequences that arise from a rapid increase in a country’s currency which is usually associated with the exploitation of a non-renewable resource like oil or gas.

Ecosystem-Based Management (EBM): An approach to ocean management that is predicated on taking a whole-of-ecosystem viewpoint.

Gross Domestic Product (GDP): The market value of all the final goods and services produced in a specific time period. GDP is frequently used as a measure of economic wellbeing of a country. It was, however, never intended to do so because it does not account for negative externalities such as pollution or oil spill clean-ups.

Gross National Income (GNI): The total amount of money earned by a nation's people and businesses. It is used to measure and track a nation's wealth from year to year. The number includes the nation's gross domestic product plus the income it receives from overseas sources.

Indirect employment: Employment created through the supply chain effects related to oil and gas sector activity.

Induced employment: Employment supported by the industry’s wider economic contribution.

Paradox of Plenty: Also known as the Resource Curse, describes the failure of states to improve the social and economic conditions of their citizens despite being rich in non-renewable extractive resources such as oil and gas.

Phakisa: ‘Hurry up’ in Sesotho.

Rentier State: A political system where elites allocate resource wealth to extend their power rather than to provide public goods.

Resource rents: Defined as the difference between the costs of producing a commodity, and the price at which the commodity can be sold.

Stranded Assets: Stranded assets are projects that fail to deliver adequate financial returns as conditions change.

Transition risk: The risk that the value of assets and income are less than expected because of climate policy and market transformations, such as the transition away from fossil fuels.

1. Introduction

South Africa's oceans and coastline are crucially important to its economy, supporting thousands of jobs and contributing millions of Rands to the national economy every year. It is estimated that coastal goods and services contribute up to 35% of South Africa's GDP (WWF-SA, 2016). Moreover, our marine environment contributes to human welfare in a myriad of ways (WWF-SA, 2016).

South Africa, like many other African countries, has identified oil and gas exploration as a means by which to boost economic growth in the hope of improving lives and livelihoods. However, the socioeconomic impacts of oil and gas operations are unclear (Lind, 2015). Lind (2015) believes the exploitation of these resources may heighten local tensions as resource extraction tends to '… take place against a background of considerable marginalisation and violence.'

This research evaluates the kinds of impacts which the development of an offshore oil and gas industry in South Africa may produce. It is based primarily on desktop analysis and some personal correspondence. Although this report is not an Environmental Impact Assessment, Economic Impact Assessment or a Cost-Benefit Analysis, this study serves as a useful primer into further studies on this important topic.

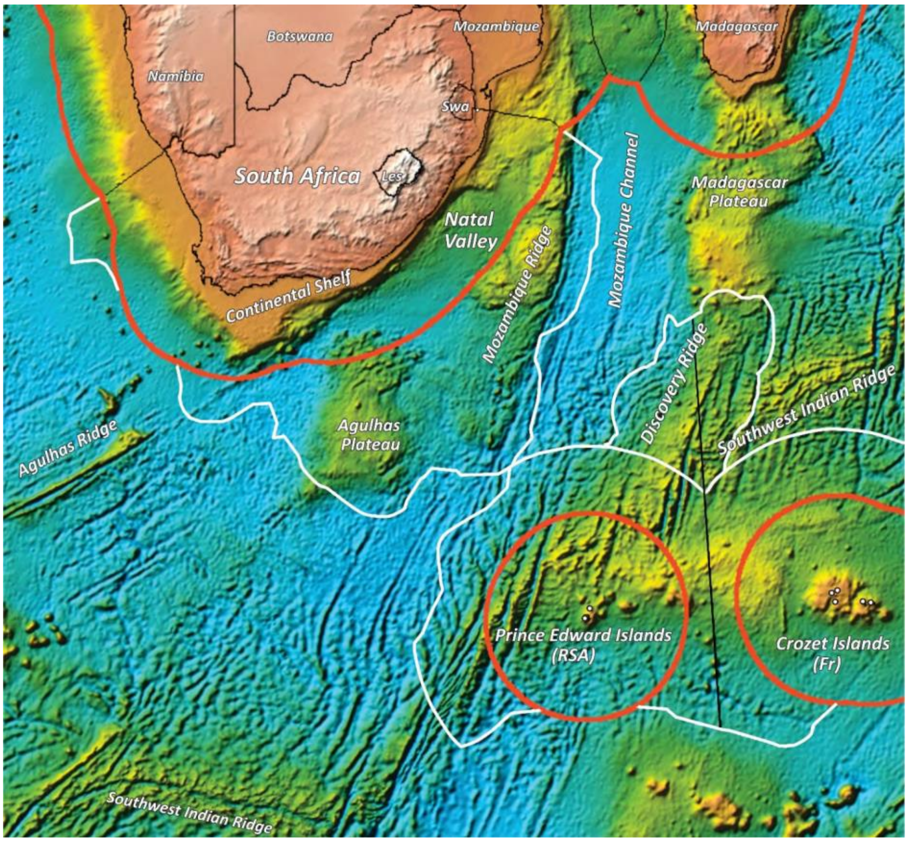
Firstly, the report evaluates the progress that has been made in unlocking the economic potential of South Africa's oceans via Operation Phakisa. In understanding the economic benefits that marine and coastal zones currently bring to South Africa, this research has drawn heavily on the work of Brick & Hasson (2018). It then explores the concept of the 'resource curse', sometimes known as the 'paradox of plenty,' by examining three case studies – from Nigeria, South Africa, and Mozambique. Then, using what information is currently available in the public realm, an analysis of the likely short and long-term impacts of the development of an oil and gas industry in South Africa is undertaken.

The likely social and economic impacts on South Africa of the development of the oil and gas industry are discouraging – there will probably be a long-term decrease in Gross Domestic Product (GDP), few jobs are likely to be created, the economy is likely to suffer from 'Dutch disease' while adverse environmental impacts from offshore oil and gas will harm the fishing and tourism industries. Negative localised impacts on provincial and local governments will likely discourage most municipalities from willingly participating in the oil and gas industry. A host of additional economic and financial factors, including the global oversupply of gas, transition risks, and the very real risks of technological lock-in and the creation of stranded assets, make the oil and gas industry an extremely unattractive economic and social proposition for South Africa.

2. Operation Phakisa: Oceans Economy

2.1. Brief Overview of Operation Phakisa

Stretching from the northern bank of the Orange River on the Namibian border to the Mozambique border, South Africa's has 2798km of coastline (DEFF, No date; Naidoo, 2020; WWF-SA, 2016). This coastline harbours three different oceans, the Indian to the east, the Southern to the south, and the Atlantic to the west. To protect its interests, in 1994, South Africa declared an ocean exclusive economic zone (EEZ) extending 200 nautical miles around the coastline, as well as around Prince Edward and Marion Islands (United Nations Convention for the Law of the Sea, 1982 as cited in Naidoo, 2020). South Africa has applied to extend its EEZ beyond 200 nautical miles by arguing that because the country's continental slope extends into the sea it can claim an additional area. To date, this has not yet been approved (Naidoo, 2020).



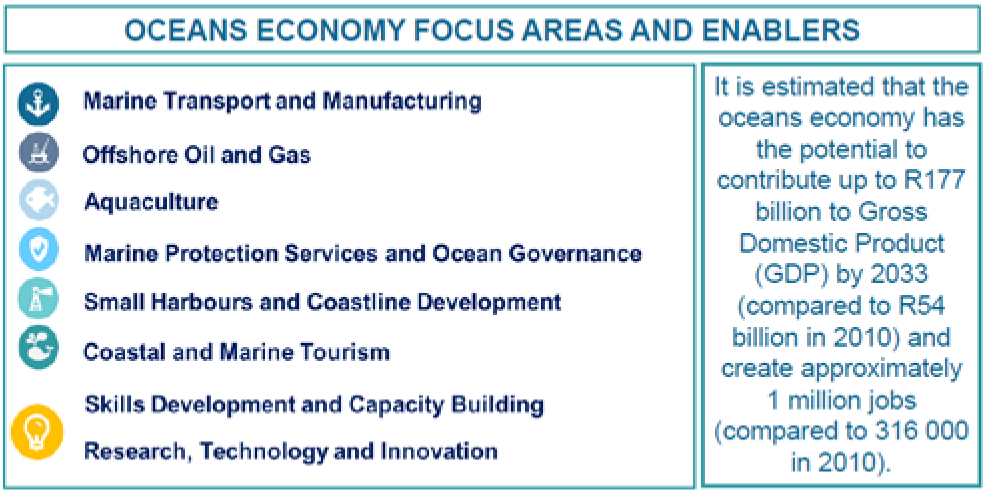
Map 1: The coastal zone of South Africa

The white outlined areas shown above illustrate South Africa's Extended Continental Shelf Claim. The blue areas depict the deep ocean floor (6,000 m deep) which is a vast plain cut by trenches and ridges which follow fault lines. The green and yellow areas depict enormous underwater plateaus and mountain ranges. South Africa's remote and tiny Prince Edward Islands are seen to be the peaks of underwater volcanoes on the flank of the South West Indian Ridge. Source: Petroleum Agency SA

The unique ocean currents around South African are highly productive and contain extensive biodiversity due to habitats which range from cool-water kelp forests to subtropical coral reefs. This diversity means that the marine and coastal zones in South Africa have enormous economic and developmental opportunities – through fishing, shipping, tourism as well as new and emergent technologically advanced sectors relating to medicine, energy, mining and food production (WWF-SA, 2016; DEFF, No date) (Jarre, et al., 2018).

Aware of this vast potential, the government launched Operation Phakisa (Phakisa) in 2014 as a 'fast results delivery programme' designed to boost economic growth and create jobs within the context of the government's National Development Plan (Department of Planning, Monitoring and Evaluation (DPME), 2014). It has seven cross-cutting focal areas, one of which is the Oceans Economy which has, in turn, six workstreams. Naidoo (2020) notes South Africa's oceans hold extensive economic growth potential which Phakisa hopes to tap into by creating new industrial opportunities (Naidoo, 2020; Chadema & Joseph, 2017). In 2014, it was estimated that the Oceans Economy could contribute up to R177 billion to South Africa's GDP, as well as create approximately one million jobs by 2033 (Department of Environment, Forestry and Fisheries (DEFF), 2019).

Figure 1: Oceans Economy Focus Areas and Enablers (Source: DEFF, 2019)



2.2. Progress to Date on Oceans Economy

Between 2014 and 2019, government unlocked Oceans Economy investments amounting to approximately R29.4 billion, while 7 093 direct jobs were created. However, of the 18 projects identified in 2019, six were only 70% on target, one was approximately 60% on target, while the remaining 11 were less than 50% on target (Operation Phakisa, 2019).

In 2020, it was reported that R40.8 billion worth of investments had been made in the Oceans Economy which had created 7 385 direct jobs. However, there was no update on the progress of the 18 projects identified in 2019, nor the amounts invested in each workstream (DEFF, 2020).

In an Oceans Economy Phakisa progress meeting in 2020, Mr Andre Share, Chief Director: Oceans Economy Secretariat, Operation Phakisa: Oceans Economy, DEFF, noted that '… there is a need to re-assess the projections in light of the global and local economic climate and in light of the current growth rate in terms of the South African economy.' (DEFF, 2020). Share reported on progress in each of the six Oceans Economy workstreams:

- ***Marine transport and manufacturing:*** While this stream invested in improvements to general port infrastructure it also invested heavily in fossil fuels. It invested in the Burgan fuel storage facility; an offshore supply base in Saldanha Bay; and the Sunrise Energy Liquid Petroleum Gas (LPG) facility in Saldanha Bay.
- ***Offshore Oil & Gas:*** Share reported that progress had been slow in this workstream, although exploration had continued, and several wells had been drilled. In addition, an emergency response organisation had been established to deal with emergency drills, and a Strategic Environmental Assessment (SEA) was being conducted for the Phased Gas Pipeline. Coega Liquefied Natural Gas (LNG) Terminal phased gas pipeline network concept study had also been completed. The Upstream Petroleum Development Bill was being fast-tracked as part of interventions by Department of Mineral Resources and Energy (DMRE). Share noted that 'South Africa has the potential but needs the private sector to invest.'
- **Aquaculture:** According to Share, a number of 'catalyst projects' had been implemented; there had been legislative reform, while a globally recognised monitoring and certification system had been initiated. An Aquaculture Development Fund to promote rural economic development and community-based aquaculture had been established, as had Aquaculture Development Zone. Share asserted that by 2018, aquaculture had created 6500 jobs – more than any of the other workstreams combined.

- ***Coastal & Marine Tourism**: Eight projects have been completed under this workstream which had created 1189 full-time jobs. Six key coastal marine tourism nodes were being developed, alongside beach precinct development. Data collection and research on marine nature-based tourism was allegedly underway.*
- ***Small Harbours Development:*** Economic research and feasibility study were to commence for priority small harbours development in the Northern Cape, KwaZulu-Natal and the Eastern Cape. Harbour infrastructure maintenance had been carried out, 29 sunken vessels had been removed while dredging had been completed at Gordons Bay, Hout Bay, Stillbaai, Struisbaai and Gansbaai.
- ***Marine Protection Services and Ocean Governance**:* Share noted that Sector Plans were being developed and 20 marine protected areas (MPAs) had been gazetted, covering approximately 5% of South Africa's Exclusive Economic Zone (EEZ). An Oceans & Coastal Information System (OCIMS) had been implemented to track vessels entering the EEZ, and to monitor harmful algal blooms. A water quality programme was being implemented (DEFF, 2020).

Despite the initiatives listed above, the reality is that the Oceans Economy in South Africa is not yet delivering the economic gains that were anticipated by Phakisa. The contribution of the Oceans Economy to South Africa's GDP has declined as a percentage of GDP, from 4.4% (R110 billion) in 2010, to 4.2 % (R130 billion) in 2019. In research undertaken for the World Wildlife Fund in South Africa in 2016, it was estimated that the total contribution of coastal resources (without regulatory services) was R57 billion. This research argued, however, that the direct economic benefits of coastal resources, via fishing, port and harbour development, and recreation and tourism opportunities, contributed as much as 35% of South Africa's GDP. In addition, indirect economic benefits, largely made of ecosystem services, are said to contribute as much as 28% of South Africa's GDP. These ecosystem services include erosion control provided by coastal features (dunes and high cliffs), waste assimilation, detoxification and recycling through coastal wetlands, forests, and grasslands (WWF-SA, 2016). Estimates of the benefits that the oceans, coastline and estuaries contribute to the South Africa economy are in the Appendix. These estimates illustrate what is potentially at risk if the wholesale development of the oil and gas industry does indeed take place in South Africa. However, these estimates are, however, subject to the proviso that it is not always possible to compare year-on-year, and some data gaps exist.

Chadema & Joseph (2017) argue that one of the reasons why Phakisa has not yet delivered the promised outcomes is because it has been hurriedly implemented. This has resulted in inadequate due diligence taking place within the programme threatening already fragile marine ecosystems with overexploitation. They contend that the government's economic agenda has overruled scientific opinion and environmental justice in relation to the oceans. This has, they argue, resulted in the watering down of legislation, inadequate public participation processes and the weakening or co-opting of environmental management institutions. They conclude by noting the policy contradictions in Phakisa, between the government's international climate change commitments and its paradoxical attempts to rejuvenate an ailing economy through increasing fossil fuel extraction via the oil and gas workstream. In highlighting the needs of the economy, Phakisa has clearly failed to consider the pressing problems of climate change and the ongoing loss of ocean biodiversity.

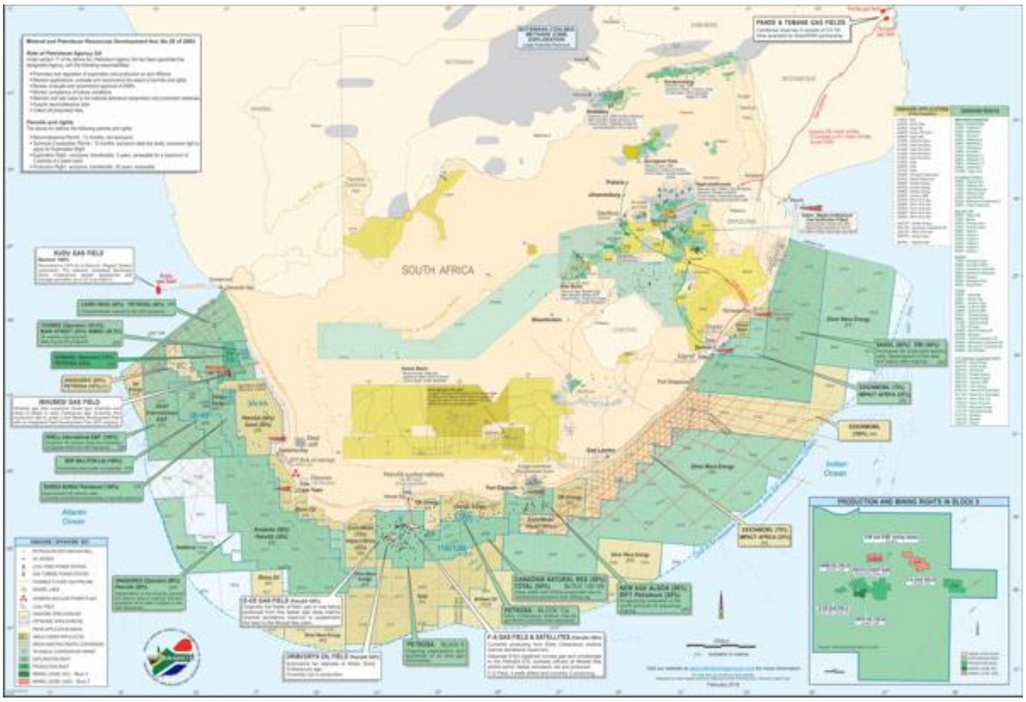
2.3. South Africa's Nascent Oil and Gas Industry

On the 7th of February 2019, President Ramaphosa announced during the State of the Nation Address that the French multinational company, Total, had made a significant gas condensate discovery 175 kilometres off the southern coast of South Africa. Ramaphosa said 'this could well be a game-changer for our country. We are extremely encouraged by the report … about the Brulpadda block in the

Outeniqua Basin, which some have described as a catalytic find …' (South African Government News Agency, 2019). It has been speculated that the Brulpadda block could produce as much as one billion barrels of gas condensate (a light liquid hydrocarbon) and condensate light oil (a form of light crude oil) (Overy, 2019).

Similar sentiments were expressed in November 2020 when another discovery in an adjacent site (Luiperd Well) was made (Githathu, 2020). Mineral Resources and Energy Minister, Gwede Mantashe, said, 'the discovery of oil and gas off South Africa will be a game changer ...' The Finance and Economic Opportunities Member of the Executive Council for the Western Cape, David Maynier stated, 'the announcement provides a confidence boost in the development of the South African oil and gas industry and is good news for the economy in the Garden Route and the Western Cape'. (Githathu, 2020).

