"GH2"

Literature Review:

The Negative Economic Impacts of Developing an Oil and Gas Sector in South Africa

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October 2024

Contents

1. Introduction

The landscape of energy production and consumption in Africa, particularly in South Africa, is at a critical juncture. While African leaders and elites often advocate for investment in oil and gas as a means of catalysing economic development, this perspective starkly contrasts with the realities faced by individuals residing in so-called sacrifice zones—communities impacted directly by the fossil fuel industry.

Activists, climate campaigners, and many politicians recognize the detrimental economic and environmental implications of fossil fuel dependency, arguing for a transformative shift towards sustainable energy solutions. In light of climate science and the evolving global energy landscape, the African continent is poised to either replicate the carbon-intensive pathways of the past or forge a new, cleaner trajectory.

This literature review critically examines the potential economic consequences of pursuing oil and gas investments in South Africa against the backdrop of an impending global energy transition, climate risks, and socio-economic disparities. It highlights existing narratives, emerging scenarios, and pressing challenges while ultimately arguing for an urgent pivot to renewable energy sources that can foster economic resilience and equity.

2. Global Energy Scenarios

> *The large deviations in outcome indicate a high level of uncertainty.* (RystadEnergy 2024)

The International Energy Agency (IEA) noted in their World Energy Outlook (2023) that global energy demand increased by 1.3% in 2022 and it is likely that energy demand will continue to grow. This increase in global demand for energy is due to both a growing economy and population growth (International Energy Agency 2023). Moreover, in Africa, increasing urbanisation and industrialisation will drive an increasing energy demand (Cilliers 2023).

With the increasing demand for energy in mind, the IEA (2023) developed three main scenarios to explore different pathways for the energy sector until 2050. These scenarios largely reflect government energy and climate-related policies, investment decisions, household and industrial strategies that affect the rate at which different technologies might enter the mix (International Energy Agency 2023). The IEA (2023) warns that none

of the scenarios should be considered a forecast- rather the aim is to understand the levers and likely outcomes of different actions.

In addition to the IEA (2023) scenarios, the Organization of the Petroleum Exporting Countries (OPEC) and RystadEnergy, an energy research and business intelligence company headquartered in Norway, also conducted analysis global demand scenarios for oil and gas to quantify risk and resilience (RystadEnergy 2024, Prince, et al. 2023). Both OPEC and RystadEnergy tend to have a more bullish view of the future of demand and commodity prices, however, RystadEnergy notes the high levels of uncertainty and a fast-changing market landscape which require an evaluation of the potential future risks and opportunities in the energy market (RystadEnergy 2024, Prince, et al. 2023, International Energy Agency 2023).

Prince et al (2023) note that most authoritative sources forecast oil and gas demand falling quickly as renewables capture market share but many oil companies – both private and National Oil Companies (NOCs) – are basing their investment decisions on continued or even rising levels of demand and equivalently high commodity prices. Six of the seven scenarios touched on in the literature below forecast demand for fossil fuels declining. The exception is the OPEC forecast which indicates demand for fossil fuels will increase. Each scenario is aligned to a likely global temperature rise above pre industrial levels in 2100, which is an important indication of the impact of energy on climate change.

The scenarios are:

- **Net Zero Emissions by 2050 (NZE) Scenario (1.5 °C):** In addition to keeping the 1.5 °C Goal in reach, the NZE Scenario meets UN Sustainable Development Goals (SDGs) seven i.e. universal access to reliable modern energy services is reached by 2030, and major improvements in air quality are secured. The goal of achieving the NZE Scenario is difficult but possible due to the recent acceleration in clean energy transitions. In this scenario, both behaviour changes and increases in low-emission liquid fuels results in oil demand peaking at 100 million bpd in 2023 and falling sharply to 29 million bpd in 2050. This scenario sees major changes in the composition of product demand, requiring refiners to adapt refinery configurations and business models and to invest more heavily in emission reductions, hydrogen, and biofuels.

- **RystadEnergy –Sigma Scenario (1.6°C):** RystadEnergy (2024) believes this scenario is less likely than their average scenario. In this scenario, oil demand peaks at 105 million bpd in 2025 and then declines to 39 million bpd by 2050; while gas demand peaks at 4.3 trillion cubic metres in 2030 and declines to 1.9 trillion cubic metres in 2050. Assumptions of this scenario include substantial

uptake of electric vehicles (EVs) and governments adopt policies to curtail ICE sales; banning of single use plastic and plastic recycling rates are high for some plastics types; oil substitution notably accelerates with exponential growth of sustainable aviation fuels (SAF) and changes in the maritime sector. At the same time, Asia solely drives gas demand growth in the next 10+ years and gas demand peaks in all other continents in the 2020s; gas demand for power declines through electrification of industrial and residential use intensifies from the early 2030s, supported by strong growth in renewables.

- **Announced Pledges Scenario (APS)** (1.7 °C): This scenario assumes that governments will meet, in full and on time, all of the climate-related commitments that they have announced, including longer term net zero emissions targets and pledges in Nationally Determined Contributions (NDCs), as well as commitments in related areas such as energy access. Pledges made by businesses and other stakeholders are also taken into account where they add to the ambition set out by governments. However, IEA (2023) expresses some optimism about this scenario but says that very considerable progress would have to be made for it to be achieved. Key assumptions about this scenario are that action is taken to increase the use of alternative fuels and cut emissions to achieve the climate goals of governments and targets set by industry organisations. Under the APS scenario, renewables generate approximately half of all electricity by 2030. Oil demand peaks within five years, primarily driven by the early uptake of EVs. Since it factors in the snowballing economic impacts of renewables alongside a 'forceful policy response', this is our proxy for reduced demand and declining commodity prices. This scenario's trajectory leads to 1.8°C of warming by 2100. We refer to this scenario as a moderate transition. (Prince, et al. 2023)

- **RystadEnergy Mean Scenario (1.9°C):** In this scenario, gas demand peaks at 4.7 trillion cubic metres in 2033 and declines to 3.4 trillion cubic metres in 2050; oil demand peaks at 105 million bpd in 2026 and declines to 65 million bpd in 2050. Key assumptions of this Mean Scenario include exponential growth of EVs, plastic recycling and bans on single plastic use reduce plastic demand; increasing recycling rates accelerate the decline of feedstock demand; a shift in both aviation and maritime fuels; robust growth in renewable power generation supported by declining costs will drive electrification of industrial and residential gas use which will intensify in the early 2030s with gas used to balance intermittent renewables; moderate development of hydrogen, batteries and carbon capture, utilization and storage (CCUS). In this scenario, gas is considered an important part of the transition towards a low-carbon world in markets that are currently highly dependent on coal.

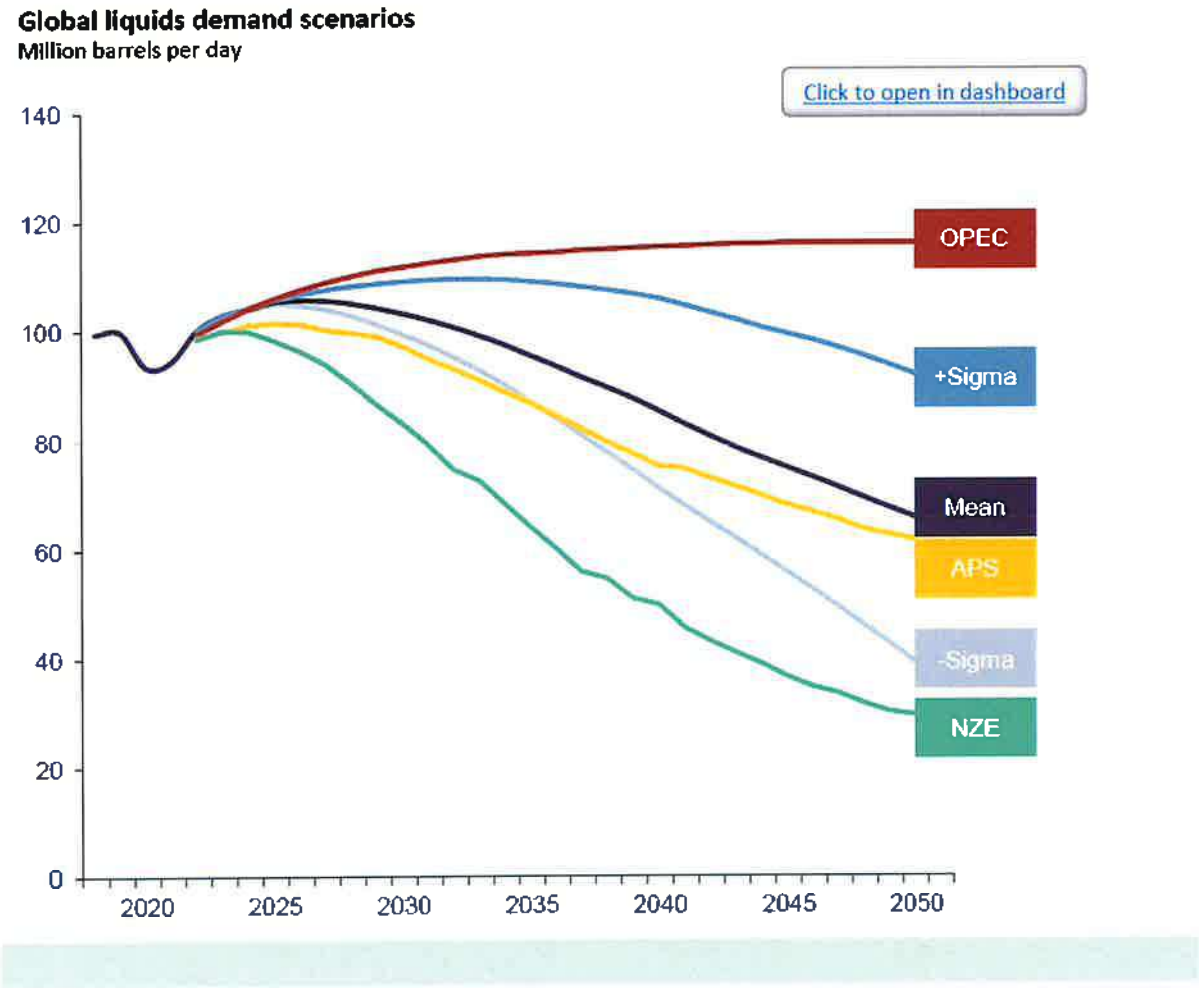
- **RystadEnergy +Sigma (2.2°C) scenario:** the 2.2°C scenario shows gas peaking in 2037 at 5.1 trillion cubic meters and declines to 4.4 trillion cubic meters in 2050; oil demand peaks in 2032 at 109.5 million bpd and declines to 92 million bpd in 2050. The +Sigma sees slow EV adoption, especially in non-OECD countries; low increase in plastic recycling rate; aviation jet displacement is limited, as is maritime gasoil; gas is considered an important part of the transition to a low-carbon world across major gas markets with continuous growth in demand for gas in Asia; gas demand in the power sector continues to grow, replacing coal in the power sector but peaking in 2030 due to slower growth in renewable power generation driven by lower investment in new capacity.