Despite these bold claims, the reality is that the South African oil and gas industry is still in a nascent stage of development with considerable uncertainty regarding the size and commercial recoverability of the country's oil and gas resources (Davis Tax Committee, 2016). This means that the hopes expressed by President Ramaphosa and others that these non-renewable resources will contribute to South Africa's economic growth and lift large segments of the population out of poverty is far from certain. As the following section illustrates, the lack of certainty is not just because the magnitude of the oil and gas reserves have yet to be accurately assessed, but because there is scant evidence from elsewhere in Africa that the exploitation of oil and gas resources naturally leads to improvements in the lives of those living and working in oil and gas rich areas. In fact, as this report will reveal, it normally leads to a wholesale deterioration in living conditions for the vast majority of citizens who live and work in such areas (Overy, 2019; Naidoo, 2020; National Planning Commission, 2012).



Map showing offshore oil and gas exploration and license blocks in South Africa's Exclusive Economic Zone. Source: http://www.petroleumagencysa.com

3. Lessons learnt from other African countries

As the saying goes, forewarned is forearmed. South Africa should look to both African and global countries for lessons on the extraction of oil and gas reserves. Mihalyi & Scurfield (2020) highlighted the benefit of hindsight as they analysed 12 Sub-Saharan African countries who had found oil and gas deposits during the period 2001 – June 2020. Their findings were that all 12 countries fell short of forecasted expectations. The economic outlook of these countries has changed following these disappointments, especially following the slump in commodity prices that began in late 2014 (Mihalyi & Scurfield, 2020).

3.1. Overvaluing non-renewable resources

For oil and gas to be commercially viable, the deposit size of the find is important. Mihalyi & Scurfield (2020) find that the commercial viability of resources varies significantly and may change over time. Moreover, many of the African countries they analysed suffered disappointment after their initial discoveries. One reason that discoveries were overestimated was due to companies wanting to emphasize positive results to inflate their share prices. This also has the effect of misleading governments and other companies exploring in the same areas (Mihalyi & Scurfield, 2020). The PWC's Africa Oil and Gas Review (2020) estimates that the demand slump in global oil will result in lower prices per barrel over at least the next 20 years which will 'cost' Africa R14,55tn in lost export revenues.

In 2020, Huxham, et al analysed how a global low carbon transitions could affect the profitability and value of Uganda's two principal under-development upstream oil fields; the export pipeline from the Kabaale industrial park near Hoima to Tanga port in Tanzania, and the East Africa Crude Oil Pipeline or EACOP (including the planned oil refinery to be built in the Kabaale industrial park). Huxham, et al (2020) note that in Uganda, the value of the upstream oil reserves has fallen by more than 70% (from R887 billion to R262 billion) since 2013. They argue that if a global low carbon transition consistent with keeping global warming to well below two degrees occurs, the value of Uganda's oil reserves could fall a further R145 billion (or 56% of its value in 2020) and would be worth 88% less than they were in 2013.

3.2. Timeline from discovery to production

Industry studies indicate that oil and gas projects frequently have time and cost overruns, and more so in Africa (Mihalyi & Scurfield, 2020). Globally, the average amount of time it takes to get from discovery to production is 7.5 years. In Sub-Saharan Africa, the average time is around 12 years. For gas assets, the average time is nine years globally, versus 15 years in Africa (Mihalyi & Scurfield, 2020). The extensive time and cost overruns may make these extractive projects less commercially viable, especially within the context of falling demand.

3.3. Government revenues generated

African government revenues have fallen significantly short of forecasts. The most recent revenue projection is on average 63% lower than was initially estimated (Mihalyi & Scurfield, 2020). The shortfall has been attributed to; lower rates of production than originally forecast; challenges associated with taxing production as the resource sector can be hard to tax effectively; underestimates of costs or cost deduction; and, mistaken fiscal assumptions in modelling (Mihalyi &

Scurfield, 2020). In addition, the share of after-cost revenues that flow to the government as opposed to companies (known as the 'government take') has not met with expectations (Hubert, 2019).

Mozambique government revenues lower than projected

There is no shortage of natural gas in Mozambique, however, the challenge lies in mobilising investments needed to bring the gas to market (Hubert, 2019). The first project to extract gas in Mozambique is the Coral South Floating project, led by Eni. The first exports are expected in late 2022.

Previous revenue projections generated by the International Monetary Fund (IMF), the World Bank-funded Gas Master Plan, and Standard Bank analysis, suggested very substantial government revenues from LNG by the early- to mid-2020s. These forecasts assumed early first exports, the rapid expansion of production capacity, and very high LNG prices (Mihalyi & Scurfield, 2020).

The predictions for government revenues from FLNG are crucial for Mozambique given the challenges of external debt and declining donor support (Hubert, 2019). Three different government revenue forecasts have been generated: Eni has indicated that the government can expect to generate around $16 billion in revenue over the life of the Coral South FLNG project; the Mozambique Ministry of Finance model suggests the project could generate around $11.5 billion in revenue; while the Mozambique Minister of Mineral Resources and Energy reported that the project could generate up to $24.5 billion.

The IMF projections for Mozambique appear flawed as they estimated that corporate income tax would be paid in the first production year, which experts believe is unlikely (Mihalyi & Scurfield, 2020). Moreover, Hubert (2019) estimates that the construction of the liquid natural gas (LNG) facilities needed for export will cost tens of billions of dollars.

An alternative forecast by Hubert (2019), using an assumed oil price of $70 per barrel in 2022, forecasts government revenues of around $11.6 billion over the life of the project. However, government revenues are highly sensitive to oil prices and if the price increases to $85 per barrel they estimate government revenues of $19 billion, while at $55 per barrel revenues would fall to $5.5 billion. Hubert (2019) suggests that government share of revenues is low at approximately 49% and that timing is a challenge as the rear-loaded nature of the agreement means that government revenues are likely to be very modest in the early years of production, especially if there are cost over-runs, or if prices remain low. This means that the start of significant government revenues will be pushed back even further (Hubert, 2019).

3.4. Developing nations are facing a debt-repayment crisis

The African continent is trapped in a vicious debt crisis due to unsustainable loans (SystemIQ, 2020). Because infrastructure is viewed as a critical engine of growth in developing economies, debt financing has historically been used to drive infrastructure development. However, many African countries have found that they have not been able to make debt repayments because of insufficient revenue generation caused by volatile commodity prices. Thus, domestic spending on social services or other national priorities tends to be sacrificed, further weakening the economy (SystemIQ, 2020).

In sub-Saharan Africa, average public debt as a percentage of GDP rose from 37% to 56% between 2012 and 2016. China holds 62% of Africa's official bilateral debt and, as Paola Subacchi (2021) observes, the conditions of this debt are more onerous than debt from multilateral development banks. This is because the terms tend to have higher interest rates, shorter maturities and are often subject to collateral. Moreover, the Chinese banks tend to renegotiate sovereign loans bilaterally and in secret (Subacchi, 2021). South Africa has not escaped this vicious cycle and in 2019 recorded a government debt equivalent to 62.2% of the country's GDP (Mkhabela, 2020). Moody's estimates that the debt burden will reach 91% of GDP by fiscal 2023, inclusive of guarantees to state-owned enterprises (SOEs) (Mkhabela, 2020). Given this debt crisis, serious questions need to be asked about whether it is prudent to be investing in volatile commodities like oil and gas which could become a serious financial burden on the South African economy. There is little doubt that investing in oil and gas in South Africa is risky and has the potential to increase the country's already excessive debt burden.

Mozambique – the non-renewable resource curse hits again

In 2008, gem-quality rubies were found in the north of Mozambique. Just two years later, extensive natural gas deposits in the Rovuma basin within the deep waters of the Indian Ocean were discovered. Since the discovery of these abundant non-renewable resources, billions of dollars of foreign investment have flowed into the Mozambican region of Cabo Delgado (Chimhangwa, 2020). According to activists and non-governmental organisations from Mozambique, the government has forcibly removed whole communities from state-owned land after granting mining and exploration concessions to private companies (Ahmed, 2020). This forced removal has been accompanied by failed land resettlement programs which have left thousands of people, who had previously farmed and fished, without viable livelihoods because they lack the necessary skills to work within the extractive sector (Ahmed, 2020; Chimhangwa, 2020).

Matsinhe, a human rights campaigner, states, 'they are not only unemployed, they are also unemployable. They are complaining, they have protested against their expulsion [from the land] They are saying … it's only outsiders who come here to benefit and we're sitting here watching them, as cited in Ahmed (2020).

Since 2017 the Cabo Delgado region has been the site of violent confrontations which have pitted government forces and mercenaries against internal rebels and insurgents as they all try exploit the rubies and gas, regardless of the costs and impacts on civilians (Chimhangwa, 2020). The violence has resulted in an estimated 200 000 people or 10% of the Cabo Delgado population, fleeing their homes since 2017. Evidence suggests that more than a fifth of the remaining population do not have enough food as the price of staple foods such as rice and maize have increased, exacerbated by concomitant increases in the price of fuel. The situation is made worse by the withdrawal of humanitarian groups which are unable or unwilling to operate within such an unstable and violent setting. (Ahmed, 2020).

Experts note that despite the wealth that have flowed into the Cabo Delgado region, the government has not increased its investment in the region to support its residents. As Ahmed argues, '…resource abundance has brought only displacement and misery for local people.' (Ahmed, 2020).

4. The Paradox of Plenty

The failure of states to improve the social and economic conditions of their citizens despite being rich in resources such as oil and gas has been described as the 'Paradox of Plenty' or the 'resource curse'. The paradox is that, on average, countries with an abundance of non-renewable resources tend to have lower levels of economic development and growth than those without such resources (Lagercrantz & Khabbaz, 2019; Onyeukwu, 2007; Stiglitz, 2012). In addition, countries rich in extractive resources tend to have higher levels of inequality and lower levels of democracy (Stiglitz, 2012; Lagercrantz & Khabbaz, 2019; Overy, 2019).

In general, countries with extensive oil and gas reserves do not develop their own economies by reinvesting their wealth. This is largely because weak political institutions and underdeveloped civil societies make it possible for political elites within mineral or non-renewable resource rich countries to redirect much of the income to themselves. This, often deliberate, mismanagement of resource revenues means that mineral resource rich countries tend to underinvest in education and other important public goods. This underinvestment is exacerbated by the neglect of taxes as a source of revenue because extractive revenues are so high.

In addition, resource rich countries fail to diversify their economies adequately, prioritising the quick gains that come from extraction, over more long-term economic planning. This often results in the agricultural sector being neglected, leading to increased poverty in rural populations. It also leads to underemployment as jobs are not created in other economic sectors. All of this is further compromised by the volatility in non-renewable resource prices which causes unstable revenue streams, a situation made worse by commodity trading (Stiglitz, 2012; Onyeukwu, 2007; Romanova, 2007).

It is unsurprising that this unstable and chaotic context gives rise to conflict between different political forces within countries over access to non-renewable resource rents. Gillies (2020) describes the emergence of the 'rentier state': A political system where elites allocate resource wealth to extend their power rather than to provide public goods (Stiglitz, 2012; Lagercrantz & Khabbaz, 2019; Gillies, 2020).

Seriously compounding the problem of the resource curse, is the phenomenon known as 'Dutch Disease'. Dutch disease, so named after the experience of the Netherlands after its discovery of North Sea gas and oil in the 1960s, describes problems that emerge with the rapid inflow of money that comes from non-renewable resource extraction. Firstly, it leads to currency appreciation, which results in a dramatic fall in the competitiveness of exports, be they manufactured or agricultural. This leads to falls in export revenue for these sectors, which are also battling against cheaper imports caused by currency appreciation. Both capital and labour to abandon these sectors in favour of the booming extractive sector, further damaging these sectors and boosting the extractive sector. This concentration of capital and labour can then become a problem within the extractive sector because it creates localised competition for goods like food (an industry which has already been undermined), and services such as housing. This then results in local costs rising for these types of critical goods and services, and results in economic recession (Lagercrantz & Khabbaz, 2019; Onyeukwu, 2007).

This localised influx of capital and labour can lead to serious social issues. Extensive migration into oil-producing areas places strain on public infrastructure and results in increased poverty rates, poor healthcare, high rates of child mortality, gender and economic inequality and crime. Research also shows how 'Dutch disease' both causes and contributes to the conflicts that occur in these countries (Onyeukwu, 2007; Romanova, 2007; Lagercrantz & Khabbaz, 2019).

Evidence shows that the economic, social, environmental and governance impacts that arise due to the extraction of oil and gas, tend to be localised in the regions where extraction takes (Lagercrantz & Khabbaz, 2019). The following sections explore in more detail the ways in which the paradox of plenty and Dutch Disease manifest themselves in non-renewable resource-rich countries. They look at problems that emerge both at national and local levels.

Nigeria, Africa's biggest paradox

Nigeria is currently the largest oil producer in Africa, and as such the energy sector has played a substantial role in Nigeria's economy. Oil was discovered in 1958 and for a long time Nigeria was one of the top 10 global producers, but by 2019 Nigeria had become the 13th largest global oil producer. Nonetheless, In the fourth quarter of 2018 oil accounted for 81% of Nigeria's export revenues, forming a large percentage of government revenues, and about 10% of its GDP (Onyeukwu, 2007; Okoi, 2019). Since 1960, it is estimated that Nigeria has earned between R5822 and R8733 billion in oil revenue (Onyeukwu, 2007; Romanova, 2007; Overy, 2019).

Despite the enormous wealth oil has generated, Nigeria's Human Development Index value for 2019 was 0.539, ranking it 161st out of 189 countries and territories. A '2019 Poverty and Inequality in Nigeria' report calculated that 40% of the total population, or almost 83 million people, live below the country's poverty line of 137,430 naira (R5556) per year (National Bureau of Statistics, 2020). The World Bank calculates that Nigerian per capita income is R32 456, compared to a global average of R266 349, while the adult literacy rate is only 62% (2018).

5. The Economic impacts of offshore oil & gas

5.1. Introduction

South African government officials have claimed that the establishment of an offshore oil and gas industry in South Africa via upstream production and the development of an oilfield services industry, including the expansion of supporting industries, would bring significant economic development to the country. This would take the form of increased GDP, improved balance of payments, increased foreign direct investment and gross fixed capital formation, greater employment, and the generation of additional tax revenues (Ground, et al., 2013; Davis Tax Committee, 2016).

The following analysis delves into some of the anticipated economic impacts of offshore oil and gas production. It references an economic model developed for South Africa, as well as research from the United States of America, Canada, and the United Kingdom. This research illustrates that the development of an oil and gas industry is unlikely to have positive benefits, either nationally or locally.

5.2. Impact on Gross Domestic Product (GDP)

Research undertaken by Wait et al (2015) links petroleum fiscal regime instruments (such as royalties, company income tax and resource rent taxes) to impacts on economic growth, investment and employment in South Africa using an economy-wide impact modelling methodology (Computable General Equilibrium modelling). The researchers developed five scenarios using the current South African fiscal system as opposed to the fiscal systems used by competitor countries such as Namibia, Mozambique, Uganda and Tanzania. The base case scenario representing the current crude oil, petroleum and gas industry fiscal system for South Africa is compared to several policy scenarios representing levels similar to the fiscal systems of each of the four countries (other than South Africa) specified in the table below:

Figure 2: Simulation scenarios for the GCE model (Source: Wait et al, 2015)

Table 5: Details of simulations

Simulation	Description
Scenario 1: Production increase (PIC)	A 20% increase in crude oil, petroleum and gas production under the current South African petroleum fiscal system as captured in the UPGEM . The current fiscal system is set at a maximum rate of 5% for royalties, 28% for income tax and 0% for resource rent tax.
Scenario 2: Mozambique fiscal system (M FS)	Royalties set at 16% (this is modelled as an annual production tax on the industry —that is essentially a tax on the firm's profits, additional to the ordinary indirect taxes levied by the government), thus an 11% increase in the current rate; income tax set at 32%; thus a 4% increase in the current rate; and resource rent tax at 0% (the same as in Scenario 1).
Scenario 3: Namibia fiscal system (NFS)	Royalties set at 5% (the same as in Scenario 1); income tax set at 35%; a 7% increase in the current rate; and resource rent tax at 30% (up 30% from 0%).
Scenario 4: Tanzania fiscal system (TFS)	Royalties set at 12.5%, a 7.5% increase in the current rate; income tax set at 30%; a 2% increase in the current rate; and resource rent tax at 30% (up 30% from 0%).
Scenario 5: Uganda fiscal system (UFS)	Royalties set at a maximum of 12.5%, a 7.5% increase in the current rate; income tax set at 30%; a 2% increase in the current rate; and resource rent tax at a maximum of 80% (up 80% from 0%).

Source: Compiled by authors

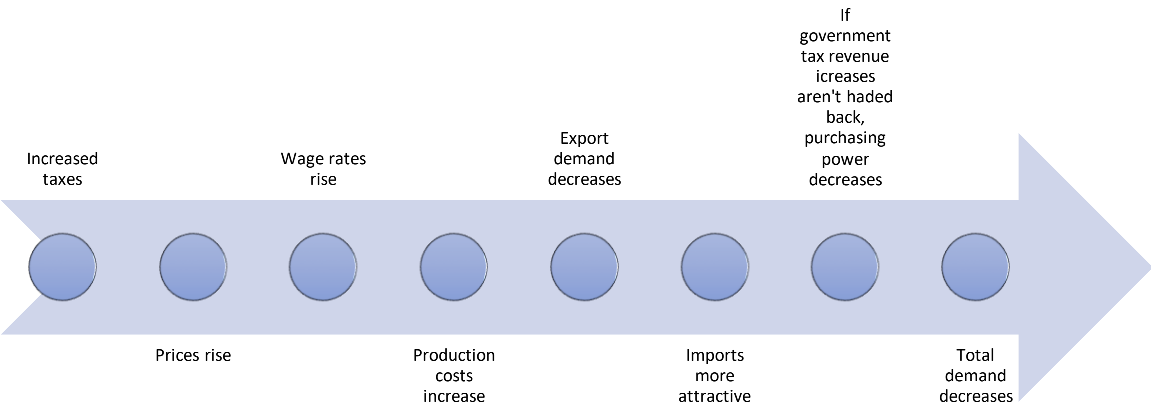
Note: Scenarios 2-5 will include Scenario 1, but under different fiscal systems (as mentioned earlier).

The model uses a relatively small, stimulated increase in crude oil, petroleum, and gas production of 20%, and notes that the outcomes may change if the stimulated increase changes. The modelling results indicate that a 20% short or long-run increase in the production of crude oil, petroleum, and gas in South Africa (Scenario 1) increases real national GDP by 0.15% in the short run and decreases GDP by 0.12% in the long run.

Similarly, for scenarios 2-5, in the short-run, real GDP is increased by between 0.15% and 0.19% for 20% increase in crude oil, petroleum and gas output, while the long-run impact is a decrease in GDP of between 0.03 and 0.12%.

Wait et al (2015) explains that the decrease in real GDP in the long run is caused by the knock-on effect of increased taxes which cause prices to rise, which causes wage rates to rise, which in turn increases production costs, which then reduces export demand and makes imports more attractive. Moreover, if government tax revenue increases are not handed back, purchasing power is reduced, resulting in a contraction in total demand.

Figure 3: Decrease in GDP in long-run due to knock-on effect



5.3. Real consumption and consumer prices

A second finding from Wait et al.'s model is that under South Africa's fiscal regime, an increase in real income stemming from the expansion of the oil and gas sector will result in increased consumption in all the short-run scenarios, mainly due to gains in real income. However, in the long run, consumers are not able to adjust to the permanent changes in real income, and all industries are also not able to invest in new capital stock due to long-run profit opportunities being negated by increased taxation in the sector. Thus, over the long run, real consumption expenditure and real investment expenditure decrease by 0.15% and 0.32% on average (Wait, et al., 2015).

5.4. Financial Flows and Ownership

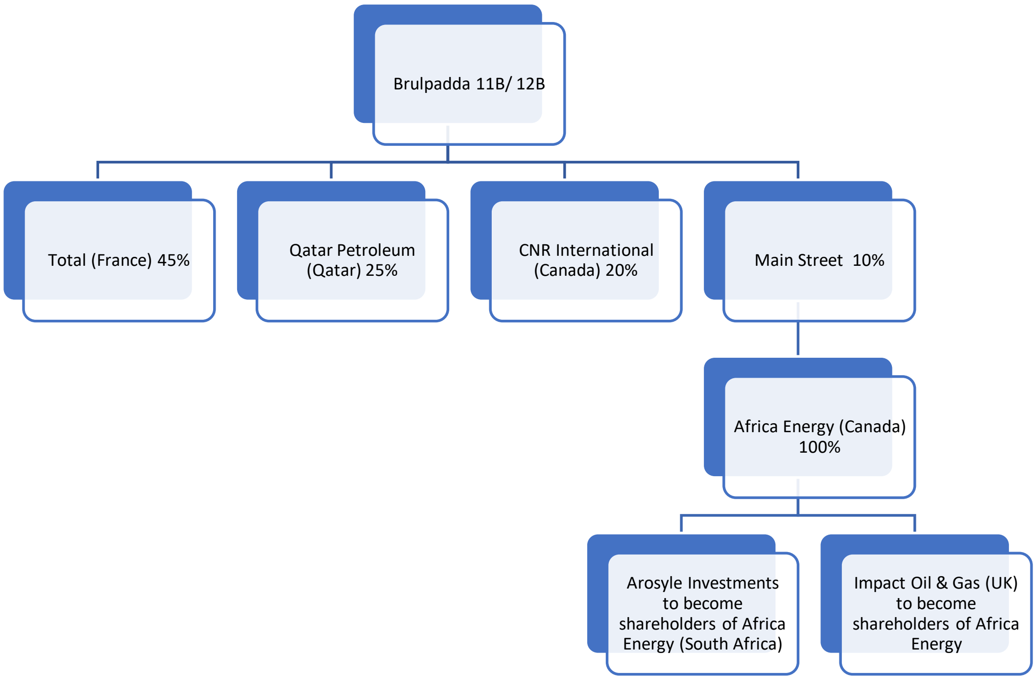
The revenue generated from the sale of oil and gas should contribute to improved GDP. However, experience from the USA shows that capital income from oil and gas industries tends to be disappointing as most of the revenue generated is allocated to capital (and lower than expected gas prices means there is less capital income) (O'Leary, 2021). Moreover, much of the capital income realised is exported out of local economies as the owners and shareholders generally live outside of regions where extraction occurs (O'Leary, 2021).

It seems that a similar reality may already be manifesting itself in South Africa nascent oil and gas industry. If ownership of the oil and gas companies is non-South African, it would clearly not reflect in the Gross National Income (Brick & Hasson, 2018). In 2019, the ownership structure of Brulpadda licensing rights were held by French multinational Total (45%), Qatar Petroleum (25%), Canadian Natural Resources (20%), and Main Street (10%). MTN chairperson Phuthuma Nhleko is the only South African director of Main Street – owning up to 51% of the company through Arostyle Investments. However, South African owned HCI indirectly owned a stake in UK-owned Impact Oil & Gas which supplied finance to Arostyle Investments (Overy, 2019; Qekeleshe, 2020).

What this means is South African-owned Arostyle Investments originally held just 5.1% of the Brulpadda find in Block 11B/12B. Qekeleshe (2020) reports that Main Streets' 10% interest in Block 11B/12B has been consolidated under Africa Energy, resulting in Africa Energy holding a direct 10%

interest in Block 11B/12B. Upon completion of the agreements, Impact and Arostyle will become significant shareholders of Africa Energy (Qekeleshe, 2020). Thus, at this stage it seems that a considerable majority of the revenue from the find will flow overseas with an unknown amount returning to South Africa through Arostyle Investments (Overy, 2019; Qekeleshe, 2020).

Figure 4: Ownership Structure of Brulpadda Find (Adapted from Overy (2019)



5.5. Taxation and Mining Royalties

A positive contribution to government revenue will come from taxes in the form of company income tax and mining royalties (Brick & Hasson, 2018; Overy, 2019; Davis Tax Committee, 2016). However, Overy (2019) cautions that it is likely that production will only start in approximately 10 years from the date of the find, meaning that there will not be any company income tax or royalty payments until production has begun.

In 2016, the Davis Tax Committee reviewed the taxation of hydrocarbon producers in the hope of restructuring it to better promote economic growth, poverty alleviation, job creation and fiscal stability. They were influenced by another finding of the Wait Study (2015). This finding indicated that fiscal systems that promote GDP growth are less attractive in terms of investment promotion. Countries still in the exploration phase should therefore opt for fiscal systems that promote investment and should only shift their focus to GDP growth once the industry has had sufficient time to develop (Davis Tax Committee, 2016; Wait, et al., 2015). The Davis Tax Commission concluded that in an environment of where the true nature of South Africa's oil and gas reserves were not yet known, and where there was policy uncertainty and low oil prices, South Africa should retain its existing fiscal regime for oil and gas companies (Davis Tax Committee, 2016).

The Petroleum Agency SA (2017) notes the following taxes that apply to oil and gas companies:

- **Royalties** - In terms of the Mineral and Petroleum Resources Royalty Act, 2008, and the Mineral and Petroleum Resources Royalty (Administration) Act, 2008, royalty rates are variable, and are based on profitability (Petroleum Agency SA, 2017; Brick & Hasson, 2018). Rates for refined mineral resources are 0.5% to 5%, and for unrefined mineral resources 0.5% to 7% (SARS 2013 as cited in (Brick & Hasson, 2018; Overy, 2019). Current royalties are collected by the South African Revenue Service (SARS) (Brick & Hasson, 2018). The Davis Tax Committee (2016) recommended that the variable royalty rate formula should be replaced with a flat rate Royalty of 5% for oil and gas (Davis Tax Committee, 2016).

- **Income Tax** - Income tax is payable in terms of the Income Tax Act, Schedule 10 which contains additional provisions applicable only to the upstream petroleum sector and will not exceed 28% (Wasserman, 2019). All expenditure and losses incurred are allowed as deductions and all allowable costs may be immediately expensed for income tax purposes (Petroleum Agency SA, 2017). In addition, a further 100% of all capital expenditure incurred for exploration and 50% in production is allowed as a deduction for the purposes of calculating income tax liability. This amounts to a generous 'super deduction' of 200% of capital expenditure for exploration and 150% for production (Petroleum Agency SA, 2017; Davis Tax Committee, 2016).
- **Customs Duties and Exchange Control** - The Customs and Excise Act makes provision for the full rebate of customs duties on imported goods and equipment for use in the upstream sector (Petroleum Agency SA, 2017). Oil and gas companies are also exempt from the normal restrictions on operating Customer Foreign Currency Accounts (Petroleum Agency SA, 2017). Brick & Hasson (2018) note that additional linkages in the economy are likely to be generated from industries supplying capital equipment, but if all capital equipment is imported then this would limit the additional linkage benefits realised by the domestic economy.
- **State Participation and BEE (Black Economic Empowerment) Participation Interest** - State participation of 10% at the production stage, carried through exploration, will be via PetroSA. A further 10% interest will be made available on commercial terms for participation by BEE companies, which may be taken by PetroSA in the absence of BEE participants (Petroleum Agency SA, 2017; Wasserman, 2019).
- **Annual Upstream Training Trust Donation** - Onshore rights are charged at R1/ hectare with a minimum of R1 000 while offshore rights are charged at R 200 000/sq degree pro rata with a minimum of R 50 000 (Petroleum Agency SA, 2017).
- **Sovereign Wealth Funds -** According to the World Economic Forum (WEF), a sovereign wealth fund is '…a mechanism through which countries make investments. A pot of money – often derived from oil or other commodities – that is then invested in shares, bonds, property or other areas of potential growth.' The WEF, as cited in Simpson (2020), states that many of the countries which use sovereign wealth funds have economies that are heavily reliant on one source of income, such as oil and gas, and they use sovereign wealth funds as a means by which to diversify their economies. In 2020, President Cyril Ramaphosa announced that South Africa would establish a sovereign wealth fund (Simpson, 2020). However, the WEF (as cited in Simpson (2020) and Gillies (2020), caution that sovereign wealth funds are frequently used as vehicles for looting and corruption.

Overy (2019) believes that it is likely that gas and oil profits will be taxed at a total of 33% - a lower amount than many other countries – and that South Africa could tax profits at far higher rates if it chose to. Moreover, he argues that there is no guarantee that any increase in tax revenue for South Africa from the oil and gas industry will be used to address South Africa's development challenges (Overy, 2019). The Davis Tax Committee (2016) uses the Wait et al (2015) study to conclude that '…attracting investment in the oil and gas sector may not deliver significant tax revenue for the *fiscus.'*.

Another issue needs to be considered in relation to tax revenues. In 2014, the South Africa government passed the Special Economic Zones Act. This Act enables the government to create 'Sector Development Zones' which are zones 'focused on the development of a specific sector or industry through the facilitation of general or specific industrial infrastructure, incentives, technical and business services primarily for the export market' (Department of Trade and Industry, 2021). The government states that these zones are designed to attract foreign direct investment and boost exports. (Department of Trade and Industry, 2021) Given the obvious commitment the government has made to open up South Africa's EEZ for oil and gas exploration, a very real danger exists that South Africa will try and accelerate this process by allowing oil and gas companies to operate their onshore facilities within 'sector development zones'. While this may well encourage investment, it will do at the cost of the South African taxpayer as it will lead to a reduction in tax revenues and duties for the government.

5.6. Impact on Jobs

5.6.1. Oil and Gas Employment Estimates and Trends

Although investment in the South African oil and gas industry may not deliver significant tax revenue for the fiscus, Wait et al., (2015) indicate that the multiplier effect of investment creates a platform for job creation and employment (Davis Tax Committee, 2016). Any expansion of the oil and gas industry will result in a slight increase in demand for labour in the short run in those industries producing capital equipment for oil and gas, together with marginal increases in wages. However, in the long run, real wages will decrease marginally, there will be a long-term shift to skilled rather than unskilled labour, while the agricultural sector will suffer a contraction in employment (Davis Tax Committee, 2016; Wait, et al., 2015).

In the United Kingdom, multipliers in the oil and gas sector were calculated at a three times multiplier of indirect jobs, and a six times multiplier of induced employment for every direct job created (Davis Tax Committee, 2016). However, the Davis Tax Commission note that the size of economic multipliers in the oil and gas industry averages two and a half internationally, and can range between one and five. Alternatively put, every Rand spent by the oil and gas industry may generate an average of R2.50 in additional economic activity (Davis Tax Committee, 2016). However, O'Leary (2021) adds that labour's share of the income generated by the natural gas industry is comparatively low. For example, the Ohio River Valley Institute found that in a gas-rich state within Ohio, the figure is only about 12%, which means the industry's contributions to direct employment and wages are modest compared to expectations.

The Oil and Gas UK Workforce Insights report estimated that in 2019 the country's upstream oil and gas sector would support approximately 269 000 jobs in the United Kingdom. Their calculations were based on:

- Direct employment or those employed by companies operating in the extraction of oil and gas and associated services.
- Indirect employment or employment because of supply chain effects caused by oil and gas sector activity.
- Induced employment or employment supported by the industry's wider economic contribution.

In 2018, direct employment of 30 400, created an estimated additional 229 500 jobs (indirect and induced) in the United Kingdom. However, it is important to note that the trend in direct and total jobs has fallen substantially since 2014 (OGUK, 2020). Moreover, the 2020 Workforce Insights report notes that for 'every £1 million spent by the UK oil and gas industry creates eight supply chain jobs and induces another eight jobs across the UK economy…' For South Africa, this could mean that for every R22 million spent, eight indirect jobs and eight induced jobs could be created. On average, an increase of R1 million in expenditure in South Africa will lead to creation of an average 7 jobs or an estimated 8,7 jobs in the agricultural industry or 10,8 jobs in the fishery sector (Schröder & Storm, 2020). In addition, as the Davis Tax Committee correctly states, the procurement of goods and services can act as a multiplier for local economic development by contributing to employment, strengthening skills, and developing local suppliers and enterprises (Davis Tax Committee, 2016).

Figure 5: Total UK Employment Supported by the Offshore OIl and Gas Industry (Source OGUK, 2019)

Figure 1: Total Employment Supported by the Offshore Oil and Gas Industry[5]

	2014	2015	2016	2017	2018	2019 Estimate
Direct	41,300	37,300	35,600	31,400	30,400	30,600
Indirect	206,100	169,500	155,100	124,300	116,100	121,000
Induced	216,500	180,200	136,200	118,100	113,400	117,500
Total	463,900	387,000	326,900	273,000	259,900	269,100

Deloitte (2021) report that in the United States, oil and gas companies laid off about 14% of permanent employees during 2020, the majority of which will not be reemployed as some of these jobs have been automated. Automation is reducing the number of people in the oil and gas industry – in some cases up to 75% of staff may become redundant (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020; Deloitte, 2021).

In Texas alone, it was reported that 46 100 jobs in production and oil-field services were lost between February and June 2020 (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020). Jeliazkov, et al., (2020) note that globally, more than one million oilfield services workers will have lost their jobs by the end of 2020. According to Rystad Energy, a conservative estimate of global oil and gas job losses came to 340 000 jobs but they are expecting further job losses in the coming months (Exarheas, 2021).

Furthermore, by mid-June 2020, 4,500 jobs had already been cut in the United Kingdom's North Sea, with more another 30,000 direct and indirect jobs to be cut by the end of 2020 (Jeliazkov, et al., 2020). Platform et al., (2020) conducted a survey on 1 383 offshore workers in the UK offshore oil and gas industry, representing 4.5% of the workforce. Their findings were that 42.8% of oil and gas workers have been made redundant or furloughed since March 2020.

5.6.2. Actual versus Promised Jobs

The Davis Tax Committee quotes the Standard Bank Commodities report[2] on offshore oil (2013) noting, 'Standard Bank reports that if all the offshore fields in South Africa were to be developed, producing around 450kbd (thousand barrels per day) at an oil price of $110/barrel (bbl), in terms of job creation this would require around 20 500 skilled personnel … and around 33 000 predominately unskilled jobs' (Davis Tax Committee, 2016).

[2] There are two concerns that must be noted with the Standard Bank Report. Firstly, they estimate an oil price of $110/bbl – this amount is contested by analysts and accountants who have revised their estimates to below $55/bbl (Grant, 2020). The question should be whether lower estimates will create lower levels of employment. Secondly, the report itself cautions 'THIS COMMUNICATION MAY CONTAIN RESEARCH. SUCH RESEARCH IS A MARKETING COMMUNICATION: It is not investment research as it is not the result of financial analysis and has not been prepared in accordance with legal requirements designed to promote investment research independence.' (Ground, et al., 2013).

According to multiple studies in the United States, the oil and gas industry's promises of job creation from the drilling of natural gas have been greatly exaggerated. Many of the jobs that are created are short-lived, have gone to out-of-area workers, and are being lost to automation (Deloitte, 2021). In addition, workers tend to be brought in temporarily from other places such as the Gulf Coast states where many drilling services companies are based (O'Leary, 2021).. Research in the United States showed that while the industry claimed 31 direct jobs would be created for each well, only four jobs were created at each well. It also noted that the indirect jobs that the industry claims to create, usually exist prior to the establishment of oil and gas wells (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

Experience closer to home indicates that job projections and actual job creation do not necessarily match. The methane gas project in Mozambique was expected to create 114 800 new jobs every year between 2018 to 2039 (Davis Tax Committee, 2016). Anecdotally, Mozambiquan insiders argue that there have been only a few indirect jobs created in catering, cleaning, and construction (Personal Communication, 2021).

The mature oil and gas industry in the United Kingdom documents the top ten disciplines that work offshore, with most categories falling into skilled or semi-skilled positions. Analysis by OGUK (2021) highlights the gender-bias of the oil and gas industry – with only 3.6% female representation amongst the total offshore workforce.

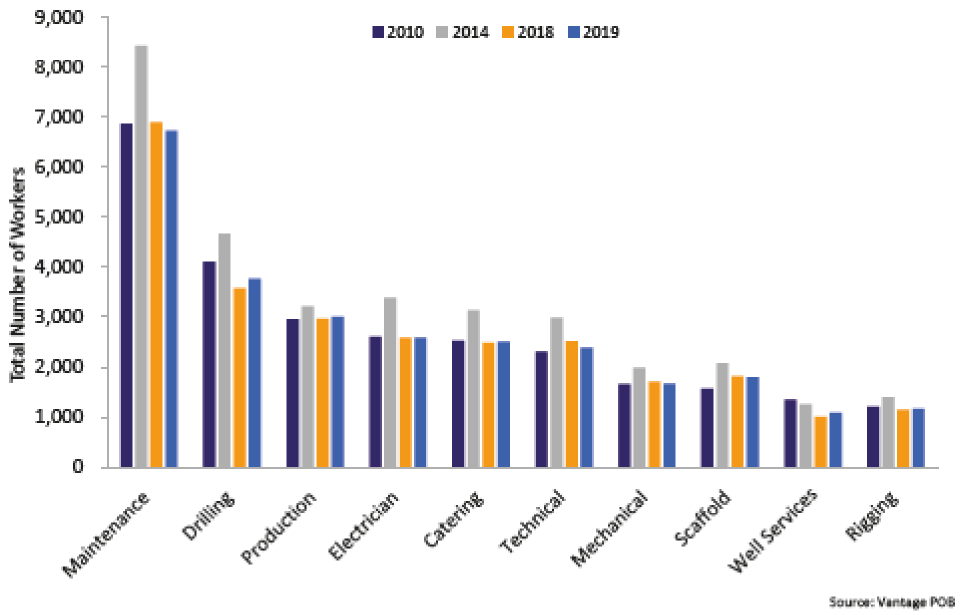


Figure 6: Offshore Employment by Top Ten Disciplines (Source: OGUK)

These findings point not only to the gendered nature of work in the oil and gas sector, but to the critical question of skills. Overy (2019) contends that the South African oil and gas industry is unlikely to create significant numbers of jobs, because those that will be on offer will be skilled and often highly specialised[3]. Ground et al (2013) argue that the South African labour force lacks the skills and

[3] Expansion of the gas-to-liquid plant in Mossel Bay would probably create more construction jobs, while the deep-water ports at Coega in the Eastern Cape and Saldhana Bay in the Western Cape would see an increase in services for the oil and gas industry – again, the jobs would likely be largely technical and highly skilled (Overy, 2019).

experience necessary to exploit both the direct and indirect job opportunities that an expansion of the oil and gas sector may bring. They recommend that oil and gas companies be encouraged to invest in skills development in South Africa. Moreover, they note that ‘even if participation in oilfield operation and services industries is largely by foreign firms, there would still be considerable benefits to existing domestic industries to the extent that the oil industry requires their respective services (e.g., manufacturing, construction and financial services) and this would have a positive multiplier effect’ (Ground, et al., 2013).