- **Stated Policies Scenario (STEPS) (2.4 °C):** This scenario is a reflection on what governments are actually doing to reach their targets and objectives across the energy economy and aspirational energy or climate targets are not automatically assumed to be met i.e. a proxy for industry business-as-usual (Prince, et al. 2023). IEA's Stated Policies Scenario (STEPS) describes a world where no new climate policies are implemented, beyond those that are already in force. Prior to 2022, STEPS projected rising oil demand until at least 2040 and gas demand until at least 2050, but the 2023 edition projects that coal, oil and gas will all peak before 2030. (Prince, et al. 2023). We refer to this scenario as a **slow transition** (Prince, et al. 2023).

- **OPEC Scenario:** The OPEC scenario sees a bullish liquids demand with gradual increase in demand up until 2045. Global oil demand is expected to rise from 99 million bpd in 2022 to 116 million bpd in 2045. This scenario assumes that the aviation, road transportation, and petrochemical sectors will each see oil demand grow with the largest demand increase from the road transportation sector as internal combustion engine (ICE) vehicles will continue to dominate the global fleet and account for more than 72% in 2045. With respect to refined products, major long-term demand growth is expected for jet/kerosene followed by ethane/liquified petroleum gas, diesel/gasoil, naphtha and gasoline. (RystadEnergy 2024).

Except for the OPEC scenario, these global energy scenarios illustrate the global decline in oil and gas use – most of the scenarios illustrate the peak in oil in the 2020s or early 2030s, and then gradually decline from there. The drivers responsible for these differences range from policy assumptions and the pace of technological advances to the cost competitiveness of oil substitutes and beyond. But it is clear that there is a transition away from fossil fuels, including oil and gas, although scenarios differ as to the pace and scale of the transition (International Energy Agency 2023, RystadEnergy 2024).

Figure 1: Forward Projections for Global Liquids Demand (RystandEnergy, 2024)



3. The Global Energy Transition to Net Zero is Reducing Demand in the Oil and Gas Sector

It also reflects longer term trends: fossil fuel technologies have been losing market share to clean energy technologies across various sectors in recent years, and in many cases fossil fuel-powered technologies have already seen a peak in sales or additions. (International Energy Agency 2023).

For the first time in the decision text of a UN climate summit, known as a Conference of the Parties (COP), there was a call for "the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies" at COP26 in Glasgow in 2016. This was followed by a strong push at COP27 in Sharm el-Sheikh in 2022, supported by 80 governments.

The Global energy scenarios largely indicate a global decline in oil and gas use (some from as early as the 2020s) although the pace and scale of the transition differ amongst

scenarios. For example, McKinsey's "current trajectory" energy transition scenario suggests that global oil demand could peak by 2027, while global gas demand could peak by 2040 (Leke, et al., 2022). The drivers responsible for these differences range from the implementation of stronger climate-friendly policies, improvements in technology, increasing energy efficiency and the cost competitiveness of oil substitutes amongst other factors (Dube, No date; International Energy Agency, 2023; RystadEnergy, 2024).

It is unlikely that the demand outlook will be linear and it is more realistic that in the short-term it is likely that oil and gas prices will remain somewhat volatile and rise and fall (Sanzillo 2024, International Energy Agency 2023). The IEA (2023) uses an example of how heatwaves and droughts could cause temporary jumps in coal demand by pushing up electricity use at a time when hydropower output may be constrained.

However, these changes in price are unlikely to reverse the more fundamental trend of new lower-cost (and lower-carbon) technologies as determinants of economic growth (Sanzillo 2024, International Energy Agency 2023). Notably, this declining demand is important for new oil and gas projects to take into account as the economic, financial and climate change risks of major new oil and gas projects must be taken into account (International Energy Agency 2023).

In addition to the energy scenarios, analysis of the global macroeconomic situation confirms the energy transition. Although developed economies saw an increase in natural gas demand in 2021 and the energy sector showed some financial recovery, this did not last long, and demand in 2022 was below pre-pandemic levels (Sanzillo 2024, International Energy Agency 2023). The Russian invasion of Ukraine in February 2022 resulted in fossil fuel companies earning record amounts due to inflation, fears of oil and gas shortages and higher interest rates (RAN; BankTrack; IEN; OCI; Reclaim Finance; the Sierra Club; Urgewald, 2023). As mentioned above, this did not last long, especially as Europe had an unseasonably warm winter, lowering their demand for oil and gas.

Thus, it is widely agreed that the global energy sector has been in a state of economic decline and this trend will continue (Sanzillo, 2024). Sanzillo (2024) substantiates this statement by noting that:

- The energy sector only has 3.9% of the stock market – declining from 28% of the stock market in the 1980s.
- During the decade before the Ukraine invasion, the energy sector lagged the stock market and for five years it placed last in the stock market.

- At the start of this century, coal was the leading source of electricity, commanding 50% of the electricity market. In 2023, it failed to command 20% in any given month.
- The oil and gas sector faces strong competition in most of its major end-product markets e.g. ExxonMobil CEO Darren Woods anticipates that there will be no new automobiles using gasoline by 2040 and the gas sector will likely decline.
- Plastics use is expected to grow, but recycling will put a damper on industry growth projections (Sanzillo 2024).

4. Key Drivers of the Energy Transition

Market signals, financial incentives and maturing technology have driven investment and deployment of clean energy (International Energy Agency 2023). Mass-manufactured technologies such as solar PV, wind turbines and EVs are leading the way. Sales of residential heat pumps and stationary battery storage are also rising fast (International Energy Agency 2023). Following the Russian Federation (hereinafter Russia) invasion of Ukraine, Europe has seen an accelerated move away from gas (International Energy Agency 2023). At the same time, implementation and updating of government policies and the slowdown of China's growth rate are expected to continue to drive the global energy transition.

Clean energy deployment is accelerating fast

In 2015, the market tipping was reached as renewable energy (RE) crossed average global grid parity, making it the cheapest from of new energy (PWC, 2020). Across the world, renewable energy generation is increasing as steady and continuing cost reductions take place - 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 (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 USD 7.4 billion in 2018, from USD 2.3 billion in 2017 with the REIPPP attracting ZAR 209.4 billion (approx. USD 14.2 billion).

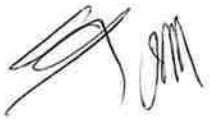
SystemIQ (2020) adds that green finance mechanisms are being developed to accelerate renewable energy deployment and to avoid the impact of stranded assets e.g., the European Commission's €1 trillion European Green Deal investment plan proposed in January 2021 which aims to assist all member states and will be used to support the

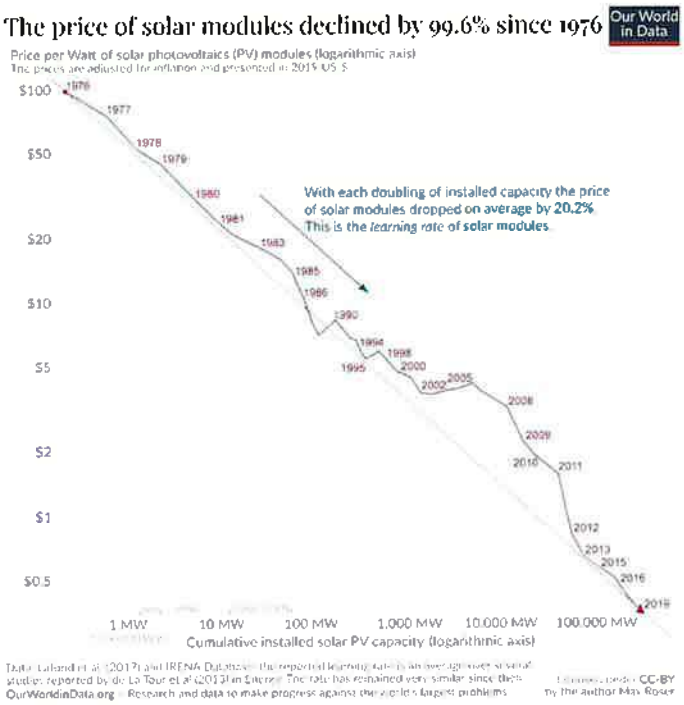
renewable energy-skilling of workers, helping SMEs to create new economic opportunities, and overall diversify economic activity, investing in the future of the most affected regions. Moreover, Multilateral Development Banks (MBDs) and investors have shifted their priorities to both financing the transition, and scaling up renewable energy, positing fossil fuel projects as high-risk investment prospect for future finance (SystemIQ, 2020).

As the costs of key clean energy technologies – solar PV, wind, heat pumps and batteries – fell by close to 80% on a deployment weighted average basis between 2010 and 2022, their uptake has increased (International Energy Agency 2023). The falling costs of wind and solar are due to the learning curves of clean energy and it's likely that the price difference between fossil fuels and renewables will become larger in future- with renewables likely to become even cheaper (Roser 2020). The result has been that electricity has expanded to become the basis of the entire energy system (Prince, et al. 2023). 'Importantly, these cost reductions cannot be reversed: the new technologies and means of industrial production cannot be "unlearned".' (Prince, et al. 2023).

As a consequence of increased electrification and deployment of wind, solar and battery technology, the economics of gas power plants have been threatened, making electrification rather than gas a more economical energy source. According to BNEF (2020), two-thirds of the world's population live in a country where either onshore wind or solar photovoltaic provide the cheapest source of new, utility-scale generation. Battery storage is now the cheapest new-build technology for peaking purposes (up to two-hours of discharge duration) in gas-importing regions, like Europe, China or Japan (BloombergNEF 2020).

The IEA (2023) documents the boom in solar manufacturing which has increased ten-fold globally over the last decade. They believe this trend will continue, with investments in the pipeline set to raise global solar module manufacturing capacity from about 640 GW in 2022 to over 1 200 GW in the medium term. The rapid expansion of solar manufacturing suggests that the uptake in solar installations will continue.





Increasing energy efficiency

Although increasing energy efficiency hadn't been prioritised in the energy transition this trend is set to change: The IEA (2023) documents in their annual Energy Efficiency Report of 2023, that countries have mobilised $700 billion for energy efficiency projects since 2020. At COP28, nearly 200 countries pledged to double the global average annual rate of energy efficiency improvements by 2030 (from about 2% in 2023 to over 4% in 2030). The IEA (2023) adds that energy efficiency is currently seeing a strong global focus among policy makers as many governments are introducing new or strengthening existing policies and energy saving programmes. These countries include India which has enacted new policies for various sectors and the USA through their Inflation Reduction Act which has stimulated energy efficiency measures coupled with substantial job creation with over 2 million Americans working in energy efficiency, according to the National Resources Defence Council.

Buildings within cities and urban areas tend to represent the biggest sources of GHG emissions, contributing, on average, 60 percent of global emissions. According to C40 Cities (2020), building retrofitting could provide up to 55 percent of the GHG reductions needed to meet global 2030 targets and align the world with the 1.5 degrees Celsius trajectory. As a result, countries like South Africa, who have set targets for carbon reductions in alignment with the Paris Agreement, have identified the retrofitting of buildings as a key element in their climate action initiatives (C40 Cities, 2021; C40 Cities, 2020).

However, the outcomes from increased energy efficiency won't be immediate and energy efficiency gains are likely only to be realised over a period of years (International

Energy Agency 2023). The World Economic Forum estimates energy demand could be decreased by 31% across all sectors if businesses take action to reduce demand by 2030. The IEA (2023) calculates that energy efficiency pledges could cut energy costs in advanced countries by one-third, reducing CO2 reductions by 50% in 2030. Priorities vary by country, but key improvements at the global level come from upgrading the technical efficiency of equipment such as electric motors and air conditioners, from efficiency gains brought about by electrification and the switch away from solid biomass use in low-income countries, and from using energy and materials more efficiently. Further electrification of end-uses is a priority. EVs and heat pumps are central to this (International Energy Agency 2023).

The other benefits of increasing energy efficiency include increasing energy security, reducing air pollution and needing less clean energy to be installed, reducing costs. At the same time, increasing energy efficiency has the ability to create a substantial number of jobs. For South Africa, C40 Cities has calculated building interventions are poised to become a catalyst for job creation by 2030 in South Africa. C40 Cities (2022) highlights that building retrofits have the potential to create and sustain between 342,000 and 560, 000 jobs. This accounts for over 78 percent of the potential job opportunities stemming from the implementation of climate mitigation actions. Building retrofitting also offers the opportunity to create green jobs for vulnerable groups, such as women, youth and the unemployed (C40 Cities, 2022).

As the PWC (2020) report notes: there is no turning back the global energy transition and this market disruption is taking place against increasingly fragile African economies who depend on fossil fuels for foreign revenue. The market shift has impacted oil and gas companies as seen in their announcements of large losses, divestments, downscaling and lay-offs in an attempt to remain profitable (PWC, 2020). **Companies such as BP, Chevron, Shell, Total and Eni have also written off assets** based on the assumed oil price – with an estimated US$87bn reserves that are now assumed uneconomical (PWC, 2020). Another clear indication is that **the accountants and auditors of the big energy firms are beginning to acknowledging the transition** as Total, Repsol, Shell and BP now base their financial statements on price assumptions 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, based on a comparison to third party scenarios and BP subsequently amended its assumptions in Q2 2020 (Grant, 2020).

Technology is making it possible to decarbonise heavy industries

The Making Mission Possible Report by the Energy Transitions Commission notes that **it is technically possible to decarbonise heavy industries** (Energy Transitions Commission, 2020). Although many high heat applications for gas can be substituted

with cheap renewable power, there may be some applications for the foreseeable future that will continue to require gas (Robertson, 2020). Due to innovation, 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). Similarly, 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 and optimum use, and none will be easy to scale-up.

Rapid increase in Electric Vehicle Sales

Global oil demand is largely due to road transport (45% of demand) and petrochemicals (15% of demand). However, as internal combustion engines (ICE) are phased out and the uptake of electric vehicles increases, road transport will no longer be a source of oil demand growth. This change is expected to take place as soon as 2030, with projections assuming that the sale of ICE vehicles has already peaked (International Energy Agency 2023).

Government commitments and carbon neutral policies are rapidly moving to decarbonise the energy sector

Pressure on governments from civil society, peers and their own increasing concerns about the impacts of climate change have resulted in stronger commitments and policies to drive decarbonisation (International Energy Agency 2023). Globally, developed economies are beginning the shift away from fossil fuels by accelerating green policies and investments as 'carbon neutral' and 'net zero' have become real targets, embedded in national policies and legislation in order to align with the goal 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, **the low carbon transition will bring long-term structural changes**, influencing the value of physical and financial assets, tax flows, jobs and knowhow. These risks are known as "climate transition risks" (Huxham, et al., 2020).

Europe has increased its ambition to cut gas dependence due to its historic reliance on Russian gas. These commitments include:
Governments have also formed voluntary alliances on fossil fuel phaseout (International Energy Agency 2023). For example:

- Beyond Oil and Gas Alliance (2021) in which core members commit to ending new oil and gas licensing

- Clean Energy Transition Partnership, in which governments and financial institutions agree not to provide international public finance for fossil fuels.

- Targets for net zero emissions have now been set by governments (33 countries and the European Union plus businesses). As of June 2023, net zero emissions pledges cover more than 88% of global energy-related emissions and nearly 92% of global GDP (Net Zero Tracker 2023). 149 countries have pledged to meet a net zero emissions target (Net Zero Tracker 2023).

Bank Fossil Fuel Policies

Article 2.1c of the Paris Agreements aims to make "finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development." (Just Share 2023). The implication of this is that capital needs to be directed towards low-carbon solutions, and away from high-carbon activities (Just Share 2023). Thus, financial institutions, like banks, can support the goals of the Paris Agreement through their lending, investment and underwriting activities. The United Nations-convened Net Zero Banking Alliance (NZBA) and the sector-specific alliance for banks under the Glasgow Financial Alliance for Net Zero (GFANZ) are two alliances that have been formed within the banking sector to align to Article 2.1C (Just Share 2023).

Globally, despite over 125 banks embracing net zero commitments or joining NZBA since 2021, many of the banks have targets that are too low to meet the Paris Agreement or are heavily reliant on false solutions such as carbon offsets and discredited technologies such as Carbon Capture and Storage (CCS) (RAN; BankTrack; IEN; OCI; Reclaim Finance; the Sierra Club; Urgewald 2023). Many banks have policies that expose them to climate risk. However, the Banking on Climate Chaos (2023) report notes that there are some banks that are adopting restrictions on financing hydrocarbons. Examples include French banks Crédit Mutuel (coal policy) and La Banque Postale (strong fossil fuel policy); Danish Danske Bank (new policy excluding companies with upstream expansion plans) and HSBC starting to move towards exclusion policies.

South Africa's five largest banks (Absa Group Limited (Absa), FirstRand Limited (FirstRand), Investec Limited (Investec), Nedbank Group Limited (Nedbank), and Standard Bank Group Limited (Standard Bank) were analysed for their climate-related disclosures, policies and the extent to which their lending and investment activities support their stated commitment to the goals of the Paris Agreement (Just Share 2023). The research found that Investec has signed onto the NZBA; Absa, FirstRand, Investec and Standard Bank are signatories to the PRB while Nedbank is "in support of the Principles for Responsible Banking,". All these banks continue to finance the fossil fuel industry – and during 2022, many of these banks increased their exposure to fossil fuels. However, Investec's fossil fuel financing and exposure decreased, due to a large and unexplained reduction in the bank's oil exposure (Just Share 2023). All five of the SA

banks analysed made progress in their recognition of climate risks and commitment to global climate goals and have committed to reduce their financed emissions to net zero by 2050.