However, evidence from the United States shows that the manufacturing jobs that were promised as an indirect benefit of the oil and gas industry do not materialise (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020). In fact, evidence suggests that in some cases unemployment in oil and gas regions increased (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

In terms of jobs creation to date, Phakisa has been a failure. Freight News (2019) reported that Phakisa has ‘failed dismally to generate the number of jobs it anticipated’. Between 2014 and 2019, while over R40 billion had been invested in targeted maritime sectors, less than 10 000 of the 77 000 direct jobs promised had been created (Freight News, 2019). This lower than forecast job creation rate has been attributed to the mismatch between skills available and skills required – especially in the offshore oil and gas sector which required highly specialised skills and fewer people to perform (Freight News, 2019).

5.6.3. Oil and Gas Jobs and Working Conditions

Deloitte (2021) observes that the oil and gas industry is not a reliable employer due to mass layoffs often caused by price volatility. Moreover, offshore work has been deemed precarious because of inadequate government regulation, the challenges of offshore collective organising, and market instability. For example, in 2014 oil and gas workers in the North Sea experienced salary cuts, retrenchments and reduced staff allocations due to downward pressure on the global price of oil (Jeliazkov, et al., 2020). Reports from the United States document oil-industry related wage theft, with some workers claiming they have not been paid fairly. In some instances, workers claim that they have not even been paid the minimum wage (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

Platform et al., (2020) note that satisfaction with health and safety standards was most commonly rated as average by offshore platform workers. Workers expressed significant concern about employment and job security within the oil and gas sector and a low level of confidence in government support. Of those surveyed, 81.7% said they would consider moving to a job outside of the oil and gas industry. These responses indicate that workers feel neglected and unheard – in the past, and in the context of the current crisis.

There are also concerns about the safety of offshore workers. For example, in the United Kingdom 167 lives were lost in the Piper Alpha rig explosion in 1988, while 33 people have died in helicopter crashes between 2009-19 moving to and from offshore oil platforms (Jeliazkov, et al., 2020). In April 2010, eleven workers died when the Deepwater Horizon oil rig exploded in the Gulf of Mexico. The risk for workers has increased as drone strikes have become a threat to oil and gas operations (Team Linchpin, 2020). Saudi Arabian oil wells were attacked by drones in September 2019 which cut oil production in half – highlighting the vulnerability of the workers and infrastructure from these security risks (Blas & Razzouk, 2019).

5.7. Cheaper energy costs

South Africa is not energy secure, and in theory the expansion of the South African oil and gas industry should result in cheap, abundant energy which in past years has been coupled to economic growth – and without electricity, economic development is constrained (Davis Tax Committee, 2016). However, Overy (2019) cautions that it is unlikely that producers like Total would be willing to sell gas and oil in South Africa below global market rates. Nigeria has the seventh cheapest oil price globally, but for the average Nigerian, in relative terms, this oil is the fourth most expensive in the world (Overy, 2019).

Moreover, there is no direct causal or inevitable link between a surplus of energy and manufacturing sector growth. Evidence shows that manufacturing sectors have not necessarily grown or become more profitable as energy has become more plentiful (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

5.8. Strengthening of the Rand

Wasserman (2019), amongst others, argues that as oil represents a substantial amount of South Africa's imports (15-20%), if it produced more oil, it would not have to sell so many Rands to buy Dollars to pay for imported oil. This would have the result of changing the country's balance of payments which could strengthen the Rand (Ground, et al., 2013; Wasserman, 2019).

However, as Huxham et al. (2019) remind us, South Africa is likely to benefit from a net positive impact of lower global oil demand anyway, which will lead to lower oil prices for South Africa of R538 billion between 2018 - 2035. This means that South Africa's imports of oil are likely to be cheaper and may even crowd out domestic production.

6. Additional Economic and Financial Factors to Consider

> 'If you're in the energy business, in the next several years, things are going to change dramatically.' Amy Myers Jaffe, energy expert with the Council on Foreign Relations as quoted in Domonoske (2020).

There are a number of other pitfalls that could befall South Africa. Analysts and economists caution that there is a long-term substantial decline in demand for fossil fuels, just as there is an excess in supply. In addition, there are climate-related financial risks. These include transition risk: the problem of stranded assets; negative impacts on trade and competitiveness; and the physical risks of climate change itself. All these factors should be considered prior to investment in further non-renewable resource extraction (Huxham, et al., 2019). This is especially so as these factors have become increasingly important when analysing or insuring projects, and are seen by the world's central banks as one of the biggest threats to global financial stability (Huxham, et al., 2020).

6.1. There is an excess supply of oil and gas

> 'We are not seeing a slowdown in demand or even a recession in the global gas industry; what we are witnessing is a depression in the global gas industry. Globally, gas/LNG prices have collapsed. The U.S. shale fracking industry has imploded with multiple bankruptcies and a severe depression in activity. Cargo ships carrying LNG are circling oceans searching for a buyer. ' (Robertson, 2020).

The PWC Africa Oil & Gas Review notes that the impact of COVID-19 on gas has been less severe than oil although natural gas prices have seen a decrease over the year with a fall in demand taking effect in an already oversupplied market (PWC, 2020). Robertson (2020) concurs, noting there is a global supply glut of gas that will continue until the end of the 2030. While some of this excess supply is attributed to COVID-19, other causes of this over-supply were already present prior to 2020. Some of these factors include the overbuilding of LNG plants, and the over-production of uneconomic shale and coal seam gas (CSG). Moreover, the low-cost producer Qatar, is massively expanding its LNG production by 64% up to 2027.

Evidence of the implosion of the United States fracking industry comes from the 70% fall in the number of operating drill rigs over the last 12 months, and the 36 oil and gas bankruptcies that occurred in 2020 (Robertson, 2020). The United States shale industry has been cash flow negative every year for the last decade. In Australia, export markets are declining, and the gas industry suffered R277 billion in write-offs in the first six months of 2020. Australian gas companies have lost between 58% and 69% of their value since January 2011 (Robertson, 2020).

In addition, global price wars triggered by disagreements over production limits between Russia and Saudi Arabia have impacted oil producers. Jeliazkov, et al., (2020) report that as Saudi Arabia and Russia flooded the market with cheap crude in March 2020, the price of a barrel of Brent collapsed to $19.71 on the 21 April 2020, with the price of US oil turning negative for the first time in history on the same day. Although OPEC and non-OPEC producers, in a bid to address the unprecedented instability in the market, agreed to cut their output by 500 000 barrels per day from January 2021, energy analysts indicate that these dramatic events would speed up the emergent energy transition (Jeliazkov, et al., 2020; ProShare, 2021).

6.2. Demand for oil and gas is falling

The International Energy Agency (IEA) suggests there are two different scenarios for oil demand. In the first scenario, oil use in passenger cars peaks in the late 2020s, however there are continued increases in demand for petrochemicals for trucks, and in the shipping and aviation sectors. While in the second scenario, there is a peak in global oil demand within the next few years before demand falls by more than 50% in advanced economies between 2018 and 2040, and by 10% in developing economies (IEA, 2020).

However, PWC (2020) notes that global peak oil demand has already occurred, arguing that COVID-19 has accelerated the global energy transition by as much as five years in developed countries which have tied the renewable energy transition to economic stimulus packages. Deloitte (2021) notes that while the oil and gas industry is accustomed to price fluctuations, this downturn seems unlike any other, calling it the 'great compression'. With the survival of many companies at risk due to the longer-term decline in petroleum demand, the next decade could look very different for the entire oil and gas value chain (Deloitte, 2021).

There are several key factors which are likely to reduce global oil and gas demand. These factors include: the carbon neutral targets and policies; the availability of new technologies; the reduced costs of renewable energy; the need to prioritise food security; as well changes in consumer behaviour precipitated by the digital transformation, such as more people working from home (Deloitte, 2021).

6.2.1. Carbon neutral targets and policies will impact on markets

Globally, developed economies are beginning the shift away from fossil fuels by accelerating green policies and investments as 'carbon neutral' and 'net zero' emissions targets have become embedded in national policies and legislation in order to align with the goals of the Paris Agreement (PWC, 2020; Robertson, 2020; Huxham, et al., 2020; IRENA, 2020). Unlike demand shocks like COVID-19 where prices and consumption may recover, this low carbon transition will bring long-term structural changes, influencing the value of physical and financial assets, tax flows, jobs and skills. These risks are known as 'climate transition risks' (Huxham, et al., 2020).

Developed economies are becoming increasingly energy efficient as the energy intensity of a given unit of GDP has declined in key markets such as Europe and Japan (Robertson, 2020). Furthermore, gas is no longer considered as a transition fuel as grid-scale batteries are now cost competitive with gas, reducing the need for gas for peaking power purposes (Robertson, 2020). According to the IEA, primary energy demand under net zero emission targets falls by 17% between 2019 and 2030, with emission targets likely to fall more substantially by 2050 (REF). Huxham, et al (2020) note that as the demand for fossil fuel commodities like coal, oil, and gas decline, so does the demand for related infrastructure, such as ports, rail lines and pipelines. Lower demand is likely to result in lower prices (Huxham, et al., 2020). These long-term structural changes will drive global demand down for oil and gas and negatively impacting export volumes for Africa (SystemIQ, 2020; PWC, 2020). As Robertson (2020) states, 'the first rule of business is to listen to your customer.' Thus, developing economies should acknowledge that there is an energy shift underway, and should reconsider their reliance on fossil fuel exports (PWC, 2020).

As the PWC (2020) report notes, this market disruption is taking place against increasingly fragile African economies which depend on fossil fuels for foreign revenue. The market shift has impacted oil and gas companies as evidenced by the large losses, divestments, lay-offs and downscaling that has occurred (PWC, 2020). Companies such as BP, Chevron, Shell, Total and Eni have also written off an estimated R1267 billion in reserve assets which are now assumed uneconomical (PWC, 2020). The accountants and auditors of major energy firms are beginning to acknowledge the transition, as Total, Repsol, Shell and BP now base their financial statements on price assumptions (at around $55 - $65 per barrel)[4] that are more conservative than their peers (Grant, 2020). BP's auditors, Deloitte, explicitly noted in 2019 that its previous impairment prices were not consistent with the Paris goals, and BP subsequently amended its assumptions in the second quarter of 2020 (Grant, 2020). Deloitte (2021) notes that even the industry accelerated its energy transition, with many oil and gas companies announcing net-zero goals at the peak of the pandemic. In fact, supermajors like BP and Shell strengthened their net-zero goals by targeting reductions in oil and gas production and investment by up to 40% over the next decade (Deloitte, 2021).

6.2.2. Technology is making it possible to decarbonise heavy industries

The Making Mission Possible Report by the Energy Transitions Commission, an international think tank, notes that it is technically possible to decarbonise heavy industries (Energy Transitions Commission, 2020). That said, while many high heat applications for gas can be substituted with cheap renewable power, there may be some applications that for the foreseeable future will continue to require gas (Robertson, 2020). Due to ongoing innovations, many technologies and business solutions are close to being brought to market that will make it possible to decarbonise heavy industries (Energy Transitions Commission, 2020). Robertson (2020) predicts that by 2030, green hydrogen will be cost competitive across all 'hard to decarbonise' sectors. IRENA (2020) differs as it believes that the solutions may not be commercially mature or ready for wide adoption quite yet, especially as uncertainties remain about their potential uses.

6.2.3. The Accelerating Renewable Energy Transition

> 'The clear established global trend is towards more renewable power in electricity systems with grid scale batteries, and less gas.' (Robertson, 2020).

[4] Although some experts mentioned as low as $40/ barrel during the Beyond Petro States Webinar.

In 2015, renewable energy (RE) became the cheapest from of new energy (PWC, 2020). Across the world, renewable energy generation is increasing as steady and continuing cost reductions occur. For example, in 2019, 200 gigawatts (GW) of renewable power plants were built while only 100GW of fossil fuel and nuclear were constructed (Robertson, 2020; Jeliazkov, et al., 2020). Grid scale battery usage is increasing rapidly, and battery cost deflation is faster than wind or solar cost deflation (Robertson, 2020). IRENA (2018) notes that the share of renewable energy in the power sector will increase from 25% in 2017 to 85% by 2050, mostly through growth in solar and wind power generation. Investment in clean energy in sub-Saharan Africa increased from R33 billion in 2017, to R108 billion in 2018. In South Africa, the REIPPP has so far attracted ZAR 209.4 billion (approx. $14.2 billion).

SystemIQ (2020) notes that green finance mechanisms are being developed to accelerate renewable energy deployment. For example, the European Commission's €1 trillion European Green Deal investment plan proposed in January 2021 aims to assist all member states transition away from fossil fuels. It includes skills training in the renewable energy sectors; support for SMEs to create new economic opportunities; economic diversification activities; and specific investment in regions most affected by the transition away from fossil fuels. In addition, Multilateral Development Banks (MBDs) and investors have shifted their priorities towards financing the transition and scaling up renewable energy. They have also begun to evaluate and describe fossil fuel projects as high-risk investments (SystemIQ, 2020).

6.3. Transition Risk

Huxman et al (2019) describe transition risk as the risk that the value of assets and income are less than expected because of climate policy and market transformations, such as the transition away from fossil fuels.

Huxham, et al analysed South Africa's transition risk and found that the country faces transition risk of more than R1747 billion in present value terms between 2013 and 2035. The authors note that South Africa's trade-offs associated with a low-carbon transition are particularly acute because of high levels of unemployment and inequality, together with a strong reliance on fossil fuels. They state, 'the analysis … demonstrates that the risk to South Africa – its companies, workers and public finances – of continuing with business as usual is higher than the costs of managing those risks through proactive management of risks to the economy.' (Huxham, et al., 2019). Moreover, they note that if the government took action to mitigate the risks, it could avoid potential economic risk concentrations, and in so doing, reduce the costs associated with the decarbonisation of the South African economy.

This research did not include analysing the risk from offshore oil and gas industries, but they did recommend that South Africa should avoid or delay any new investments that could add to South African climate transition risk until the market for the related product is certain. Thus, South Africa should introduce climate transition risk assessments as a standard condition of applications for public sector procurements. In addition, financial assistance should be offered on preferential terms by state-owned financial institutions to help avoid investments where the risks outweigh potential or likely benefits (Huxham, et al., 2019).

Making the risk and its eventual allocation explicit may also reduce the incentive for local entre-preneurs or Black Economic Empowerment companies to buy emissions-intensive assets from international mining majors, leaving more transition risk with investment grade balance sheets who are strong enough to absorb it. Such a step would also make it easier for government to budget for effects on public finances (Huxham, et al., 2019).

6.4. Stranded Assets

The International Energy Agency defines stranded assets as 'those investments which have already been made but which, at some time prior to the end of their economic life, are no longer able to earn an economic return'. Simply put, stranded assets are projects that fail to deliver adequate returns as conditions change (Grant & Coffin, 2020). These investments may involve the purchase of rights to explore a given area, or assets with infrastructure in place producing hydrocarbons. Livsey (2020) notes that global investors are shifting their investments away from the traditional energy sector which poses a significant problem for energy groups whose fossil fuel reserves may never be extracted due to climate change. These energy groups will then be left with stranded assets, having to write off substantial amounts of their fossil fuel reserves – estimated to be over R13103bn — or one-third to half the current value of major oil and gas companies (Livsey, 2020). Hurst (2020) highlights the impact that COVID-19 has had on companies which have abandoned projects that are no longer viable. Moreover, Livsey (2020) predicts that oil and gas producers will be hit twice – fossil fuels will lose their value while simultaneously carbon taxes will reduce demand further.

According to Hurst, in 2020 about a third of the fossil-fuel investment planned through to 2030 risks failing to deliver adequate returns for developers (Hurst, 2020). Most international oil companies, and some national ones, have shares and bonds trading on the capital markets which now have lower valuations than five years ago (Livsey, 2020).

At the end of January 2021, the risk of stranded assets facing energy companies was highlighted when rating agency S&P increased its risk rating for the entire oil and gas sector from 'intermediate' to 'moderately high' due to the move away from fossil fuels, poor profitability and volatile prices (Butler, 2021). As such, 13 oil and gas companies were warned that they may be downgraded in the future. The companies on notice of a possible downgrade are Australia's Woodside Petroleum as well as multinationals Chevron, Exxon Mobil, Imperial Oil, Royal Dutch Shell, Shell Energy North America, Canadian Natural Resources, ConocoPhillips and Total (Butler, 2021). S&P are also considering downgrading four large Chinese producers – China Petrochemical Corp, China Petroleum & Chemical Corp, China National Offshore Oil Corp and CNOOC (Butler, 2021).

6.5. Trade and competitiveness

According to the National Planning Commission, South Africa's trade accounts for around 60% of GDP (National Planning Commission, 2020). Considering this importance, South Africa's trade must remain competitive. In 2020, Montmasson-Clair analysed the impact of the rise of the global climate change regime on South Africa's trade and competitiveness and found that exports are particularly at risk for several reasons.

South Africa's exports are focused on few destinations and are heavily concentrated around a small number of value chains. Therefore, South Africa is particularly vulnerable to changes in trade patterns arising from measures aimed at transiting to low-carbon pathways. Secondly, many of the importers of South African goods are transitioning away from carbon-intensive pathways, and consequently many of them are considering imposing carbon border adjustment mechanisms (carbon border tax) that would reflect the amount of carbon emissions attributed to goods being imported. This is a form of green protectionism, whereby trade protectionist measures are justified under the guise of addressing climate change. South Africa's exports are carbon intensive due to its carbon-intensive energy system while the country is also a large exporter of fossil fuels.

In February this year, it emerged that the European Union is to present a proposal on a 'carbon border adjustment mechanism' by the end of 2021. This mechanism would 'place a carbon price on imports from less climate-ambitious countries' (News, 2021). Approximately 30% of South Africa's exports go to the European Union. EcoMetrix Africa recently observed that such 'carbon border adjustment mechanism' would 'likely lead to a reduction in exports' from South African to the European Union because the South Africa economy is so carbon intensive (EcoMetrix Africa, 5). It should be noted that President Biden has also promised to create a carbon border tax on imports coming into the United States (South Africa's second largest export market) (Williams, 2021).

Moreover, South Africa's vulnerability is reinforced by the absence of an ambitious domestic climate change framework. Lastly, South Africa's relatively long distance to its trading partners has implications for transport costs and associated Green House Gas emissions (PWC, 2020; Montmasson-Clair, 2020).

6.6. Technological lock-in, path dependence and infrastructural stranded assets: just transition 2.0?

As Overy wrote in 2019, transitioning to gas runs the risk of technological lock-in and path dependency. If significant amounts of money are invested in gas extraction and the associated industries necessary for its exploitation, economies can be become 'locked' into hydrocarbon-intensive technologies and infrastructures, despite the emergence of cheaper and less environmentally damaging alternatives. Spending on gas therefore crowds out funding for new renewable energy sources, and for research into renewables and improved storage.

In addition, technological lock-in could lead to the use of gas being extended well beyond climate limits because of the need to recover costs from gas plant development. Lastly, it could lead to stranded assets, as gas plants are abandoned in favour of cheaper and more environmentally sustainable renewable energy sources (Overy, 2019).

6.7. Decommissioning costs

It is important to include the costs of decommissioning of offshore oil and gas infrastructure before investments are made, otherwise these costs will be borne by the state and ultimately, by South African taxpayers. For instance, the total cost of decommissioning offshore oil and gas production in the United Kingdom, including the transportation and processing of infrastructure, is estimated at R961 billion (Oil & Gas Authority, 2020). Australian research highlights the importance of minimising impacts from contaminants when decommissioning infrastructure. If these contaminants escape into the wider environment, huge clean-up costs can occur (Dawkins, 2020).

7. Local Economic and Social 'Mal/Development'

There is an assumption that the establishment of an oil and gas industry brings extensive local economic benefits to the areas in which the industry takes hold. But as we have seen, this has not been the general pattern in Africa, where regions rich in non-renewable resources have tended to be cursed, rather than blessed by them.

Recent research by the Ohio River Valley Institute analysed the 22 counties which make up the Appalachian methane gas region. While their findings revealed that these counties increased their contribution to US GDP by more than one-third between 2008 and 2019, during the same period measures of local economic prosperity—the economic impacts of that growth—not only failed to keep pace with the increased share of output, but actually declined (O'Leary, 2021) (O'Leary, 2021)

O'Leary (2021) documents this case of economic growth without increasing prosperity, or the resource curse. He notes that the gas wells produced substantially more gas than had been originally predicted which should have created over 200 000 additional jobs and increased tax revenues for these counties as well as other indicators of economic progress. Between 2008 and 2019 the number of jobs nationally increased by 10%, but in the Appalachian methane gas region, despite booming natural gas production, the 22 major gas-producing counties experienced a combined job growth of only 1.6% - with many of the counties experiencing substantial job declines during that time (O'Leary, 2021). Moreover, the vast majority of Frackalachian counties experienced economic stagnation or outright decline and depopulation. O' Leary notes, '… there is little in the numbers to support the contention that the Appalachian natural gas boom has been or can be an engine for economic prosperity**.** If high production volumes were capable of creating jobs and prosperity, it would have happened. And there is a great deal which suggests that, in some cases, the industry may have the opposite effect.' (O'Leary, 2021).

Because of the jobs and other economic opportunities that sites of resource extraction appear to promise, local government institutions can become overwhelmed by the demand for social services and public goods. Evidence from the United States and Canada shows that the influx of people that follows the emergence of extractive industries results in increased demand for public services for several complex and often interrelated reasons. A growing population clearly demands increased infrastructural support in terms of basic municipal services such as health, education, emergency services, water and sanitation, electricity, and transport.

7.1. Health

Health services come under severe strain because of the negative health consequences of oil and gas extraction. Although the health effects of people exposed to upstream oil industry contaminants has been poorly studied, the health of communities living in close proximity to oil and gas extraction sites is affected by environmental impacts such as the contamination of air and water. Their health is also affected negatively through gas flaring and the long-term impact of climate change on these communities (O'Callaghan-Gordo, et al., 2016; CCAC Secretariat, 2020; Maduka & Tobin-West, 2017). Health outcomes range from chronic and recurrent respiratory diseases, abnormal haematological indices and increased susceptibility to blood dyscrasias, dermatological diseases and malignancies, nausea, dizziness, fatigue, genotoxity and alteration in hormonal status among others (Maduka & Tobin-West, 2017; O'Callaghan-Gordo, et al., 2016). Psychological disorders are also more prevalent in communities living close to oil and gas extraction sites (O'Callaghan-Gordo, et al., 2016). Moreover, persons living in gas-flaring host communities are 1.75 times more likely to be hypertensive than persons resident in communities outside of oil-rich areas (Maduka & Tobin-West, 2017). One resident living next to a flaring site in South Africa told the British *Guardian* newspaper in 2015, 'it's very scary: I feel choked up, I feel my lungs can't get air, I feel starved of oxygen. I get panic attacks' (CCAC Secretariat, 2020).

Research on human health and climate impacts of fracking in Appalachia found that premature deaths caused by the industry's pollution had an economic cost of R335 billion, while one year of life is lost for every three job years created by the industry. It also noted a disproportionate burden on the poor that included higher mortality risks induced by fracking-related air pollution. The lead author of this research stated, ‘Private firms across the supply chain have not faced the full costs of natural gas development… and the public has effectively subsidized greenhouse gas and air pollution emissions that result in climate change and health impacts’ (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

7.2. Education

The demands placed on schooling systems also seems to outstrip the ability of local governments. Research shows that schools in resource-rich towns in the United States and Canada tend to have higher teacher turnover, lower attendance rates, poorer academic results, and higher drop-out rates (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

At the exact point that demand for public services increases, the negative environmental consequences of the oil and gas industry can act to reduce local government revenues. This is because the oil and gas industry can reduce local taxes and income from other economic sectors such as tourism, forestry and fisheries. In addition, substantial local costs must sometimes be borne by local communities addressing issues such a s water pollution caused by the industry. (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

7.3. Emergency Services

There is also increased demand for police and emergency workers because of the myriad of social ills that take place in resource extraction sites as documented by (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020). These social ills include:

- Increases in prostitution.
- Sex trafficking, including children, in oil boomtowns linked to ‘a confluence of underlying forces including big oil money, an increase in drug cartels and drug use, degradation of women in a male-dominated workforce, increased access to weapons, and a rise in transient populations’.
- Increases in domestic violence, dating violence, sexual assault, and sexually transmitted diseases.
- Increases in traffic violations, traffic accidents and fatalities.
- Increased drug abuse and drug trafficking.

Evidence from the United States conclusively shows that crime levels increase compared to before the extraction of oil and gas and compared to other towns without extractive industries. ‘With the arrival of drilling and fracking operations, communities have consistently experienced steep increases in rates of crime, variously including assault, rape, sex trafficking, larceny, and auto theft…Crime rates have increased even with additional allocation of funds for public safety’ (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

7.4. Local Businesses

Although an increase in people from a ‘boom’ in the oil and gas industry will create opportunities for some businesses, there are several sectors that will be impacted negatively by the oil and gas industry. In addition, volatile oil and gas prices are likely to impact negatively on local businesses as volatility increases business risks (O’Leary, 2021). The Ohio River Valley Institute notes that it cannot be assumed that companies will purchase from local suppliers, as many oil and gas companies already have preferential suppliers from outside regions, and thus there is often little beneficial impact on local economies (O’Leary, 2021).

Other business can be severely negatively impacted. Findings from the United States and Canada demonstrate that the fishing industry, both commercial and small-scale, tourism, and tourism-related industries such as accommodation, experience downturns with the commencement of oil and gas extraction. (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

7.5. Housing

The rapid influx of people seeking work puts extreme pressure on housing and accommodation stocks. Evidence from the United States, Britain and Canada has identified a negative impact on local housing markets. For poorer residents, affordable housing becomes a challenge as there are insufficient houses available to satisfy demand. However, over the longer-term, the negative impacts of the industry, such as pollution and seismic activities, resulted in properties losing value – and these impacts tended not to be covered by home insurance. In some cases, some properties became 'unsellable' or people were unable to cover their home loans – especially during volatile periods (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

7.6. Inequality

Evidence also indicates that the combined impact of these challenges exacerbates pre-existing social and economic problems within communities. In particular, inequality between residents tends to accelerate, between those who benefit from the non-renewable resource boom and those who do not, but nonetheless still have to endure its negative impacts. As the Concerned Health Professionals of New York note 'economists are increasingly quantifying community quality of life impacts and the unequal distribution of costs and benefits associated with drilling and fracking.' (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

7.7. Conflict

There are numerous global examples of increased conflicts around non-renewable resource extraction sites, largely due to the degradation of natural resources. Indigenous communities are frequently at the forefront of this violence and intimidation (Lind, 2015). Examples include the convergence of state and corporate interests in driving non-renewable resource-violence in Nigeria, Mozambique, South Africa, Uganda and elsewhere. (Lyons, 2016). Another example comes the state-based violence currently being perpetrated against members of the North Dakota's Standing Rock Sioux Tribe who are trying to defend their water rights and way of life against the North Dakota access oil pipeline (Lind, 2015). Conflict also occurs as residents from regions where mineral resources are being extracted feel that they are not benefitting from them but are enduring the negative consequences of the extraction (Ross, 2015)

Babatunde (2020) notes that oil pollution of the marine environment and increased deforestation and the exploitation of marginal land has severely damaged the resources that people traditionally depended upon for their livelihoods in the Niger Delta. This has led to a complex pattern of conflicts in the region since the late 1990s. Local people blame the oil multinationals and the Nigerian government for the environmental degradation and feel they have not been properly compensated for its impact (Babatunde, 2020).

In Turkana, in northern Kenya, relations between the state and local communities are characterised by mistrust and conflict since the mushrooming of oil exploration operations in the area since 2012. Until the oil finds, successive governments showed little interest in Turkana, even though insecurity was rife and poverty levels were high. Many Turkana are dubious of the state's inability or unwillingness to address chronic violent insecurity, which has been so damaging to the livelihoods of local pastoralists over time. (Lind, 2015).

7.8. Local Employment

Evidence suggests that few jobs are realised for local community members in the early years of oil or gas developments. The Concerned Health Professionals of New York (2020) documented that in the USA, 77% of the workforce on shale gas drilling projects consisted of transient workers from out of state. Only by the 30^{th} year of the shale gas development would 90% of the workforce be comprised of residents from in state (Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020).

Local towns also suffer from the consequences of Dutch Disease when non-renewable resources become depleted or when demand shrinks. In these areas, finding employment with the extractive has often been the only means of survival. As a result of the decline in demand for coal, oil and gas, and the inevitable decommissioning of rigs, mining communities around the world have seen their local job markets decline or be eliminated entirely (SystemIQ, 2020). This obviously has the effect on exerting yet more pressure on local governments. (Raimi & Newell, 2016) warn that all communities heavily dependent on oil and gas-related revenues must diversify their economies – a major challenge when regional economies have come to thrive on the extraction of finite resources.

In South Africa, our high rates of unemployment will probably result in an influx of unemployed people into oil and gas rich locations who will likely increase the size of informal settlements, while housing and rental costs are likely to increase for middle-income families. Although local governments will probably gain from property taxes, residents will most likely carry the burden of the increased taxes in order to subsidise the increase in demand for municipal services.

The sad reality is that most municipalities in South Arica will be entirely incapable of dealing with the increases in demand for public services and environmental protection services that will come with the emergence of an oil and gas sector in South Africa. In 2020, the Auditor-General reported that 'most municipalities' in the country were in a state approaching chaos. They were 'crippled by debt', could not pay for water and electricity, had 'inaccurate and lacklustre revenue collection', and were plagued with 'expenditure that is unauthorised, irregular, fruitless and wasteful'. He concluded by noting that there was a 'high dependence on grants and assistance from national government' (Makwetu, 2020).

There are also important differing concepts of 'development' and what 'development' actually means to people. It cannot be assumed that all South Africans want the economically determinist development that resource extraction promises to bring. The current battles over mining in the Xolobeni region of the Eastern Cape in South Africa is insightful here.

Within the Xolobeni community many people are opposed to attempts by an Australian company to mine their traditional lands. Community members reject the type of development that they believe will come with mining. As Overy notes, 'they want to continue to use their unpolluted grasslands for pasture, grow their naturally organic food from their kitchen gardens and preserve the health of the rivers they drink from' (Overy, 2019). Xolobeni community leader, Nonhle Mbuthuma, stated last year, 'us and the land, we are connected. If you separate us from the land, you are killing some part (of us)'. (Rosa Luxemburg Stiftung, 2020).

Clearly these important concerns need to be considered within the context of the development of oil and gas in South Africa because much more than simple, reductionist economic views of the world are at stake.

Raimi & Newell (2016) argue that each community experiences oil and gas-driven growth differently and that it is difficult to generalise from one region to the next (Raimi & Newell, 2016). They note that a substantial majority of local governments across the United States have experienced net fiscal benefits from increased oil and gas production, and while they have seen increased demand for public services, revenue from a variety of sources has largely been more than enough to offset these additional costs. However, the data they present is concerning as they do not analyse losses from other industries, increased public health costs, increased pollution, nor do they weigh costs versus the revenue in their data. Moreover, they note that not all local governments have seen net fiscal benefits from oil and gas production. Municipalities that have experienced rapid growth have struggled to provide services for rapidly increasing populations (Raimi & Newell, 2016).

Boom and bust in Rustenburg, South Africa

In Rustenburg South Africa, platinum output increased by 67% between 1994 and 2009, changing Rustenburg from an agricultural community to a more urbanized city (Lagercrantz & Khabbaz, 2019; Eunomix, 2016). During this period, people migrated to Rustenburg to find jobs in the platinum sector which resulted in the population growing from about 68 000 in 1996 to 626 522 in the 2016. The most significant increase was among the male population in the 20 – 34 age group (Eunomix, 2016). So rapid was Rustenburg's growth, that by 2012 it contributed almost 4.9% of South Africa's GDP (Eunomix, 2016). However, the economy of Rustenburg became dependent on supporting the mining industry, which accounted for 70% of all local businesses (Lagercrantz & Khabbaz, 2019; Eunomix, 2016).

At the local level, the impact of the platinum boom has been largely negative. The rapid increase in population density has led to numerous social challenges, as documented by Eunomix (2016), Lagercrantz & Khabbaz (2019), and the Bench-Marks Foundation. These social challenges include:

- **Unemployment -** In 2011, overall unemployment in Rustenburg was 26.4%, with youth standing unemployment at 35%. Furthermore, 30% of the economically active population earnt no income, while 24% of households lived on less than ZAR 600 per month.
- **Crime -** Overall levels increased as more thefts, sex crimes, drug-related crimes and residential burglaries take place in Rustenburg than in other South African cities of similar size.
- **Disrupted Households** - Increased numbers of single men, and female-headed households (27% of all households), which has resulted in increased poverty as women struggle to find work due to patriarchal structures (Eunomix, 2016).
- **Substantial increases in HIV and AIDS rates** - between 2001 to 2011, there was a 49% increase in the number of HIV-infected people in Rustenburg. Other health problems among mine workers include tuberculosis, malnutrition, and respiratory illnesses. High levels of substance abuse have also been reported.
- **Lack of access to quality formal education.** The influx of people has resulted in overcrowded schools (up to 65 children per class) and a lack of basic schooling infrastructure. Moreover, only 31% of Rustenburg's population aged over 20 have completed high school, and only 8.9% have some form of higher education.
- Significant poverty levels and income inequality threaten social cohesion as almost 62% of the population live in poverty.

Evidence shows that the local government is unable to meet the demand for basic services such as housing, water, electricity, sewerage, public transport, health facilities and schools. This inability to meet with the demands for social goods has been hampered by the mismanagement of local public finances, inadequate government capacity, and questionable policy decisions.

8. Environmental impacts

8.1. The Impact of Seismic Surveys

Seismic surveys used during oil and gas exploration activities create noise in the ocean (Oceans Not Oil, No Date). Duarte, et al (2021) state that 'anthropogenic noise negatively affects marine animals.'. The research finds strong evidence that anthropogenic noise impacts marine mammals, fishes and invertebrates, marine birds, and reptiles. The researchers note that there is evidence that noise compromises hearing ability and induces physiological and behavioural changes in marine animals, but find that there is lower confidence that anthropogenic noise increases the mortality of marine animals and the settlement of their larvae (Duarte, et al., 2021).

8.2. The Cost of Oil Spills and Other Ocean Damage

Besides the human lives that have been lost, huge damage to marine and coastal areas have been documented from oil spills either at well heads, or from tankers. Sacred Trust (2020) notes that while it is impossible to know exactly how much a new oil spill would cost, experts are able to estimate financial risks by examining previous major spills. For example, a study in 2012 on the potential economic impact of a tanker spill on ocean-based industries in British Columbia, estimated damage to the regional economy of between R2181 – R3554 million depending on the size of the spill. In addition to the costs to the economy, clean-up costs were estimated at between R35 billion and R137 billion (Hotte, 2012).

In addition to these short-term economic costs, oil spills have extensive long-term damages and costs which, the researchers argue, have not been sufficiently understood. They note that for both people and wildlife, a spill will have a 'resonating and resounding impact for the next 10 to 20 years' (Onmanorama, 2020). Amadeo (2020) writes that the impacts of the 1989 Exxon oil spill in Prince William Sound, Alaska are still being felt today as the economy has yet to fully recover. Amadeo (2020) notes that ten years after the Deepwater Horizon spill in the Gulf of Mexico, it 'continues to harm wildlife and the environment.' To date, the disaster has cost BP R946 billion in clean-up and compensation payments (Vaughan, 2018). However, most literature does not calculate the costs of damage to the environment, which should, of course, be included in future oil spill cost calculations. In addition, the magnitude of such compensation payments could threaten the economic viability of oil companies, adding yet more risk to investments in fossil fuels.

There is a very real risk that an accident could occur at drilling sites within the gas reserves so far found in South African waters. This is because particularly so because of what Total describe as 'the challenging Deepwater environment'. Total CEO Patrick Pouyanne has stated 'the region is quite difficult to operate: huge waves, the weather isn't very easy'. Deepwater drilling is technically challenging and dangerous because of the pressures and temperatures that exit at great depths. The deeper the drilling, the higher the pressure of the gas or oil in the reservoir which makes it incredibly difficult to control (Overy, 2019).

Oil and gas companies will face these challenges in the two finds so far reported because they are in some of the words most treacherous waters, deep in ocean floor trenches within the westward Agulhas Current which is one of the fastest currents in the world where winter waves can reach 30 metres in height. Under the water at depths deeper than 800 metres, things are equally treacherous as the Agulhas Undercurrent flows north at some of the fastest speeds ever recorded for an undercurrent. Peter Sharp, the executive vice-president for wells at Shell Oil, stated in 2012 that 'deepwater operation is the most complex, costly activity we undertake. Every single one is the equivalent of a moonshot' (Overy, 2019). If the sinking of a deepwater well is the equivalent of a 'moonshot', the risks of an accident occurring in South African waters are clear.

There two main sectors of the economy that are negatively impacted by oil spills are fishing and tourism.

8.2.1. Impact on Fishing

After the Deepwater Horizon spill, 40% of Gulf waters were closed to all commercial and recreational fishing, and more than seven years later that impact was still being felt (Kroh & Conathan, 2012; Amadeo, 2020). Fisheries suffered R3315 million worth of damage after the Exxon Valdez spill, and four years later the herring fishery collapsed (Kroh & Conathan, 2012; Cheong, 2012 as cited in Waló, 2016). It should also be noted that deep water coral and fish at the base of the food chain are affected by oil spills, with the concomitant knock-on impacts on the food chain (Amadeo, 2020).