What is interesting is that although neither international nor South African banks are moving as fast as we need to align to the Paris Agreement, there have been some shifts and new policies excluding or limiting fossil fuels investments and exposure to climate change. Moreover, it is likely that SA banks will begin to implement stronger policies as the South African Reserve Bank has issued Guidance notes to both the SA banking and insurance sector in May 2024 (South African Reserve Bank 2024). These guidance notes set out the requirements for banks operating in SA to disclose their climate related risks and to put measures in place to reduce their risks. Amongst other things, the guidance notes also require banks to disclose their Scope 1, 2, and 3 greenhouse gas (GHG) emissions as well as:

- Climate-related transition risks: The amount and percentage of assets or business activities vulnerable to climate-related transition risks through exposure to transition sensitive sectors.
- Climate-related transition risks: The financed emissions of exposures to transition sensitive sectors.
- Climate-related physical risks: The amount and percentage of assets or business activities exposed to physical risks in geographical regions or locations.
- Capital deployment: The amount of capital expenditure, financing and/or investments deployed towards climate-related risks and opportunities (South African Reserve Bank 2024).

A slowdown in China's growth rate

China's growth has shaped energy markets and the global environment, accounting for more than 50% of global energy demand growth and 85% of the rise in energy sector CO2 emissions over the last 10 years as China experienced rapid electrification. At the same time, China is massively increasing its domestic petrochemical production: petrochemical production is responsible for around 80% of growth in oil product demand in China over the 2019 to 2023 period.

However, China's growth rates have slowed and there is an expectation that its total energy demand will peak around the middle of this decade; with stable and then slowly declining demand, clean energy growth is sufficient to drive a decline in fossil fuel demand and hence emissions.

5. Transition Risk

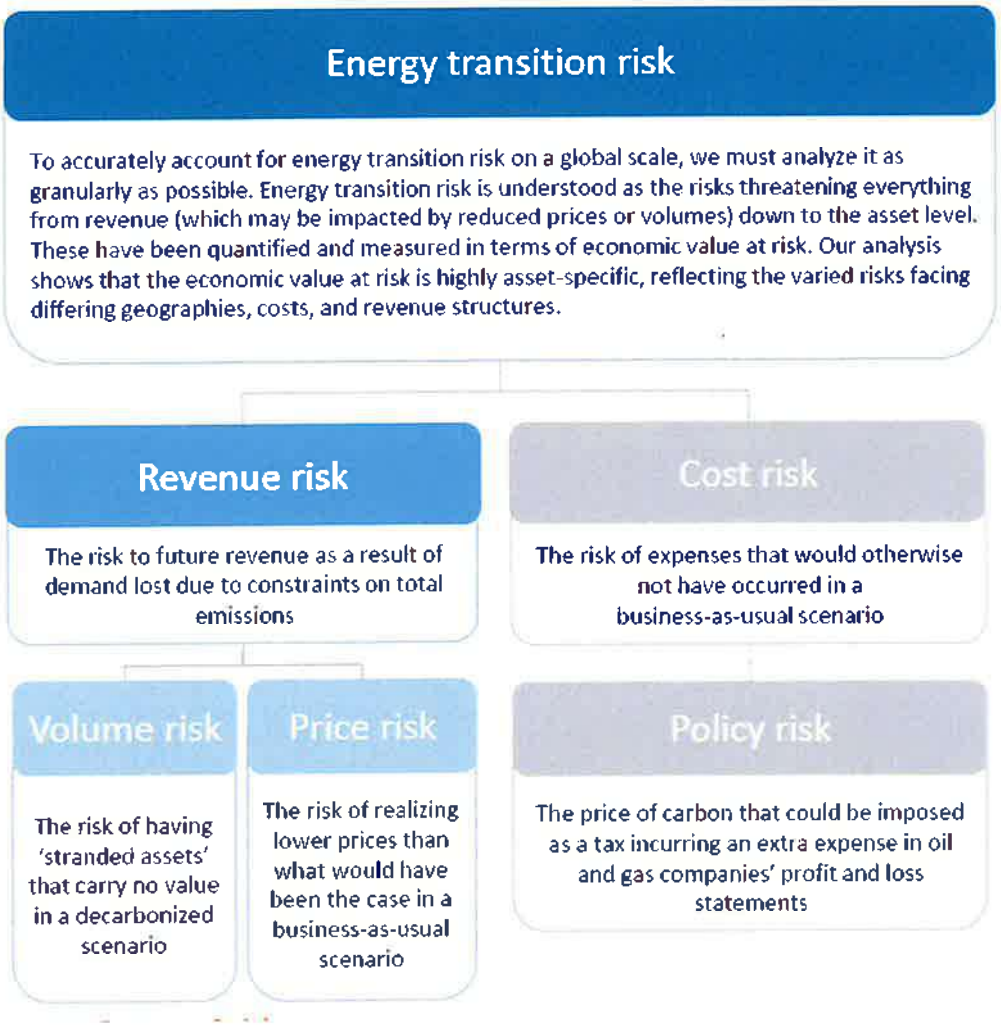
In the report titled, 'Understanding the impact of a low carbon transition on South Africa' Huxman et al (2019) describe transition risk as the risk that the value of assets and income are less than expected because of climate policy and market transformations, such as the transition away from fossil fuels. The African Climate Foundation (No Date) defines transition risks as liabilities that the banking and insurance industries would hedge against. They note that transition risks are increased in countries with poor governance. Carbon Tracker suggests that the O&G industry should practise prudent risk management by having a cautious view of the future, considering higher risk level and limiting capital expenditure to only competitive projects (Carbon Tracker, 2023).

RystadEnergy (2024) finds that the energy transition risk is comprised of both revenue risk and cost risk (RystadEnergy, 2024). Although these risks tend to be highly asset-specific, the economic impact on African countries regarding stranded assets and transition risks are analysed according to whether these countries are **existing petrostates**[1] (Nigeria and Algeria), **emerging**[2] gas producers (Mozambique, Tanzania, Mauritania and Senegal) and countries currently **exploring** for gas (South Africa and Namibia) (Carbon Tracker, 2023). Modelling indicates that **both current and emerging** African petrostates **should be cautious** when considering investing in gas and gas infrastructure because investments in African gas are ultimately value destructive (The African Climate Foundation, 2022).

[1] Petrostates are countries economically dependent on the extraction of oil and gas

[2] Emerging petrostates are those countries that have only recently discovered oil and gas and are wanting to exploit these discoveries (Prince, et al. 2023).

Figure 1: Energy Transition Risk



Petrostates

Most producers are ill-prepared for the coming peak. (Prince, et al. 2023)

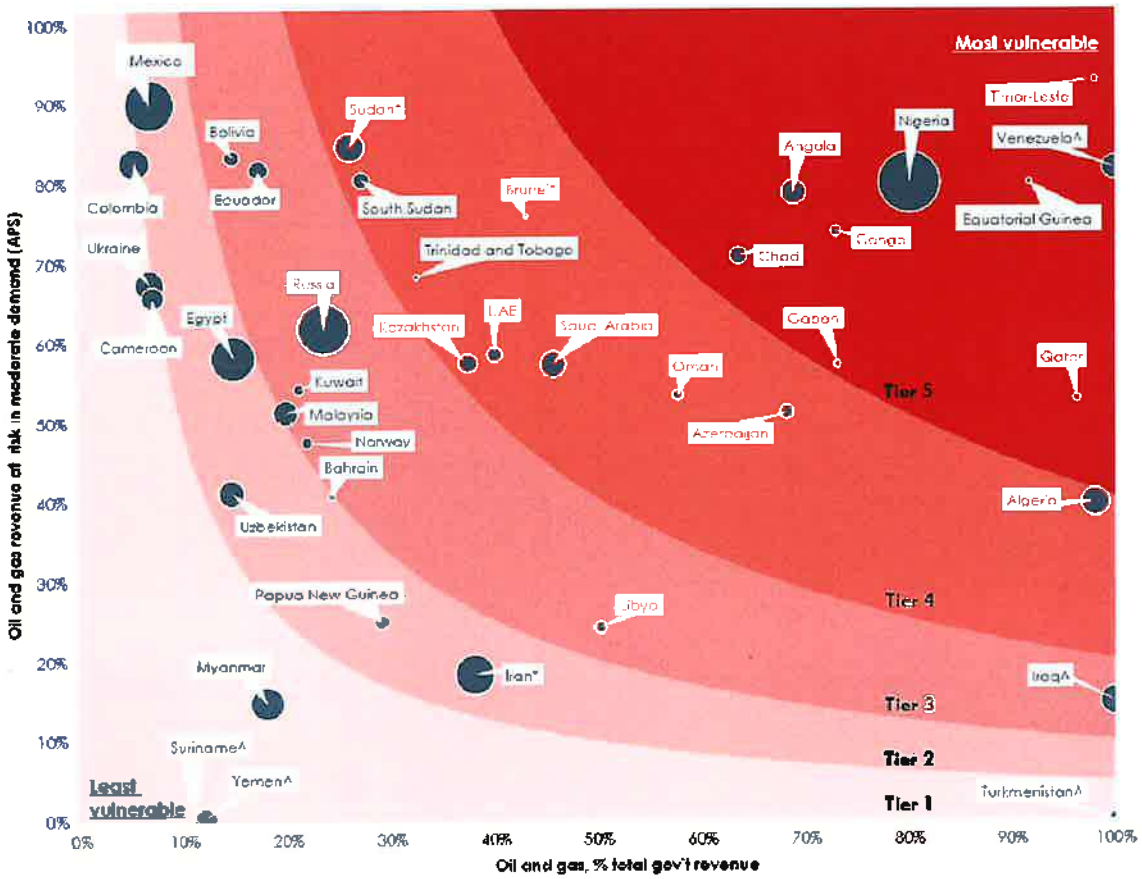
African oil- and gas-producing countries are facing difficult times: they are vulnerable to the global energy transition because it is likely that **reduction in the demand for oil and gas**, due to the energy transition, **will lead to a fall in commodity prices** for oil and gas, reducing production volumes and subsequent **revenue reductions as their exports decline** (Prince, et al. 2023). African countries exhibit a high potential revenue loss, and represent countries with high oil and gas revenue dependence i.e. the percentage of **O&G revenue as a percentage of total government revenue tends to be high** (Prince, et al. 2023). Moreover, high population growth in African petrostates compound their **vulnerability.** The most vulnerable African countries are Equatorial Guinea, Nigeria, Gabon, Congo, Angola and Chad (in that order).

At the same time, **additional investments in O&G are highly likely to be stranded assets** (Boyer 2021, Prince, et al. 2023, Dube No date, RystadEnergy 2024). According to McKinsey, replacement of approximately 60 percent of Africa's current oil production could become uncompetitive by 2040, facing the increased risk of stranded assets (Leke, Gaius-Obaseki and Onyekweli 2022). In Nigeria, petroleum exports make up more than 85 percent of the government's total export revenues (Leke, Gaius-Obaseki and Onyekweli 2022). African petrostates face extensive risk and projections have questioned the potential revenue in light of the accelerating energy transition:

- More than 2/3 of the Mozambican NOC Empresa Nacional de Hidrocarbonetos' planned investment would end up in projects that would not break even.
- Almost ½ of the Nigeria National Petroleum Corporation's projects would not break even either, putting at risk $13 billion
- Almost ½ of the Republic of Congo SNPC's planned expenditures would not yield any profit (between $500 and $600 million)
- Senegal's oil and gas resources might already be stranded, e.g. the Sangomar field original internal rate of return was estimated at 28% but drops to 9% when taking into account the energy transition and operational delays.
- Ghana would see less than half of their projected revenues materialise in net zero by 2050 scenario,
- The nascent oil and gas projects in Uganda would yield no revenues (Boyer 2021).

Oil and gas often make up a high proportion of government revenues, thus if oil prices fall, these **governments will struggle to balance their budgets as they need to continue providing public services for their populations**. Boyer (2021) suggests that governments should be transparent about project costs and contractual terms to allow a proper understanding of each project's economics and viability under different parameters.

Figure 3: Vulnerability of Petrostates' Total Government Revenues to Reduced Oil and Gas Demand Resulting From A Moderate-Paced Energy Transition



Source: Rystad Energy, IMF, CTI Analysis

*Notes: Bubble size indicates relative population size. * Indicates countries where we have not been able to update oil and gas as % of total gov't revenue data since our last analysis. ^ indicates either greater oil and gas revenue than total government revenue (Iraq, Venezuela) or improved oil and gas revenues in our moderate transition, due to unknown gas pricing and demand*

The **fiscal breakeven price** or price necessary for an oil-exporting state to balance its budget is another way to measure a state's vulnerability or economic resilience. Although O&G producers do not know what demand and price will do in the future, it is likely that an early excess of supply is likely to push down prices, leading to low subsequent investments, and resulting in higher prices in the short term. Essentially, the **lower the production price is for a state, the less vulnerable these states are** – it's important that a petrostates fiscal breakeven price is higher than the average price of Brent crude oil (approximately USD 80 per barrel in 2023) (Prince, et al. 2023). Therefore, **only those petrostates that have reduced costs and carbon intensity and become aggressively competitive will be viable** as overall demand and markets become more competitive during the energy transition. The Global Energy Scenarios forecasts that in

the **Net Zero Emissions scenario oil will be around $15 per barrel** and the Mean scenario forecast oil price at around $65 per barrel from 2027 to 2050. At this stage, few petrostates will have a breakeven fiscal price i.e. their costs are not profitable.

Emerging Petrostates

The global transition to Net Zero increases the financial risk for countries who are "emerging petrostates". Oil and gas producers will face a **declining demand plus lower commodity prices** on future revenues – and these aspects **must be factored into development of new oil and gas projects** as discoveries with less competitive breakeven price risk becoming stranded assets (RystadEnergy 2024, Prince, et al. 2023). At the same time, these **large capital investments** take years to develop the infrastructure required to extract oil plus **need decades of production to recoup costs** something that is highly unlikely to materialise, given the need for the energy transition (and noting that most O&G projects are only economically feasible if most of the products are exported).

Despite these concerns for emerging producers, African countries continue to trying to exploit their oil and gas finds. However, Prince et al. (2023) warn: '...they run the risk of wasting precious capital on upfront oil and gas investments, without realising the future cashflows they may be planning for.' i.e. **these 'assets' will likely be stranded before these countries are able to realise revenues.** Noticeably, faster and deeper energy transitions will affect demand more strongly and trigger higher risks of stranded assets. The analysis by ACF (no date) indicates that numerous LNG projects currently approaching or beyond their final investment decisions (FID) would no longer be economical.

Examples indicate that many countries may only begin exporting their oil and gas after fossil fuels are set to peak in the mid-2020s. Most African oil and gas projects take over 12 years to start producing and then these countries need to payback the investment costs (Payback periods for LNG projects can span 15 years, with contracts often accompanied by 20-year take-or-pay clauses.) before they begin to produce (The African Climate Foundation, no date).

This means **that if countries find gas in 2025**, then they will likely only **start producing in 2037** but will still **need to payback the investments costs**, at least until **2052** (depending on how big the find and how profitable the markets will be) – by which time they will need to close operations due to being obsolete, uncompetitive and not financially viable as well as due to climate change commitments. During this time, there will not be money flowing into the country i.e. no benefit for the country in question but there will be debt to repay. Added to this, analysis finds that African oil and gas assets are on average 15% to 20% more expensive to develop and operate and 70 to 80 percent

more carbon intensive than global oil and gas assets (Leke, Gaius-Obaseki and Onyekweli 2022).

These examples include:

- **Uganda which** has faced delays on its oil and gas project e.g. the East Africa Crude Oil Pipeline which is likely to begin oil exports in 2025
- **Mozambique has** billion-dollar investments, on top of the increases in sovereign debt, which will require revenues to pay back well beyond peaking demand
- BP's floating LNG project along the border between **Mauritania and Senegal** has been delayed but is expected to be operational next year.
- The Mauritanian government is hoping to agree a business plan for a major offshore gas field in **Mauritania** in the coming years, with Shell also exploring for oil in the area.
- **Ghana** has been aiming to double its oil production and the government is selling more exploration rights in the hope of boosting production amid a severe economic crisis (Prince, et al. 2023).

Companies are at Risk across the entire value chain

The road ahead will be unlike any the industry has travelled before. (RystadEnergy 2024).

RystadEnergy (2024) note that along the full value chain i.e. exploration, development and production, companies in the oil and gas sector are at risk as we transition global energy systems. Included in their stakeholders are investors and banks (likely consultants too) who have traditionally earned an income from the oil and gas sector.

While the whole oil and gas sector will be negatively impacted, some companies might be better positioned to remain competitive for a longer period of time. At this stage, it is estimated that national oil companies (NOCs) hold the most competitive reserves (i.e. produce at lower costs), so they will probably remain more competitive in a low-price oil market environment – although they will face a minimum of a 20% decline in liquid production rates by 2040 (Prince, et al. 2023). Therefore, towards 2050, most NOCs will hold an increasing share of global production and investments in all scenarios. However, these outcomes aren't certain for all NOCs and some NOCs are less competitive than others (Prince, et al. 2023). At the same time, NOCs have fewer incentives to change as governments want to maintain income from petroleum. Public companies are more likely to be spurred by persistent shareholder or external pressure to embrace lower-