8.2.2. Impact on Tourism

Waló (2016) highlights the susceptibility of the tourism industry to crises and disasters, especially since the success of a particular destination rests heavily on its ability to offer tourists a safe and pleasant environment. Oil spills impact coastal tourism destinations in the following direct ways: they damage tourism resources like beaches, coastal landscapes, marine ecosystems and biodiversity; and they impede water sports, recreational fishing and coastal leisure activities. Indirectly, they negatively impact business sectors associated with tourism, such as catering, transport and accommodation. (Waló, 2016).

The total economic impact to the tourism and sport fishing after the Exxon Valdez spill has been calculated at R645 million. Visitor spending in the summer of 1989 decreased 8% in south-central Alaska and 35% in southwestern Alaska (including the Aleutian Islands), compared to 1986 levels. Overall, this amounted to an estimated loss of R219 million in visitor spending (Oxford Economics, 2010). (Waló, 2016). Research indicates that the Deepwater Horizon spill, affected tourism not only in Louisiana but also in nearby states not directly in contact with the oil. Leisure visitor spending dropped by R3599 million in 2010 in Louisiana alone. The estimated cost to the tourism industry around the Gulf Coast was calculated to be more than R111 billion.

8.3. Methane Emissions, Climate Change and Ocean Acidification

Methane emissions are the second-largest cause of global warming and come from a range of anthropogenic and natural sources, such oil, natural gas, coal and bioenergy (IEA, 2021). Research indicates that the entire lifecycle emissions of the gas supply chain must be taken into account when considering it environmental impacts. While the combustion of gas may produce less CO2 emissions than burning coal, when emissions from every stage of the gas supply chain are considered, such as during exploration, extraction, and the manufacturing of energy conversion technology, then research indicates that gas is neither good for the climate nor for the environment (Anderson & Broderick, 2017).

If South Africa establishes an oil and gas industry, it will contribute a significant amount of carbon dioxide emissions into the atmosphere and increase the country's greenhouse gas emissions. The consequences of this will have a significant impact on South Africa's coastal and marine economy. For example, Celliers (2016) warns that a major challenge for South Africa is ocean acidification due to climate change. Ocean acidification is caused by the uptake of carbon dioxide from the atmosphere, and results not only in a loss of biodiversity, but it also severely damages fish stocks, threatening food security. Moreover, ocean acidification threatens coastal defences (due to decreased storm protection from reefs), tourism and recreational activities (Celliers, 2016; Ghosh, 2020). For example, recent research indicates that 80% of Cape Town's Blue Flag beaches are already threatened by climate change induced sea level rises and coastal erosion. The same research notes that 'iconic tourist attractions such as the Cape Point, V&A Waterfront, Robben Island and several beaches along the False Bay area are under the same threat' (Dube, 2021). Evidence is already showing that fish stocks in South Africa are being negatively impacted by climate change. In particular, the distribution and abundance of South Africa's important pelagic fish stocks (Phillips, 2017).

South Africa' faces extreme climate change risks which need to be mitigated, meaning that it must become more resilient in the face of these risks. According to Yale's 2020 Environmental Performance Index (EPI), out of 180 countries, South Africa ranked at 131st for air-quality and 158th for ecosystem vitality (Yale Environmental Performance Index, 2020). As for fisheries, South Africa ranks 116th, emphasizing the poor health of our marine and coastal ecosystems (Yale Environmental Performance Index, 2020). Moreover, the impacts of climate change on food production, agricultural livelihoods and food security in South Africa are significant national policy concerns, with implications beyond South Africa's borders (SANBI, No date).

At the same time, South Africa is the 14th largest carbon emitter in the world because of its heavy reliance on coal as an energy source (CarbonBrief, 2018). Alarmingly, South Africa is 'warming at twice the global average'. With projections observing that even with mitigation measures in place, South Africa is likely to warm by 2 to 3 degrees Celsius by 2050 (Department of Environmental Affairs, 2018; CarbonBrief, 2018). However, if South Africa continues along its business-as-usual emissions scenario, warming could exceed 4 degrees Celsius across the whole country by the end of the century, surpassing 6 degrees Celsius in some western inland areas (Climate Action Tracker, 2019). The negative impacts of expanding the South African oil and gas industry within this context are patently obvious.

9. Governance and Political Impacts

9.1. Introduction

Governance systems are comprised of two parts, the governing system (traditionally the government) and the system to be governed (the social and ecological components) (Kooiman et al., 2008 as cited in McDaid, 2013). The form and type of relationship that exists between the governing system and the system to be governed is crucial for effective governance to take place (McDaid, 2013). For this literature review, the focus is on ocean governance in South Africa as the governing system, and the oil and gas industry as the system to be governed.

9.2. The Rentier State and Extractive Industries

A theme within the resource curse literature argues that some of the negative outcomes are not inevitable as they can be minimised, if not avoided, with good governance, public accountability, and transparent resource management (Romanova, 2007).

Sadly, most oil and gas extractive regions are characterised by poor governance, weak public accountability and secretive and incompetent resource management regimes which are the product of complex colonial legacies and developmental trajectories (Ross, 2015). Evidence shows that non-renewable resource booms both entrench existing weak governance institutions, and weaken effective governance institutions where they exist (Ross, 2015). This effect can prevent government transitioning to democracy, or weaken democractic governments.

In short, the 'rentier state' becomes possible because resource rents can be extracted that do not demand the same levels of public accountability as taxes do. This results in political leaders having little incentive to encourage economic development, provide public goods, or seek sustainable state revenues via taxation. (Frynas & Buur, 2020). The resource rents that can be extracted also have the effect of entrenching rule, because they enable leaders to increase patronage to buy off potential challengers and invest in repression (Frynas & Buur, 2020; Gillies, 2020; Ross, 2015).

Gillies (2020) documents how corruption unfolded during Africa's 2005 to 2014 oil boom. Sixty controversies from seventeen African countries were analysed to understand how both public and private sector actors used illicit tactics to capture a portion of ballooning resource rents. (World Bank, 2020 as cited in Gillies, 2020). Gillies (2020) describes key characteristics 'rentier states':

- power tends to be centralized in the hands of a few decision-makers who use rents to buy loyalty, appease enemies and enrich their inner circle.
- lines between the public and private sector become blurred, which creates high potential for conflicts of interest.
- weak oversight institutions such as parliaments, the courts and the press, tend to be repressed, co-opted or starved of funding (Gillies, 2020).

Gillies (2020) makes the important point that it is not just governments that engage in this behaviour, as private actors from across the world have been implicated numerous times in corrupt practises relating to the extraction of oil and gas.

The ability of these anti-demoncratic effects to take hold depends on the existing strength of government institutions before the extraction of non-renewable resources comences. Research shows that states with effective bureaucracys and strong adherence to the rule of law can better resist these tendancies because strong institutions make corruption and the extraction of non-renewable resource rents much harder (Ross, 2015).

9.3. Ocean Governance in South Africa

Naidoo (2020) concludes that the critical success factors for the successful implementation of ocean governance in South Africa falls into three areas: Knowledge Platforms; Implementing the Ecosystem-Based Management to Ocean Governance[5]; and using Infrastructure, System and Processes to Perform Marine Spatial Planning. (Naidoo, 2020) notes that successfully implementing an ocean governance model in South Africa will require:

- investment in institutional and supporting structures.
- transparent and accountable strategic objectives and decision-making processes (Naidoo, 2020).

South Africa does not, however, invest in ocean and coastal sciences within national departments, national research agencies or at universities (Naidoo, 2020). In addition, Vrey (2019) points out that institutional support structures in South Africa are lacking, drawing specific attention to the example of the South African police service. Vrey states:

> 'The South African Police Service (SAPS) has a sea border unit, but one almost devoid of capability or capacity to operate beyond South African harbours in spite of its obligation to police territorial waters up to 12 nautical miles (nm). By February 2018, SAPS still had no operational sea-going capability to deal with threats from the sea within its area of responsibility and through its sea border unit beyond proposals on how to police harbours – small harbours in particular. Fact remains that any threat from the sea beyond harbours had become the de facto responsibility of DAFF with one offshore and three inshore protection vessels dedicated to fisheries protection and vessels of the SA Navy. Leaving aside some progress in acquiring new navy vessels for inshore patrolling and hydrographic services, no credible capacity-building programme is visible to support Phakisa's oceans leg at sea with enforcement.' (Vrey, 2019).

We have already seen how some commentors have argued that that the economic agenda in South Africa has overruled the scientific and environmental ones, drawing specific attention to how the government withdrew the requirement for oil and gas companies to produce Environmental Impact Assessments (EIAs) for reconnaissance activities such as offshore seismic surveys (Naidoo, 2020; Chadema & Joseph, 2017).

If the economic arguments have overruled the scientific ones, then it is vitally important that the government departments tasked with holding the oil and gas industry to account for environmental and other transgressions are able to do so. This onerous task will largely fall to the newly renamed Department of Forestry, Fisheries and the Environment (DFFE).[6] However, an examination of the Department's 2019-20 annual report indicates that it is far from being in a position to be able to do so.

Regarding oceans specifically, the report notes that the Department failed to publish the 'Annual South African Oceans and Coasts Environment Data Report'. In addition, it underspent its 'Oceans Economy' budget allocation by R32 million, or 34%. The Department also endures an overall vacancy rate of 12%, which partly explains why it only has 26 permanent regulatory inspectors in its employ. While the report notes that the Department issues 220 compliance notices during the year to enforce environmental regulations, it also noted that only half of outstanding compliance notices were fully enforced.

The Department's difficulties must be set against the shambolic state of its financial affairs during the last few years. The Auditor-General issued the Department with a qualified opinion in 2019/20 because of a host of financial problems caused by totally inadequate internal financial controls. The Auditor-General draw attention to R2.7 billion of irregular expenditure, R149million of unauthorised expenditure and R88million of fruitless and wasteful expenditure. To make matters worse, the Auditor-General also observed that 'Specific information systems were not implemented to enable the monitoring of progress made towards achieving targets, core objectives and service delivery' (Department of Environmental Affairs, 2020).

It is not at all clear how, given this parlous situation, the Department can hope to monitor the activities of numerous oil and gas companies currently operating in South African waters, or hope to monitor the establishment of an oil and gas industry in South Africa. As Odeku notes, 'effective and sustainable use of the ocean's wealth depends on good, efficient governance policies, practises and management'

[6] While individual South African provinces have their own Departments of Environmental Affairs, in terms of ocean health, their duties are limited to estuaries coastal shorelines only.

(Odeku, 2021). The governing system is clearly totally inadequate for this considerable task and must be drastically improved as a matter of the utmost urgency.

These research findings do not bode well for South Africa. South Africa's Corruption Watch recently stated that the country had been characterised by 'looting, incompetence and malfeasance' in recent years (Watch, 2019). Other observers have described a 'corruption pandemic' in South Africa (Mpikashe, 2020). While the current Judicial Commission into State Capture is revealing how important state institutions necessary for the survival and flouring of democracy have been hollowed out (See the numerous testimonies and evidence being presented to the State Capture Commission, https://www.statecapture.org.za/.). While the government has now committed itself to dealing with corruption, serious doubts exist as to whether it will be able to do so.

Nigeria provides a stark example of the damage that weak state institutions and rampant corruption can do. In Nigeria, the vast majority of the revenue that has come from oil and gas since its exploitation began has been squandered. In 2017, Oxfam estimated that R291 trillion has been stolen by public officials between 1960 and 2005, stating that 'public resource management is subject to elite capture, corruption and rent-seeking, and as such contributes to reproducing inequality and compromises opportunities for inclusive growth' (Overy, 2019). South Africa must clearly do everything it can to avoid this parlous outcome.

10. Conclusion

This literature review uses the concept of the resource curse, or the 'paradox of plenty', to understand the types of economic, social, environmental, governmental, and political impacts the exploitation of offshore oil and gas may have in South Africa.

The economic impact is likely to have a small negative impact on South Africa's long-run GDP. However, global literature notes that the impact on local economic development and job creation is likely to be worse. Case studies indicate that the localised economic and social impacts of extractive industries can be disasterous as people flock to these sites in search of jobs and a better life only to endure poor health and education outcomes, increasing inequality and conflict. Moreover, evidence indicates that the establishment of an offshore oil and gas industry will have potentially dire impacts on commercial and small-scale fishers and tourism in South Africa.

Additional economic factors that must be considered, including the excess global supply of oil and gas and declining demand as countries begin their transitions towards net zero economies. All future potential South African investments in oil and gas should seriously evaluate transition risk, the risks of stranded assets, technological lock-in, and decommissioning costs before decisions are taken. As Mihalyi & Scurfield (2020) point out, South Africa should be cognizant that African countries have frequently been disappointed in the economic outcomes of their oil and gas industries which have promised much, but have delivered little when it comes to the overall development of national economies in the interests of all citizens.

The exploitation of oil and gas also threatens South Africa's commitment to the Paris Climate Agreement. It is unlikley that South Africa will be able to meet its Nationally Determined Contribution to reduce green house gas emissions if it pushes ahead with the wholesale extraction of more fossil fuels.

It is clear from the evidence presented in this report that there is startling paradox at the heart of Operation Phakisa. At one and the same time it is trying to promote the growth of the sustainable ocean economy via fishing, aquaculture, and tourism, while simultaneously promoting the unsustainable extraction of fossil fuels from the very same source - two entirely incompatible goals. Whereas one promises the long-term sustainable management of resources, the other threatens this process, both in the short-term via localised negative environmental impacts, and in the longer-term by contributing to the crisis of global climate change. Some commentators have argued that the sustainable development rhetoric within Operation Phakisa is designed to 'disguise the darker side' of the project with its 'ever-deeper and destructive undersea oil and gas drilling and mineral extraction' (Bond, 2019). It is quite clear that the rhetoric of Phakisa runs aground in the face of the climate crisis.

System IQ note that 'trends present significant headwinds to the development and may in fact exacerbate existing macro issues for South Africa in terms of energy generation, export competitiveness, debt capacity, resilient and inclusive job creation and optimal use of natural resources.' (SystemIQ, 2020).

As Park and Kildow remind us 'a paradigm shift from an unsustainable carbon economy to a sustainable replenishable ocean economy is considered imperative to combat the global crisis that threatens human civilisation' (Odeku, 2021). It is patently clear that the accelerated adoption of renewable energy technology, together with increased energy efficiency, and the sustainable exploitation of the Oceans Economy is a far more promising and sustainable alternative to oil and gas for South Africa. Rather than look for the illusionary 'quick fix' of oil and gas revenues, the South African government should look to the sustainable Ocean Economy together with renewable energy to provide the economic growth and the long-term, skills-based, low-carbon, and resilient jobs that are desperately needed (SystemIQ, 2020).

Moreover, the commodification of the ocean around South Africa as a site for yet more capital accumulation must be rejected in favour of a view of the ocean that sees it as a Commons that provides immeasurable social, cultural and climate benefits to us all. A Commons that must be protected by a broad coalition of citizens and organisations against the predation of the oil and gas industry.

11. References

Department of Environmental Affairs, 2018. *South Africa's 3rd Annual Climate Change Report,* Pretoria: Department of Environmental Affairs.

Ahmed, K., 2020. *How did a 'cocktail of violence' engulf Mozambique's gemstone El Dorado?.* [Online] Available at: https://www.theguardian.com/global-development/2020/sep/18/mozambique-cabo-delgado-cocktail-of-violence-escalates-el-dorado-of-gemstones
[Accessed 5 January 2021].

Albrecht, G., 2012. The age of solastalgia. *The Conversation*, 7 August.

Amadeo, K., 2020. *BP Oil Spill Economic Impact.* [Online] Available at: https://www.thebalance.com/bp-gulf-oil-spill-facts-economic-impact-3306212
[Accessed 1 March 2021].

Anderson, K. & Broderick, J., 2017. *Natural gas and Climate Change,* Manchester: s.n.

Babatunde, A., 2020. *How oil and water create a complex conflict in the Niger Delta.* [Online] Available at: https://theconversation.com/how-oil-and-water-create-a-complex-conflict-in-the-niger-delta-135105
[Accessed 1 December 2020].

Blas, J. & Razzouk, N., 2019. *Coordinated drone attack cuts Saudi oil production in half.* [Online] Available at: https://www.worldoil.com/news/2019/9/14/coordinated-drone-attack-cuts-saudi-oil-production-in-half
[Accessed 9 February 2021].

Bond, P., 2019. Blue Economy threats, contradictions and resistances seen from South Africa. *Journal of Political Ecology,* Volume 26.

Brick, K. & Hasson, R., 2018. *Valuing the Socio-Economic Contribution of Fisheries and Other Marine Uses in South Africa,* Cape Town: Safeguard our Seabed Coalition.

Buse, C. et al., 2019. Locating community impacts of unconventional natural gas across the supply chain: A scoping review. *The Extractive Industries and Society,* 6(2), pp. 620-629.

Butler, B., 2021. *Rating agency S&P warns 13 oil and gas companies they risk downgrades as renewables pick up steam.* [Online] Available at: https://www.theguardian.com/business/2021/jan/27/rating-agency-sp-warns-13-oil-and-gas-companies-they-risk-downgrades-as-renewables-pick-up-steam
[Accessed 2 February 2021].

CarbonBrief, 2018. *The Carbon Brief Profile: South Africa.* [Online] Available at: https://www.carbonbrief.org/the-carbon-brief-profile-south-africa

Cavanagh, R. et al., 2021. Future Risk for Southern Ocean Ecosystem Services Under Climate Change. *Frontiers in Marine Science,* Volume 7, pp. 1-21.

CCAC Secretariat, 2020. *Gas flaring has dangerous side effects but these mitigation opportunities could be a win for everyone.* [Online] Available at: https://www.ccacoalition.org/en/news/gas-flaring-has-dangerous-side-effects-these-mitigation-opportunities-could-be-win-everyone
[Accessed 4 February 2021].

Celliers, L., 2016. *Why managing ocean acidification is crucial for South Africa.* [Online]
Available at: https://theconversation.com/why-managing-ocean-acidification-is-crucial-for-south-africa-54607
[Accessed 1 March 2021].

Chadema, S. & Joseph, C., 2017. *Phakisa is a regressive step against Climate Change Policy gains in South Africa.* [Online]
[Accessed 9 February 2021].

Chelin, R., 2018. *Can the illegal abalone trade be stopped?.* [Online]
Available at: https://issafrica.org/iss-today/can-the-illegal-abalone-trade-be-stopped
[Accessed 28 January 2021].

Chimhangwa, K., 2020. *War in Mozambique: a natural gas blessing, turned curse.* [Online]
Available at: https://www.opendemocracy.net/en/oureconomy/war-mozambique-natural-gas-blessing-turned-curse/
[Accessed 5 January 2021].

Climate Action Tracker, 2019. *Country: South Africa.* [Online]
Available at: https://climateactiontracker.org/countries/south-africa/

Concerned Health Professionals of New York; Physicians for Social Responsibility, 2020. *Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (Unconventional Gas and Oil Extraction),* New York: s.n.

Costanza, R. et al., 2014. Changes in the global value of ecosystem services. *Global Environmental Change,* pp. 152-158.

Davis Tax Committee, 2016. *Report on Oil and Gas for the Minister of Finance,* s.l.: Davis Tax Committee.

Dawkins, R., 2020. *Decommissioning offshore oil and gas infrastructure: liability or opportunity?.* [Online]
Available at: https://ecos.csiro.au/decommissioning-offshore-oil-and-gas-infrastructure/
[Accessed 5 February 2021].

DEFF, 2020. *Growing the Oceans Economy,* s.l.: DEFF.

DEFF, No date. *Chapter 9: Oceans and Coasts,* s.l.: Environment.gov.

Deloitte, 2021. *2021 oil and gas industry outlook,* s.l.: Deloitte.

Department of Environment, Forestry and Fisheries (DEFF), 2019. *Operation Phakisa - Oceans Economy.* [Online]
Available at: https://www.environment.gov.za/projectsprogrammes/operationphakisa/oceanseconomy#introduction
[Accessed 10 February 2021].

Department of Environmental Affairs, 2016. *2nd South Africa Environment Outlook. A report on the state of the environment.,* Pretoria: Department of Environmental Affairs.

Department of Environmental Affairs, 2020. *Annual Report,* Tshwane: s.n.

Department of Environment, F. a. F., 2016. *Status of the South African Marine Fishery Resources,* s.l.: South African Government.

Department of Planning, Monitoring and Evaluation (DPME), 2014. *Operation Phakisa.* [Online] Available at: https://www.operationphakisa.gov.za/Pages/Home.aspx [Accessed 9 February 2021].

Department of Tourism, 2017. *Naitonal Tourism Sector Strategy 2016 – 2026,* Tshwane: Department of Tourism .

Department of Tourism, 2020. *2019-2020 Annual Report,* Tshwane: Department of Tourism.

Department of Trade and Industry, 2021. *Special Economic Zone (SEZ),* Tshwane: s.n.

Dickson, D., Tilghman, N. & Bonny, T., 2020. *The future of work in oil, gas and chemicals: Opportunity in the Time of Change.* [Online] Available at: https://www2.deloitte.com/us/en/insights/industry/oil-and-gas/future-of-work-oil-and-gas-chemicals.html
[Accessed 9 February 2021].

Domonoske, C., 2020. *We're Barreling Toward An Epic Glut Of Oil.* [Online] Available at: https://www.npr.org/2020/03/20/818457109/were-barreling-toward-an-epic-glut-of-oil
[Accessed 25 January 2021].

Duarte, C. et al., 2021. The soundscape of the Anthropocene ocean. *Science,* 371(6529).

Dube, K. N. G. &. C. D., 2021. Rising sea level and its implications on coastal tourism development in Cape Town, South Africa. *Journal of Outdoor Recreation and Tourism,* Volume 33.

Duncan, J., n.d. *Valuing South Africa's Ocean Economy: current facts and figures.* Cape Town, WWF.

EcoMetrix Africa, 5. *How will carbon border taxes affect SA?.* [Online] Available at: https://www.ecometrix.co.za/2020/05/05/what-are-carbon-border-taxes-and-how-will-it-affect-sa-business/
[Accessed 8 April 2021].

Energy Transitions Commission, 2020. *Making Mission Possible: Delivering a net-zero economy,* s.l.: Energy Transitions Commission.

Eunomix, 2016. *The impact of platinum mining in Rustenburg: A high-level analysis,* s.l.: Eunomix.

Exarheas, A., 2021. *Global Oil Job Loss Numbers in 2020.* [Online] Available at: https://www.rigzone.com/news/global_oil_job_loss_numbers_in_2020-10-mar-2021-164843-article/
[Accessed 9 April 2021].

FAO, 2018. *Fishery and Aquaculture Country Profiles: South Africa.* [Online] Available at: http://www.fao.org/fishery/facp/ZAF/en [Accessed 2 February 2021].

Freight News, 2019. *Operation Phakisa's job creation objective fails dismally.* [Online] Available at: https://www.freightnews.co.za/article/operation-phakisas-job-creation-objective-fails-

dismally
[Accessed 9 February 2021].

Frynas, J. & Buur, L., 2020. The presource curse in Africa: Economic and political effects of anticipating natural resource revenues. *The Extractive Industries and Society,* Volume 7, pp. 1257-1270.

Ghosh, I., 2020. *Visualizing the Human Impact on the Ocean Economy.* [Online] Available at: https://www.visualcapitalist.com/human-impact-ocean-economy/
[Accessed 17 February 2021].

Gillies, A., 2020. Corruption trends during Africa's oil boom, 2005 to 2014. *The Extractive Industries and Society,* Volume 7, pp. 1171 - 1181.

Githathu, M., 2020. *New gas find by Total a boost for the Western Cape, SA.* [Online] Available at: https://www.iol.co.za/capeargus/news/new-gas-find-by-total-a-boost-for-the-western-cape-sa-69ea2870-8206-47c3-872e-47b8bd852f72
[Accessed 28 January 20201].

Grant, A., 2020. *The Impair State: The Paris Agreement starts to impact oil & gas accounting,* : Carbon Tracker.

Grant, A. & Coffin, M., 2020. *Fault lines: How diverging oil and gas company strategy link to stranded assets,* s.l.: Carbon Tracker.

Ground, M., De Wet, W. & Leoka, T., 2013. *Offshore oil—the impact on South Africa's economy,* s.l.: Standard Bank.

Hotte, N. (. a., 2012. *Potential economic impact of a tanker spill on oceanbased industries in British Columbia,* s.l.: University of British Columbia.

Hubert, D., 2019. *Government Revenues from Coral FLNG,* s.l.: Oxfam.

Hurst, L., 2020. *'Stranded Assets' Risk Rising With Climate Action and $40 Oil.* [Online] Available at: https://www.washingtonpost.com/business/energy/stranded-assets-risk-rising-with-climate-action-and-40-oil/2020/09/18/89f90d3a-f963-11ea-85f7-5941188a98cd_story.html
[Accessed 26 January 2021].

Huxham, M., Anwar, M. & Nelson, D., 2019. *Understanding the Impact of a Low-Carbon Transition on SA,* s.l.: Climate Policy Initiative.

Huxham, M., Anwar, M., Strutt, E. & Nelson, D., 2020. *Understanding the impact of a low carbon transition on Uganda's planned oil industry,* s.l.: Climate Policy Initiative.

IEA, 2020. *Oil.* [Online] Available at: https://www.iea.org/fuels-and-technologies/oil
[Accessed 18 January 2021].

IEA, 2021. *Methane Emissions from Oil and Gas.* [Online] Available at: https://www.iea.org/reports/methane-emissions-from-oil-and-gas
[Accessed 2021].

IRENA, 2018. *Global Energy Transformation: A roadmap to 2050,* Abu Dhabi: International Renewable Energy Agency.

IRENA, 2020. *Reaching Zero with Renewables: Eliminating CO2 emissions from industry and transport in line with the 1.5 o,* Abu Dhabi: International Renewable Energy Agency.

Jarre, A. et al., 2018. Untangling a Gordian knot that must not be cut: Social-ecological systems research for management of southern Benguela fisheries. *Journal of Marine Systems,* 01(004).

Jeliazkov, G., Morrison, R. & Evans, M., 2020. *Offshore: Oil and gas workers' views on industry conditions and the energy transition,* s.l.: Platform; Friends of the Earth, Scottland; Greenpeace.

Kroh, K. & Conathan, M., 2012. *The Lasting Impact of Deepwater Horizon.* [Online] Available at: https://www.americanprogress.org/issues/green/news/2012/04/19/11409/the-lasting-impact-of-deepwater-horizon/
[Accessed 26 February 2021].

Lagercrantz, H. & Khabbaz, S., 2019. *The Platinum Boom in Rustenburg and the Bust of the Community: A case study of the Natural Resource Curse in South Africa,* Sweden: Linnaeus University.

Lind, J., 2015. *Interview: have oil companies learnt anything from the NigerDelta crisis?.* [Online] Available at: https://theconversation.com/interview-have-oil-companies-learnt-anything-from-the-niger-delta-crisis-47118
[Accessed 1 December 2020].

Livsey, A., 2020. *Lex in depth: the $900bn cost of 'stranded energy assets'.* [Online] Available at: https://www.ft.com/content/95efca74-4299-11ea-a43a-c4b328d9061c
[Accessed 26 January 2021].

Lyons, K., 2016. *How the pursuit of carbon and fossil fuels harms vulnerablecommunities.* [Online] Available at: https://theconversation.com/how-the-pursuit-of-carbon-and-fossil-fuels-harms-vulnerable-communities-69364
[Accessed 1 December 2020].

Maduka, O. & Tobin-West, C., 2017. Is living in a gas-flaring host community associated with being hypertensive? Evidence from the Niger Delta region of Nigeria. *BMJ Global Health,* 2(4).

Makwetu, K., 2020. *Not much to go around, yet not the right hands at the till,* s.l.: Office of the Auditor General of South Africa.

McDaid, L., 2013. *Investigation into the Nature of the Fisher Community Representation in the Development of the Small-scale Fisheries Policy in South Africa.* Cape Town: UCT.

Mihalyi, D. & Scurfield, T., 2020. *How Did Africa's Prospective Petroleum Producers Fall Victim to the Presource Curse?,* s.l.: World Bank Group.

Mkhabela, M., 2020. *South African debt burden will reach 90% of GDP by 2021.* [Online] Available at: https://www.iol.co.za/business-report/opinion/south-african-debt-burden-will-reach-90-of-gdp-by-2021-47236765#:~:text=Debt%20to%20gross%20domestic%20product%20%28GDP%29%20increased%20by,62.2%20percent%20of%20the%20country%E2%80%99s%20GDP%20in%202019.
[Accessed 25 January 2021].

Montmasson-Clair, G., 2020. *THE GLOBAL CLIMATE CHANGE REGIME AND ITS IMPACTS ON SOUTH AFRICA'S TRADE AND COMPETITIVENESS:,* Tshwane: TIPS.

Moreno, C., Speich, D., Fuhr, C. & Fuhr, L., 2015. *Carbon Metrics – Global abstractions and ecological epistemicide - An essay,* Berlin: Heinrich Böll Foundation.

Mpikashe, V., 2020. *Corruption pushing South Africa towards becoming a failed state.* [Online] Available at: https://www.dispatchlive.co.za/news/opinion/2020-09-22-corruption-pushing-south-africa-towards-becoming-a-failed-state/
[Accessed 2 March 2021].

Naidoo, A., 2020. *Ocean Governance in South Africa: Policy and Implementation.* s.l.:s.n.

National Bureau of Statistics, 2020. *2019 Poverty and Inequality in Nigeria: Executive Summary,* Abuja: National Bureau of Statistics.

National Planning Commission, 2012. *National Development Plan 2030: Our Future-make it work,* Tshwane: The Presidency.

National Planning Commission, 2020. *Economic Progress Towards The National Development Plan's Vision 2030,* Pretoria: National Planning Commission.

News, E. P., 2021. *Carbon levy on EU imports needed to raise global climate ambition.* [Online] Available at: https://www.europarl.europa.eu/news/en/press-room/20210201IPR96812/carbon-levy-on-eu-imports-needed-to-raise-global-climate-ambition
[Accessed 8 April 2021].

O'Callaghan-Gordo, C., Orta-Martínez, M. & Kogevinas, M., 2016. Health effects of non-occupational exposure to oil extraction. *Environmental Health,* 15(56).

O'Leary, S., 2021. *Frackalachia: The Natural Gas Fracking Boom and Appalachia's Lost Economic Decade,* Ohio: Ohio River Valley Institute.

Oceans Not Oil, No Date. *The Problem with Offshore Oil.* [Online] Available at: https://oceansnotoil.org/seismic-surveys/
[Accessed 2 March 2021].

Odeku, K., 2021. An Analysis of 'Operation Phakisa' to Unlock the Potential of Ocean Resources in South Africa. *Journal of Asian and African Studies,* 56(2).

OGUK, 2020. *Workforce Report 2019,* s.l.: OGUK.

OGUK, 2021. *Workforce Insight 2020,* s.l.: OKUK.

Oil & Gas Authority, 2020. *UKCS Decommissioning Cost Estimate 2020,* s.l.: Oil & Gas Authority.

Okoi, O., 2019. *The paradox of Nigeria's oil dependency.* [Online] Available at: https://www.africaportal.org/features/paradox-nigerias-oil-dependency/
[Accessed 31 March 2021].

Onmanorama, 2020. *Mauritius oil spill: Scientists fear lasting impact of poisonous shock....* [Online] Available at: https://www.onmanorama.com/lifestyle/news/2020/08/16/mauritius-oil-spill-impact.html
[Accessed 2 March 2021].

Onyeukwu, A., 2007. *Resource Curse in Nigeria: Perception and Challenges,* s.l.: Open Society Institute.

Operation Phakisa, 2019. *Oceans Economy: Summary Progress Report,* s.l.: South African Government.

Overy, N., 2019. Mantashe needs to ask what kind of development Xolobeni wants. *Daily Maverick*, 14 February.

Overy, N., 2019. *Total Game Changer or Just Hot Air? The Discovery of Gas off South Africa's Southern Coast.* [Online]
Available at: https://za.boell.org/en/2019/04/27/total-game-changer-or-just-hot-air-discovery-gas-south-africas-southern-coast
[Accessed 28 January 2021].

Petroleum Agency SA, 2017. *Petroleum Exploration South Africa.* Cape Town: Petroleum Agency SA.

Phillips, B. &. P. M. (., 2017. *Climate Change Impacts on Fisheries and Aquaculture: A Global Analysis.* s.l.:Wiley.

Pretorius, P., 2018. *The implications of comprehensive and incremental approaches to public sector reform for the creation of a developmental state in South Africa: Case study of the Oceans Economy Operation Phakisa.* Cape Town: s.n.

ProShare, 2021. *2021 Economic Outlook - Light at The End of The Tunnel.* [Online]
Available at: https://www.proshareng.com/news/Reviews%20&%20Outlooks/2021-Economic-Outlook---Light-at-The-End-of-The-Tunnel/55236#
[Accessed 25 January 2021].

Provincial Treasury, 2019. *Provincial Economic Review & Outlook 2019,* Cape Town: Western Cape Government.

PWC, 2020. *Africa Oil and Gas Review - Energising a new tomorrow,* s.l.: PWC.

Qekeleshe, S., 2020. *Africa Energy Increases Stake in Block 11B/12B Offshore South Africa.* [Online]
Available at: https://www.africaoilandpower.com/2020/08/26/africa-energy-increases-stake-in-block-11b-12b-offshore-south-africa/
[Accessed 8 February 2021].

Raimi, D. & Newell, R., 2016. *A tale of two oil and gas boomtowns – a boost to the economy, a tricky landing.* [Online]
Available at: https://theconversation.com/a-tale-of-two-oil-and-gas-boomtowns-a-boost-to-the-economy-a-tricky-landing-59502
[Accessed 1 December 2020].

Raimi, D. & Newell, R., 2016. *Local fiscal effects of oil and gas development in eight states,* Durham: Duke University Energy Initiative.

Raimi, D. & Newell, R., 2016. *US State and Local Oil and Gas Revenues,* Washington D.C.: Resources for the Future.

Robertson, B., 2020. *Flogging a Dead Horse - Why the Gas Industry Can't Stimulate the Economy,* s.l.: Institute for Energy Economics and Financial Analysis.

Romanova, I., 2007. *Oil boom in Nigeria and its consequences for the country's economic development.* [Online]
Available at: https://www.grin.com/document/67959
[Accessed 5 January 2021].

Rosa Luxemburg Stiftung, S. A., 2020. *Xolobeni: The Right to Say No!,* s.l.: s.n.

Ross, M., 2015. 'What have we learned about the Resource Curse?. *Annual Review of Political Science,* Volume 18.

Sacred Trust, 2020. *WHAT WOULD THE ECONOMIC COST OF AN OIL SPILL BE?.* [Online] Available at: https://twnsacredtrust.ca/concerns/economic-cost-oil-spill/ [Accessed 1 March 2021].

SANBI, No date. *Climate Change and the Agricultural Sector.* [Online] Available at: https://www.sanbi.org/sites/default/files/documents/documents/ltas-factsheetclimate-change-and-agriculture-sector2013.pdf
[Accessed 9 April 2021].

Sara-Wiwa, K., 2017. *Silence would be treason: The last writings of Ken Saro-Wiwa.* Dakar: Daraja Press.

Schröder, E. & Storm, S., 2020. *Fiscal Policy in South Africa: Closed Input-Output Income and Employment Multipliers,* Johannesburg: Institute of Economic Justice.

Simpson, M., 2020. *Budget 2020: Sovereign wealth fund could diversify, preserve economy.* [Online] Available at: https://www.thesouthafrican.com/news/finance/budget-speech-sovereign-wealth-fund-sa-economy-2020/
[Accessed 8 February 2021].

Skosana, D., 2019. Grave Matters: Dispossession and the desecration of ancestral graves by mining corporations in Tweefontein (Ogies), South Africa. *Society, Work and Politics Institute*, October.

South African Government News Agency, 2019. *President lauds Total's discovery of gas condensate.* [Online]
Available at: https://www.sanews.gov.za/south-africa/president-lauds-total%E2%80%99s-discovery-gas-condensate
[Accessed 28 January 2021].

South African History Online, 2013. *Marikana Massacre 16 August 2012.* [Online] Available at: https://www.sahistory.org.za/article/marikana-massacre-16-august-2012 [Accessed 7 January 2021].

Sports Trader, 2009. *Fishing contributes billions to SA economy.* [Online] Available at: http://sportstrader.co.za/Pages/Industry%20news/Fishing%20contributes%20billions%20to%20SA%20economy.html
[Accessed 2 February 2021].

Stiglitz, J., 2012. *From Resource Curse to Blessing.* [Online] Available at: https://www.project-syndicate.org/commentary/from-resource-curse-to-blessing-by-joseph-e--stiglitz
[Accessed 6 January 2021].

Subacchi, P., 2021. *China's Debt Grip on Africa.* [Online] Available at: https://www.project-syndicate.org/commentary/covid19-africa-debt-relief-china-by-paola-subacchi-2021-01?utm_source=Project+Syndicate+Newsletter&utm_campaign=eb897af335-sunday_newsletter_01_24_2021&utm_medium=email&utm_term=0_73bad5b7d8-eb897af335-10728746
[Accessed 25 January 2021].

SystemIQ, 2020. *Musina-Makhado Special Economic Zone: An alternative, higher impact model,* London: SystemIQ.

Team Linchpin, 2020. *Trends In The Offshore Drilling Industry Outlook in 2021.* [Online] Available at: https://linchpinseo.com/trends-offshore-drilling-industry-outlook/ [Accessed 9 February 2021].

Transnet, 2020. *Annual Financial Statements 2020,* s.l.: Transnet.

Turpie, J. et al., 2017. Mapping and valuation of South Africa's ecosystem services: A local perspective. *Ecosystem Services,* 07(008).