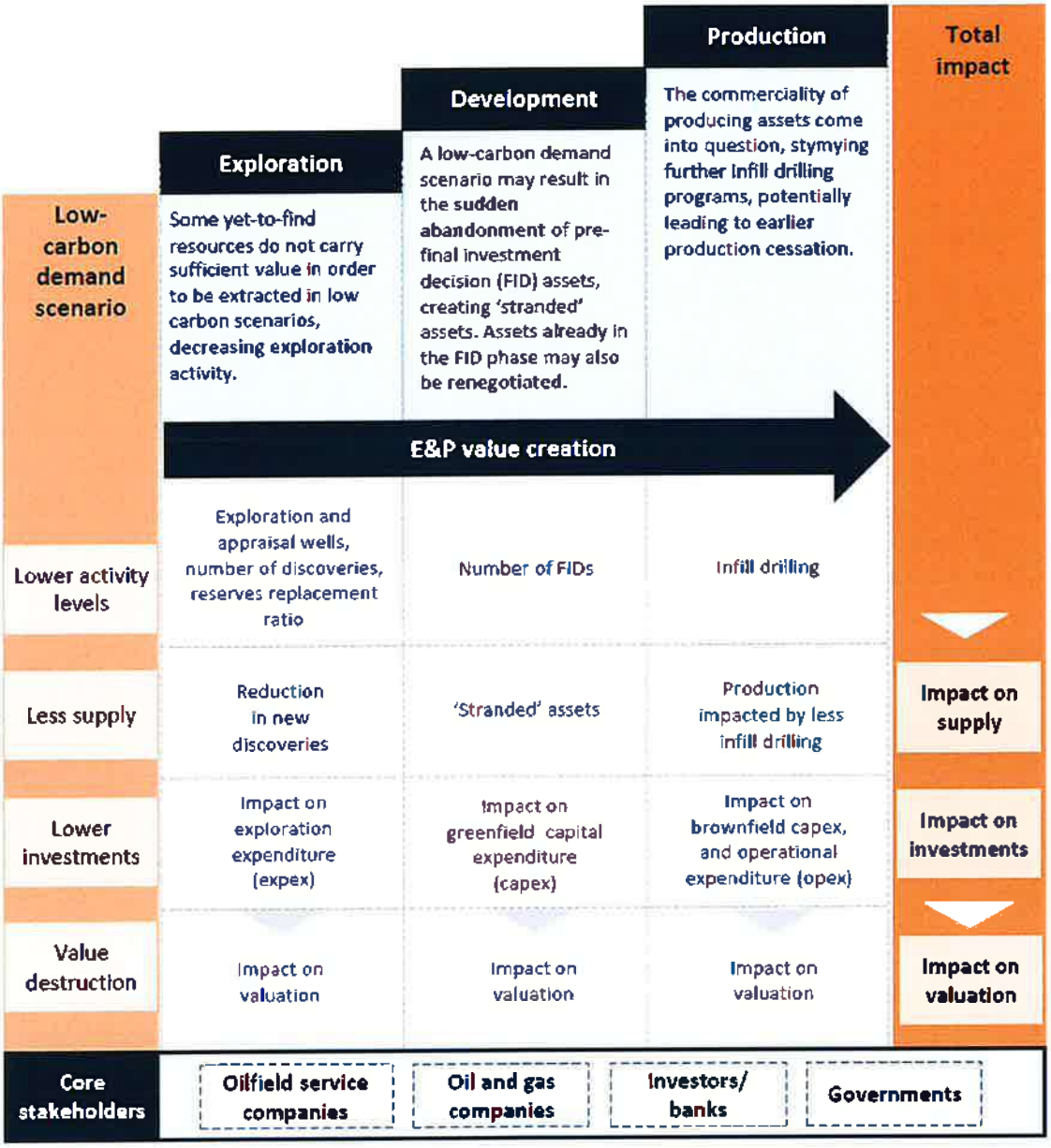
carbon operations (RystadEnergy 2024). Non-NOCs will likely face over 50% decline in demand (Prince, et al. 2023).

Oil and gas companies are in denial about climate change and analysis of eight of the largest integrated oil and gas companies — BP, Chevron, Eni, Equinor, ExxonMobil, Repsol, Shell, and TotalEnergies (the "oil majors") indicate that none of their plans or strategies are aligned to the Paris Agreement (RAN; BankTrack; IEN; OCI; Reclaim Finance; the Sierra Club; Urgewald 2023). Despite signing onto pledges, major oil and gas companies have been backsliding and it is unlikely that any of these companies will willingly make the energy transition (RAN; BankTrack; IEN; OCI; Reclaim Finance; the Sierra Club; Urgewald 2023).

Prince, et al. (2023) suggest that the oil and gas sector is trying to slow down the process of transition by trying to innovate technology that is currently dependent on oil and gas. They use the term the 'sailing ship effect'[3] to describe this inefficient use of capital to delay an inevitable transition – that would have been better spent on new technologies and innovation (Prince, et al. 2023). The example cited is Saudi Aramco's doubling of its spending on research and development in the last five years, with a particular focus on the efficiency of internal combustion engines.

[3] The "sailing ship effect" describes the increase in sailing ship innovation in the mid-nineteenth century to delay their replacement with steamships (Prince, et al. 2023).

Figure 5: Companies are at risk along the whole value-chain



Transition Risk and South Africa

South Africa would be considered an emerging petrostate, thus, if SA plans on exporting O&G, it is likely that due to the global transition to net zero, SA gas will not be sufficiently price competitive to be exported and the global demand is likely to decline by the mid-2020s i.e. there will be no market for SA O&G (IEA, 2024; International Energy Agency, 2023). If the intention is to use the O&G domestically, then models developed in SA indicate that South Africa's power needs can be met with very little gas and the large majority of new energy new generation capacity should be wind and solar, with an increasing requirement for flexible (dispatchable) capacity to support this (Roff, et al. 2022). Moreover, gas power is almost triple the cost of renewable energy and thus not

cost-competitive (Roff, et al. 2022). Research by NBI indicates that either way SA will have to substitute gas with greener alternatives and phased out by 2050 for South Africa to achieve a net-zero 2050 target (NBI, BCG, BUSA, 2022). This indicates a high probability of stranded assets if SA invests in both the upstream and downstream O&G sector.

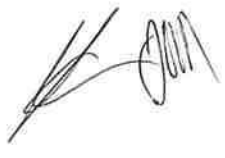
In 2019, Huxham, et al analysed South Africa's transition risk. They found that **South Africa faces transition risk of more than $120 billion in present value terms between 2013 and 2035**. The authors note that South Africa's trade-offs associated with a low-carbon transition are particularly acute because of the high levels of unemployment and inequality, together with a strong reliance on fossil fuels. **This analysis did not include analysing the risk from the offshore oil and gas industries** but they did make key recommendations for the South African government and businesses prior to investing in these projects. Moreover, they note that if the government took action to mitigate the risks, it could avoid potential economy-damaging risk concentrations and in so doing, reduce the costs associated with the decarbonisation of the South African economy:

> '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).

A key recommendation was that **South Africa should avoid or delay new investments that could add to South African climate transition risk** until the market for the related product is certain. South Africa needs to understand thoroughly the consequences and likelihood of the transition and related risks as well as determining whether these investments continue to make sense within South African's development ambitions. Thus, South Africa should introduce climate transition risk assessments as a standard condition of application for public sector procurements, financial assistance such as guarantees to finance on preferential terms from state-owned financial institutions or other fiscal incentives, could 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 entrepreneurs to compete 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 the effect on the public finances. (Huxham, et al., 2019).

The long-term structural changes in demand for fossil fuels, will have enormous repercussions as they will influence the value of physical and financial assets, tax flows, jobs and knowhow (Huxham, et al., 2020).



6. The Danger of Stranded assets

Stranded assets are assets that become devalued or fail to generate an economic return before the end of their economic lifetime or can no longer be monetised due to changes in circumstances (Dube, No date; Carbon Tracker, 2023). 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 in a given area, or assets with infrastructure in place actually producing hydrocarbons. Livsey (2020) notes that global investors are shifting their investments away from the traditional energy sector and this poses a big problem for energy groups whose **fossil fuel reserves may never be extracted due to climate change. The energy groups will then be left with stranded assets**, having to write off substantial amounts of their fossil fuel reserves – estimated to be over $900bn — or one-third to half the current value of big 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 producers will be hit twice – fossil fuels will lose their value while simultaneously carbon taxes will reduce demand further.

Economic modelling shows that to achieve Net Zero Emissions in 2050 (NZE2050), with the current levels of investment in O&G, over US$350 billion in African oil and gas assets would be stranded, with more than US$90.3 billion in stranded assets in Nigeria alone (The African Climate Foundation no date). Global Energy Monitor (2022) documents a US$245 billion planned expansion of gas infrastructure that is underway in Africa- most of this gas is intended to support Europe's short-term energy crisis resulting from Russia's invasion of Ukraine. This will likely lead to stranded assets and a failure to invest as strongly as necessary in Africa's domestic generation capacities and renewable energy future (Global Energy Monitor, 2022).

At the end of January 2021, the risk of stranded assets facing energy companies was highlighted as rating agency S&P increased its risk rating for the entire oil and gas sector from "intermediate" to "moderately high" because 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 weeks. 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 French group 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).

> *'Embarking on a large-scale gas-to-power strategy given these realities creates significant economic and environmental risk.' (Roff, et al. 2022).*

If there is no economic rationale for large-scale gas use in power and there is no international market for O&G, then following the SA government's outdated vision would deliver assets that are stranded (Roff, et al. 2022). Moreover, using the logic from emerging petrostates, if SA were to find Oil or Gas in 2024, it would likely take at least until 2034 to start producing – and then SA would have a payback period of approximately 15 years (i.e. until 2049) before SA would begin to see any profits on these investments. However, SA will then need to shut operations due to climate change commitments by 2050 (if the global market for O&G even exists at that stage, which from the energy scenarios, seems unlikely). During this time, SA is unlikely to see fiscal benefits such as increases in economic growth.

From a macroeconomic perspective if SA pursues an extractive O&G policy, it is likely that SA's levels of debt will increase and credit ratings are likely to drop further.

7. Lessons learnt from other African countries

South Africa should look to both African and global countries for lessons on the extraction of oil and gas reserves. In February 2024, Bloomberg documented some of the challenges facing African countries regarding their O&G finds, noting Senegal's economic woes:

> *Senegal joins other African countries that have struggled to ride some of the world's biggest oil and gas discoveries in decades. The finds have rarely lived up to their promise, often doing more harm than good. Everything from project delays to political uncertainties and mismanagement have capped export revenues, forcing the nations into additional borrowings and worsening their financial situations. Senegal's debt is becoming more expensive, Mozambique has had to restructure its loans and Ghana defaulted amid the mismanagement of its oil and gas production.*
>
> *The discoveries have also done little to improve the energy situation at home. Domestic markets across the continent are no match for the lucrative ones beyond its borders. Foreign companies balk at developments that don't target export markets, leaving local economies with limited access to their own gas that can be used to generate electricity for homes and industry. Almost 600 million people, or just under half of Africa's population, lack direct access to energy even as 6% of the world's gas and about 7% of its oil is produced there.*

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).

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.

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. 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

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).

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).

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8. The Resource Curse and Local Maldevelopment

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.

Moreover, research titled 'The forgotten resource curse: South Africa's poor experience with mineral extraction' finds that SA has experienced many of the symptoms outlined in the resource curse literature including relatively slow GDP growth, gross inequality, entrenched poverty and the creation of a rentier state. Overall, it finds that most of the SA population has failed to benefit from natural resource wealth – with sections of society actively harmed through the process of mineral extraction. This research classifies SA as a resource cursed state (Elbra, 2013).

It is clear from South Africa's macroeconomic outlook that many of the challenges outlined above still exist:

- South Africa's macroeconomic outcome is a bleak picture despite managing to avoid a technical recession in 2023 with real GDP growth at 0.6%. For 2024, South Africa's overall economic outlook is weakly positive with the National Treasury predicting GDP growth of 1.3% in 2024 and 1.6% in 2025 which is lower than the International Monetary Fund's forecast of 0.9% in 2024 and 1.3% in 2025. This low level of GDP growth has partially been attributed to constraints in the electricity and logistics sectors (especially rail and port infrastructure constraints) which needs structural economic reforms (Marais and Spangenberg 2024). To stimulate economic growth, there is a need for capital investment and specifically to invest in infrastructure and crowd in more private sector finance to support and implement projects.

- As of 2023, around 18.2 million people in South Africa are living in extreme poverty[4] and this number is forecast to increase in the coming years. Moreover,

[4] poverty threshold at US$1.90 dollars daily

SA has very high rates of child poverty. Although these levels have fallen as a result of a massive expansion of the Child Support Grant, given that the child population has grown over the past two decades, there were more children living in poverty in 2022 than there had been in 2003: 53% of children (11.1 million) were poor in 2022 and 38% (7.9 million children) were below the food poverty line, meaning that they were not getting enough nutrition.

- According to the most recent data, South Africa has the highest income inequality in the world, with a Gini coefficient of around 0.67. This is attributed to high levels of unemployment; very low wages or income for many of those that are employed; and high income and wealth levels for a small percentage of South Africans (the top 0.01% of people or 3,500 individuals own about 15% of all of the wealth).

- Unemployment levels in SA are estimated to be 32.6% (June 2023) but using the expanded definition of unemployment, it is more likely that over 44% of the working population is unemployed. The IMF predicts that unemployment will increase to 33,5% by the end of 2024 (using the narrow definition).

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.

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).

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).

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).

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).

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).

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).

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).

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 30th 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.

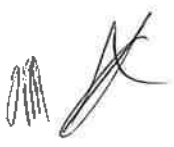
The sad reality is that most municipalities in South Arica will be entirely incapable of dealing with the increases in demand for public services and environmental protection services that will come with the emergence of an oil and gas sector in South Africa. In 2020, the Auditor-General reported that '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).



A South African Local Example: Platinum and the City of 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.

9. Additional Economic Risks to Consider

1. Increasing Sovereign Debt and Fiscal Risk

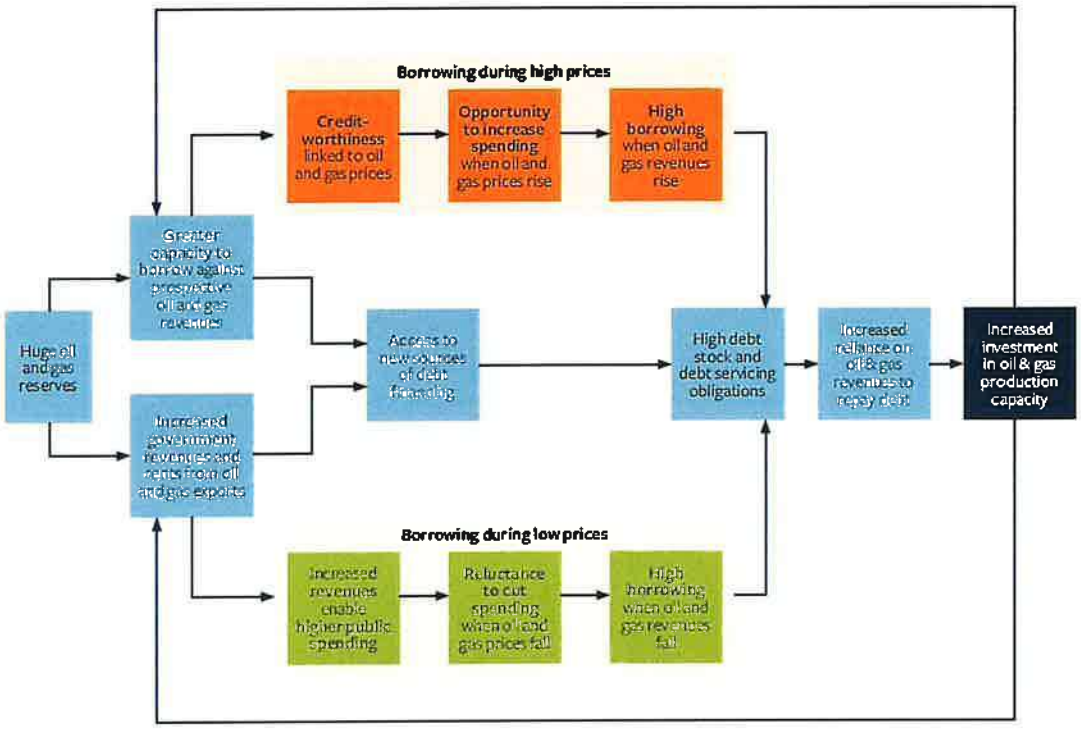
African debt, both continentally and nationally, has been rising (UNCTAD, 2023). In 2022, public debt in Africa reached USD1.8 trillion, increasing by 183% since 2010 (UNCTAD, 2023)[5]. Steadman, et al (2023) note that the increase in sovereign debt levels in low- and middle-income countries can't only be attributed to oil and gas dependency however their findings indicate that **oil and gas production exacerbates fiscal risks**. For oil and gas producers, the risks associated with climate change are high because of both the physical impacts of climate change and the likelihood of disappearing export markets will lead to fiscal and macroeconomic instability (Steadman, et al. 2023).

Petrostates tend to have increased fiscal dependence on oil and gas revenue (i.e. more dependent on the income from exporting oil and gas). Of the 33 petrostates for which the IMF has consistent data, average central government debt nearly doubled from 24% of GDP in 2010 to 46% in 2018. And the assumption was that this debt would increase (Steadman, et al. 2023). **Petrostates tend to borrow both when the oil price is high** because their credit ratings rise and hence make cheaper finance available, **and when it is low**, in order to fill their resulting fiscal gaps (Steadman, 2023). Their diagram below illustrates how countries become locked into debt dependency. Prince et al (2023) warn that **the energy transition will further exacerbate the levels of sovereign debt** as countries credit ratings decline and debt becomes more expensive while also seeing revenue from oil and gas falling and debt servicing becoming more important.

[5] The heavy debt-repayment burden will impact negatively on economic growth and stability in countries (Economist Intelligence, 2023). The higher borrowing costs and increasing debt have reverberated across countries' ability to finance development (and climate-related disasters) (UNCTAD, 2023). A higher share of revenue dedicated toward debt servicing is problematic in that it diverts resources from areas Africans need most including health, education, development and social support, exacerbating the situation of Africa's vulnerable populations. UNCTAD (2023) adds: As Africa's debt continues to rise, the continent is being confronted with a global financial architecture that is misaligned with its needs.

Figure 8: How oil and gas production locks nations into indebtedness and further dependency (Source: Steadman et al 2023)

Figure ES1 How oil and gas production locks nations into indebtedness and further dependency



South Africa's debt has ballooned and is approximately 74% of GDP (around R5.2 trillion) (Van Niekerk, 2024). Debt is expected to increase to 77.7% of GDP in the 2025/26 fiscal year, exceeding R6 trillion (debt was R2.3 trillion or 49% of GDP in 2018) (SANews.gov.za, 2023). This limits government's ability to channel resources into the productive side of the economy as debt service costs are crowding out social spending as debt repayments form a greater share than social protection, health, community development, or economic development, with one in every five rands being spent on servicing the debt (Marais & Spangenberg, 2024; Van Niekerk, 2024; SANews.gov.za, 2023).

If SA has to take out further loans to develop an O&G sector, our debt and debt repayments would rise substantially – likely leading us to default on debt repayments and to shift into a full economic recession. 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.