UNB News, 2020. *Current Blue Economy models falling under 'Neoliberal Paradigm'.* [Online] Available at: https://unb.com.bd/category/Bangladesh/current-blue-economy-models-falling-under-neoliberal-paradigm/61367
[Accessed 1 March 2021].

Vaughan, A., 2018. BP's Deepwater Horizon bill tops $65bn. *The Guardian Newspaper*, 16 January.

Vrey, F., 2019. OPERATION PHAKISA: REFLECTIONS UPON AN AMBITIOUS MARITIME-LED GOVERNMENT INITIATIVE. *South African Journal of Military Studies,* pp. 87-105.

Wait, R., Rossouw, R., Loots, E. & Bezuidenhout, H., 2015. *The effects of licensing and tax policy on the development of the upstream oil and gas sector: the case of South Africa,* Potchefstroom: School of Economics, North-West University.

Waló, N., 2016. *Economic impacts of oil spills in island tourism destinations. An application to the Canary Islands.* Canary Islands: s.n.

Wasserman, H., 2019. *Everything you need to know about South Africa's massive gas find.* [Online] Available at: https://www.businessinsider.co.za/impact-of-brulpadda-2019-2 [Accessed 8 February 2021].

Watch, C., 2019. *Annual Report 2019,* s.l.: s.n.

Wesgro, 2020. *Tourism Niche Study: Nature Tourism,* Cape Town: Wesgro.

Wikipedia, No date. *Resource Curse.* [Online] Available at: https://en.wikipedia.org/wiki/Resource_curse#:~:text=The%20resource%20curse%2C%20also%20known,outcomes%20than%20countries%20with%20fewer
[Accessed 5 January 2021].

Williams, B. a. T. S., 2021. Carbon border adjustment in the United States: not easy, but not impossible either. *Brugel*, 11 February.

World Travel & Tourism Council, 2018. *Travel & Tourism Economic Impact 2018 South Africa,* s.l.: WTTC.

WWF-SA, 2016. *Oceans facts and futures: Valuing South Africa's ocean economy,* Cape Town: WWF-SA.

Yale Environmental Performance Index, 2018. *South Africa,* s.l.: Yale University.

Yale Environmental Performance Index, 2020. *South Africa,* s.l.: Yale University.

Annexure 1: Economic Benefits of South Africa's Marine and Coastal Zones

Non-extractive Marine Users

Biodiversity and Ecosystem services

The oceans support globally critical ecosystem services, which are defined as 'the benefits people obtain from ecosystems' (DEFF, No date). Among other things, the oceans provide between 50% and 70% of our oxygen and absorb as much as one-third of the carbon dioxide (CO2) produced in the world (WWF-SA, 2016; Cavanagh, et al., 2021). The concept of ecosystem services was introduced to ensure that nature is recognized as a valuable form of capital, that contributes to economic production and human wellbeing and must be preserved (Turpie, et al., 2017). The oceans and coastal zones perform multiple ecosystem services which include:

- provisioning services - such as providing habitats for a diverse array of species which can then be fished.
- regulating services- such as influencing rainfall and weather patterns, attenuating floods, and protecting from storm surges.
- supporting services - such as nutrient cycling, heat distribution, oxygen production, carbon dioxide absorption, and assisting with waste assimilation.
- cultural services - such as recreational, spiritual, religious, and other non-material benefits (DEFF, No date; Turpie, et al., 2017; WWF-SA, 2016; Ghosh, 2020).

Turpie, et al (2017) conservatively estimated that South Africa's terrestrial, freshwater and estuarine habitats alone are worth at least R275 billion per annum to South Africans. This estimate provides an insight into the vast economic benefits that the oceans around our coast provide for us.

Some of the value provided by coastal ecosystem services include:

- The value of subsistence harvesting from estuarine and coastal habitats is estimated to be R35.7 million per year.
- South Africa's estuaries play a critical role as nursery areas for many fish and invertebrate species. The nursery value of estuaries was estimated to be R803 million per annum, with the highest values along the south Western Cape and Eastern Cape. Turpie at al (2017), estimate that if all estuaries were in their natural condition, this figure would be closer to R1.4 billion.
- Tourism expenditure attributed to natural ecosystems was estimated to be R25.2 billion per year. Close to half (49%) of this national value was attributed to protected areas which only cover 8% of South Africa.
- The capital investment in property in proximity to natural coastal open space was estimated at R907 billion, equivalent to R79 billion per year. In addition to tourism and property values, the value of South Africa's biodiversity is estimated at R6.45 billion per annum. However, the distribution of this value is unknown.
- The protection of some coastal urban areas by dune systems.

Turpie, et al (2017) conclude that the highest values came from the provisioning (food habitats), regulating (weather and flood protection) and supporting services (e.g. nutrient cycling), as well as carbon storage. The study suggests that maintaining natural systems generates substantial value to South Africans, either in the form of inputs for productive activities and welfare, and in terms of losses avoided by retaining these systems (Turpie, et al., 2017).

Naidoo (2020) uses the 2011 ecosystem valuation of Constanza et al (2014) to calculate the value of South Africa's oceans and coasts in 2019 South African Rands. He estimates the ecosystem services value of South Africa's EEZ at R3.6 trillion, or R4.1 trillion if the EEZs around Prince Edward and Marion Islands are also included.

Tourism and recreational activities

Tourism plays an important role in South Africa's economy and has been described as the 'New Gold' (Department of Tourism, 2020; National Planning Commission, 2020). According to the World Travel and Tourism Council (WTCC), tourism contributed R136,1 billion, or 2.9% of South Africa's GDP in 2017, while the indirect contribution of tourism to GDP in 2017 was 8.9% (World Travel & Tourism Council, 2018). In his 2019 State of the Nation Address, President Cyril Ramaphosa outlined an ambitious target of more than doubling South Africa's international arrivals to 21 million by 2030 (Department of Tourism, 2020).

In 2020 the National Planning Commission (NPC) claimed that approximately one job is created for every 12 to 15 tourists that visit South Africa. In 2018, direct tourism accounted for 4.7% of total employment in South Africa, while its indirect contribution stood at 9.1% (Department of Tourism, 2020). The WTTC forecasts growth to approximately 1.6 million jobs in South Africa by 2027.

Coastal tourism is particularly important as the beaches and other non-consumptive, ecotourism activities such as snorkelling, scuba diving, shark diving, whale watching, coastal hiking, bird-watching, game fishing and surfing, contribute significantly to the country's overall value as a tourist destination (DEFF, No date; Brick & Hasson, 2018; WWF-SA, 2016). In 2016, it was estimated that coastal tourism generated between R13.5 – R26 billion to the South African economy (DEFF, No date; WWF-SA, 2016).

Recent surveys highlight the growing importance of the concept of ecologically sustainable tourism to potential tourists. A 2019 Sustainable Travel Report by Booking.com revealed that 72% of travellers believed that sustainable travel choices must be made to protect the planet for future generations (Wesgro, 2020). This trend was reflected domestically, as more travellers visited natural attractions in 2019 than ever before (Wesgro, 2020). Ecotourism contributes significantly to tourism revenues in South Africa. For example, whale watching, either land-based or from on-board a vessel, is estimated to generate R45 million in annual tourism expenditure (Brick & Hasson, 2018). The Simon's Town penguin colony generates approximately R160 million per annum, with 35% of this amount spent within Simon's Town (WWF-SA, 2016). The Sardine Run on the east coast of the country was estimated to have generated R5.4 million in 2010, based on both boat-based diving and photographic packages (WWF-SA, 2016). Conversely, the suspension of the Blue Flag status of beaches in Durban due to unsafe water quality, is estimated to have cost the South African tourism industry an estimated R100 million per year (WWF-SA, 2016).

As South Africa's most developed tourism region, tourism is a particularly important contributor to economic growth and job creation in the Western Cape (Wesgro, 2020; Provincial Treasury, 2019). In 2018, the estimated total foreign direct spend in the Western Cape alone reached R16.3 billion (Provincial Treasury, 2019).

Transport and related services

An estimated 9,000 vessels (including bulk carriers, container vessels, cargo vessels, tankers, cruise ships and several smaller vessel types) pass around South Africa's coastline annually, many of which visit South Africa's ports annually (DEFF, No date; Brick & Hasson, 2018). Some 98% of South Africa's exports are conveyed by sea, passing through eight of the large commercial ports situated at Saldanha Bay, Cape Town, Mossel Bay, Ngqura (Coega), Gqeberha (Port Elizabeth), Buffalo City (East London), eThekwini (Durban) and Richards Bay (Brick & Hasson, 2018; DEFF, No date). The revenue from South Africa's ports was approximately R26 billion in the 2019/20 financial year. In the same year, port activities employed 12 218 people (Transnet, 2020).

While boat building and maintenance services declined after the global economic slump of 2008, by 2018, the Western Cape reported turnover from ship repair and maintenance at R3.2 billion, while ship construction was R481 million. The Gross Value Added (GVA) from the marine services sector in the Western Cape was R4.2 billion in 2018, a 6.2 per cent increase over 2017. Jobs grew by 10.4%, from 6 420 in 2017 to 12 390 in 2018 (Provincial Treasury, 2019).

Other Non-extractive Marine users

The marine environment also provides other useful services to the South African economy:

- It provides communications services via the laying of telecommunication and internet cables.
- It provides for the biodiscovery of useful genetic and chemical compounds and reactants for pharmaceutical applications.
- It provides real and potential sources of renewable energy, such as thermal, salinity, tidal, wind and waves
- It is home to South Africa's navy (Naidoo, 2020; Brick & Hasson, 2018; DEFF, No date).

While the economic value of these specific activities has not been calculated, it will be considerable (Brick & Hasson, 2018). DEFF (no date) adds that the true value to South Africa's citizens of enjoying access to and use of thousands of kilometres of pristine coastline is incapable of calculation.

Extractive Marine Users

Fishing

South Africa's fishing grounds are situated along the continental shelf between St Helena Bay and Gqeberha (Port Elizabeth). As most fishing activities are concentrated in the Western Cape, most of the ports, processing factories and service industries are found there. Value-added activities take place through fish processing factories and fishery-related services, such as the provision of vessels and fishing equipment, diving services, packaging, cold storage, electronics, engineering, and clothing. (Kaiser Associates 2012 as cited in Brick & Hasson, 2018). It is estimated that these services contribute over 5% of the province's GDP (Brick & Hasson, 2018; FAO, 2018). The squid industry is the exception, as the industry is concentrated in the Eastern Cape where it provides income and employment for many fisherfolk (FAO, 2018). In 2016, the DEFF estimated that 3000 people worked in the squid industry which generates as much as R480 million in revenue per year. (Department of Environment, 2016)

Brick & Hasson (2018) illustrate that the fishing industry does not exist in isolation but has multiple backward and forward linkages with other sectors of the economy. Their multiplier analysis shows that for every R1 in exogenous demand for fishery products, an additional R1.60 is generated in output through these interconnecting linkages which further translates into a net increase in domestic household income of R0.70 within fishing communities. A 2008 study by the Bureau for Economic Research (BER), reported in a presentation by Lallemand et al. (2008), provides an employment multiplier for the fishery sector of 10.7, meaning that any increase in fishery revenue of R1 million would be associated with an extra 10.7 jobs in the fishery sector and wider economy while the Institute of Economic Justice places the employment multiplier of the fishery sector at 10.8 jobs. Thus, a loss in fishery production would result in a decline in employment (Brick & Hasson, 2018).

It is important to document the economic impact that poaching, especially of the abalone, has on South Africa's fishing industry. Chelin calculates that between 2000 and 2016, 96 million abalone were poached – approximately 2 174 tons a year. This cost the economy around R628 million annually (Chelin, 2018).

1. Commercial Fishing

Five species make up 79% of the total value of the commercial fishing industry (Brick & Hasson, 2018). The main species caught in 2017 were anchovy (260 000 tonnes), hakes (143 000 tonnes) and pilchard (79 500 tonnes) (FAO, 2018). Squid jig and West Coast Rock Lobster are the other two most valuable species.

The South African commercial fishing sector is estimated to be worth between R6-8 billion annually and produces an average of 600 000 tonnes of fish per annum (Brick & Hasson, 2018; WWF-SA, 2016). In 2015, the export of fish products generated approximately R5099 million, rising to R8713 million by 2017 (FAO, 2018; Brick & Hasson, 2018). Direct employment across all commercial fishing sectors is estimated to be 27 000, while indirect employment in industries linked to the fishing sector is estimated to be between 81 000 –100 000 (Brick & Hasson, 2018). The South African fishing industry is capital intensive, with the value of insured assets in 2012 being R76.7 billion in the deep-sea trawl sector, R12 billion in the inshore-trawl sector, and R2.2 billion in the small-pelagic sector.

The South African fishing industry is regulated by the DEFF and is controlled by a permit system which limits the 'total allowable catch' (TAC) of each permit holder (Brick & Hasson, 2018). However, decades of over-fishing, and other factors such as habitat destruction and climate change, has led to numerous stock species collapsing, while others are considered over-exploited (DEFF, No date; Jarre, et al., 2018). For example, important stocks, such as red steenbras, silver kob and geelbek, are in a dire condition (WWF-SA, 2016). Jarre, et al. (2018) raise concerns about the sustainability of the industry, noting that Cape hakes, sardines, west coast rock lobsters, and the squid-jig sector are all in decline (FAO, 2018).

Despite this, the TAC restriction is having a positive impact on some important fish stocks, such as carpenter and slinger, which are beginning to recover.

2. Small-scale and subsistence fishing

Small-scale and subsistence fishers are formally recognised through the Subsistence Fisheries Policy (DEFF, No date). These fishers use simple technology, labour intensive catch methods and low capital equipment (Sowman 2006 as cited in Brick & Hasson, 2018). Research by DAFF in 2010 estimated that there are 147 fishing communities in South Africa, within which 29 233 people are considered subsistence fishers. Some 53 per cent of traditional fishing communities' country-wide are classified as poor and food insecure (spending between 66% and 89% of their income on food) (DEFF, No date; Brick & Hasson, 2018; Jarre, et al., 2018). The main harvesting methods are intertidal collection, beach and seine nets, and line fishing. In West Coast communities, near shore harvesting from boats is also undertaken. In addition to fish, rock lobster, abalone and bait organisms are also harvested (Brick & Hasson, 2018).

A 2000 Department of Environmental Affairs and Tourism study, which clearly needs updating, estimated the total value of subsistence fishing to be around R16 million, with the vast majority coming from line fishing (Hara et al. 2008: 52;. (Brick & Hasson, 2018). While small-scale fishing contributes little to South Africa's GDP, the importance of this sector is in its provision of employment and food security – particularly protein – to poor coastal communities (Isaacs and Hara 2015).

3. Recreational fishing

Sport or recreational anglers are defined as persons who carry-out angling activities at least once a year. Statistics for recreational fishing are somewhat unreliable, with numbers suggesting that between 700 000 and 2.5 million people are involved in recreational angling activities in South Africa (Brick & Hasson, 2018; Sports Trader, 2009). The main species targeted are line fish and west coast rock lobster. Legally, recreational fishers require a permit (Brick & Hasson, 2018). It has been estimated that recreational anglers catch less than 1% of the value in weight of the commercial sector (Brick & Hasson, 2018).

Research conducted in 2008 by found that 28 757 people were formal participants i.e., they were a member or an affiliated member of an organized angling club (Sports Trader, 2009). In addition, some 1.5 million people were described as freshwater bank anglers, while 850 000 were considered surf/shore anglers. Leibold and van Zyl estimated the overall economic impact of sport and recreational angling in South Africa. They found that during 2007, the impact on the economy translated as follows:

- Direct economic impact: R15.9 billion
- Indirect economic impact: R3.3 billion
- Induced effects: R1.2 billion
- Economic outflows: R1.6 billion
- Economic inflows: R2.5 million

Regarding fishing equipment, the estimated value of boats used for deep sea angling in South Africa during 2007 was R3.7 billion (Sports Trader, 2009). The Leibold and van Zyl report estimates that the total economic impact of sport and recreational angling, including deep sea angling, is at least 80% larger than that of commercial fishing in South Africa — on a similar scale to international findings (Sports Trader, 2009).

4. Marine Aquaculture

As wild-capture fishing has struggled to meet the growing demand for seafood, the aquaculture sector has grown rapidly due to technological developments and increased efficiencies (WWF-SA, 2016). Mariculture or marine aquaculture refers to the farming (breeding, rearing, and harvesting) of fish species, specifically taking place in salt water (Brick & Hasson, 2018). The commercial aquaculture industry in South Africa is relatively new and is located largely in the Western Cape. The sector has, however, been targeted as a key growth area for the Ocean Economy (WWF-SA, 2016; Brick & Hasson, 2018). The sector is projected to grow from 3 543 tons of produce (R218 million) in 2016 to more than 90 000 tons (R2.4 billion) over the next 10 to 20 years (Brick & Hasson, 2018; DEFF, No date). In 2010, the marine aquaculture sector employed 1 556 people on a full-time basis, of which 35% were female and 1 260 were historically disadvantaged (DEFF, No date).

Mining and mining-related services

South Africa's coastline is mined for heavy metals, mineral sands, cement, and aggregates, while diamond mining and offshore oil and gas exploitation takes place in the ocean (Brick & Hasson, 2018; DEFF, No date). DEFF notes that much of the sand mining or winning activity is undertaken illegally, making it difficult to estimate its true value. Through the mining of coastlines, South Africa provides 30% of the world's titanium and zirconium (Turpie and Wilson 2011 as cited in Brick & Hasson, 2018). Deposits of two minerals important to produce fertilizer, potassium and glauconite, are widely found in South Africa's EEZ, but prohibitive extraction costs have so far thwarted any attempt to exploit these minerals (DEFF, No date).

South Africa has a relatively small offshore oil and gas industry at present, with a single gas to liquid refinery in Mossel Bay which produces 36 000 barrels per day – a crude oil equivalent of 45 000 barrels per day (WWF-SA, 2016; Petroleum Agency SA, 2017). This production of offshore oil and gas (which is converted to petrol, diesel, paraffin and petrochemicals) fulfils about 7% of South Africa’s oil resources production (Petroleum Agency SA, 2017; WWF-SA, 2016). Approximately 69% of South African crude oil is imported from elsewhere, with the balance being obtained from coal using Sasol’s synthol process of oil production (Atkinson & Skink 2008 as cited in Brick & Hasson, 2018).

Some 98% of South Africa’s EEZ is subject to a right or lease for offshore oil and gas exploration or production, and there are now over 300 exploration wells (WWF-SA, 2016; Petroleum Agency SA, 2017). There have been an increasing number of applications for unconventional offshore oil and gas activities. This is in line with Phakisa’s aim to fast-track the drilling of 30 production wells in the next ten years, and to develop associated infrastructure, such as a phased gas pipeline network (Operation Phakisa 2014 as cited in WWF-SA, 2016).

The industry has, however, suffered from the volatility of the oil price, with the price falling below the required level for certain deep sea drilling operations to become viable. Further hindrances to the industry include infrastructure development delays, and a reduction in port infrastructure capacity for ship and rig repair, with the Cape Town Port in particular operating below maximum capacity. (Provincial Treasury, 2019).