2. Downgrading of credit ratings

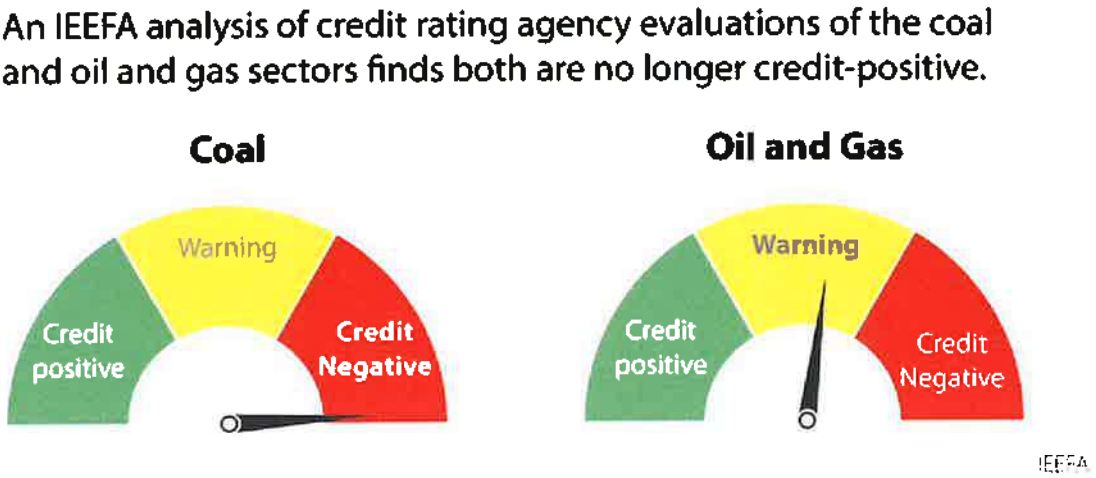
> ... credit rating agencies, have all moved to the arena of comprehensive credit analysis, acknowledging the impact of climate change on traditional risk areas—regulatory, legal, economic, financial, political, and social. The issue has grown to such magnitude that climate has become its own risk category. (Sanzillo 2024).

Credit ratings are described as **independent mechanisms to assess creditworthiness** or the ability – and willingness – **of debt issuers to meet repayment obligations** (Steadman, et al. 2023, Sanzillo 2024). Credit ratings provide international investors with a rapid, standardised way to assess and price debt, and are particularly important for borrowing in international capital markets. But credit ratings agencies have significantly changed their perspectives: **fossil fuels** were once considered to be credit positive but now they are issuing clear, **specific warnings about the financial risks of fossil fuels** including oil and gas as these now face substantial financial risks.

Prince, et al. (2023) find that **there has been a general downgrade in credit ratings for the petrostates as debt has increased.** As petrostates earn less revenue from their oil and gas production, their **creditworthiness declines** i.e. they will have **lower credit ratings and thus borrowing on international capital markets will become more expensive** for these petrostates (Prince, et al. 2023). The consequences are likely to be a devaluation of currency, rising debt levels, reduced access to capital markets and economic contraction leading to concerns among investors and credit rating agencies about a state's ability to service its debt i.e. lower investor confidence (Prince, et al. 2023). Sanzillo (2024) warns that countries that want to capitalise on not yet exploited oil and gas reserves, **the market is more likely to reward low-carbon, fossil-free investments** (Prince, et al., 2023).

A key factor that prospective lenders typically use to assess the creditworthiness of a sovereign government, state-owned entity or private company that controls significant oil and gas reserves is the market price of oil and gas (S&P Global Ratings, n.d.). This is because the entity's ability to service debt is linked to the revenues it can generate from the sale of oil and gas, which are higher when prices rise and lower when they fall. However, commodity markets experience large and unpredictable price fluctuations (Steadman, et al., 2023). Thus, experience indicates that revenues tend to not be predictable.

Figure 2: Credit ratings agencies evaluations of fossil fuel sources



South Africa's credit ratings have been somewhat volatile over the last decade. In January 2024, Fitch credit rating agency disappointed SA by affirming the rating BB- with a stable outlook i.e. indicating an elevated vulnerability to default risk. In May 2024, S&P left SA's rating at S&P has a "BB-/B" rating on South Africa's foreign currency debt and a "BB/B" on local currency debt. These ratings are lower than investment grade ratings, making it more expensive to borrow on international markets for SA.

However, ratings agencies have expressed concern due to the weak economic outlook; power shortages, the struggling logistic sector, high unemployment rates and income inequality, and a high and rising government debt-to-GDP ratio. But the ratings agencies identified positive aspects such as flexible exchange rates, mostly local-currency-denominated, strong institutions, as well as a credible central bank. Were South Africa to increase its debt-to-GDP ratio further, credit would become far more expensive making it challenging to borrow on international markets.

3. Technological Lock-In

If African countries continue to invest in fossil fuels, it will displace investment in clean energy systems – Africa will be locked into old technologies and infrastructure and will be unable (and unaffordable) to change its course (Dube, No date). In 2022, RES4Africa wrote that although Africa's energy system has seen a major transformation, there has been limited uptake of non-hydro renewables. They add that if sustainable energy solutions had played a greater role in the transition from coal, there would have been the opportunity to significantly increase the socio-economic benefits that would have accrued with their development (RES4A; IRENA; UNECA, 2022). In addition to benefits such as the speed and reduction in operational costs of renewable energies, the positive impacts of shifting to renewable energy include:

- For each dollar invested, renewable energy creates two to five times more jobs than fossil fuels
- Other investments for a green economy – like climate adaptation, conservation agriculture, public transport and energy-efficient building retrofits – provide up to 25 times more jobs than those created by fossil fuels (IRENA and AfDB, 2022).

Roff, et al. (2022) note that the economically rational role for gas in power generation is for peaking or standby capacity. For approximately 97% of the time, large-scale gas-fired power generation will stand idle. Thus, locking SA into energy systems largely reliant on gas will create technological lock-in and perverse outcomes. Investing in gas infrastructure would reduce the funding available for cheaper RE and due to the cost of gas, if there is an extensive gas build out, including CCGT, it will be expensive to run these systems (and increase overall costs of energy in SA, likely to be passed onto consumers). Moreover, 'The option to delay this decision has immense value for South Africa, allowing us to evaluate technological developments as they arise and not commit ourselves to carbon lock-in / stranded assets.' (Roff, et al. 2022).

4. Illicit financial flows

   Countries with a high level of dependency on oil are more prone to higher levels of IFFs. (UNCTAD 2020).

Illicit financial flows (IFFs) are methods, practices and crimes aimed at **transferring financial capital out of a country, in contravention of laws.** IFFs include money laundering, bribery and tax evasion (Global Forum Secretariat, 2023). IFFs erode the public revenues that countries need to invest in their social and economic development, erode the investment base of countries and undermine the public's confidence in the integrity of the tax system (OECD, 2022).

Although it's difficult to accurately track IFFs, the report on Tax Transparency in Africa (2023) notes that IFFs as much as 50% of illicit outflows from Africa are generated via trade mispricing. In 2019, it was estimated that Africa loses more than $50 billion annually in IFFs although estimates vary with UNCTAD (2020) estimating that Africa had IFFs of USD 88.6 billion (EUR 85.1 billion) annually, or 3.7% of Africa's gross domestic product (UNCTAD 2020). IFFs are substantially higher than aid and investments in Africa (Global Forum Secretariat, 2023; ECA, 2019).

Research indicates that the **extractive industries are particularly prone to IFFs** (UNCTAD 2020). This is because the extractive industries tend to have high degrees of power and political influence, as key areas of revenue and export earnings, and African countries enter into secret and unequal contracts with multinational companies i.e. a **lack of transparency and accountability** (ECA 2019, Global Forum Secretariat 2023).

Of explicit concern is that IFFs contribute to financing terrorism in Africa:

> Taken together, the illicit exploitation of natural and environmental resources, including gold, diamonds, oil, charcoal, other minerals, timber and wildlife, and illegal taxation, confiscation and looting, account for 64 per cent of finance linked to security threats and conflicts (International Criminal Police Organization et al., 2018). It is further estimated that of the $31.5 billion in IFFs generated annually in conflict areas, 96 per cent is used by organised criminal groups, including to fuel violent conflict (Global Forum Secretariat 2023).

Illicit financial flows (IFFs) are difficult to measure due to their secrecy but it has been estimated that South Africa is losing more than $62 billion a year because of illicit financial flows and tax evasion: $21.9 billion per year in inward flows and $40.9 billion in outward flows (Cokayne, 2023). OECD research indicates that IFFs, not including tax evasion, might be closer to **between USD 3.5 and 5 billion in IFFs are leaving the country each year** (approximately 1-1.5% of South African annual GDP).

IFFs are particularly harmful in South Africa due to the significant fiscal challenges that the country faces. The SA government is trying to effectively address IFFs in SA but this is challenging without sufficient capacity and global support (OECD, 2022). A study on the Illicit Financial Flows (IFF) in the South African mining sector, specifically analysed transfer pricing (TP). The research noted that Trade misinvoicing is a reality impacting the South African mining industry and trade misinvoicing has become normalised in many categories of international trade. This form of IFFs which reduces the ability of SA to capture its legitimate share of the gains from international trade in terms of foreign exchange earnings and fiscal revenue collected from customs and other trade levies. At the same time there are many incentives for trade misinvoicing due to the regulatory environment (tariffs, customs, export subsidies, exchange controls) and imperfect monitoring and poor enforcement of regulations (Ngozo, 2020). Trade misinvoicing generates two sets of losses to the economy:

- Loss of revenues from customs duties, VAT taxes, income taxes, royalties, and other measures.
- Perpetuating the current economic structure through transfers of income and wealth out of domestic earnings, usually into wealthier countries overseas.

The South African mining industry has accumulated and reported net profits of R221 billion, between 2010 and 2019. The declared profits do not include the undeclared IFFs in trade misinvoicing for the silver-platinum group (R296 billion) and iron ore (R108 billion) in 2014 alone (Ngozo 2020). It is likely that IFFs will take place in an O&G sector

in SA where it is difficult to govern and measure extraction of O&G – which further impacts on the lack of profitability of an O&G sector.

5. Trade and competitiveness

According to the National Planning Commission, South Africa's trade accounts for around 60% of GDP (National Planning Commission, 2020). In light of the importance of trade to South Africa, remaining competitive is a particularly important economic factor. In 2020, Montmasson-Clair analysed the impact of the rise of the global climate change regime on South Africa's trade and competitiveness. The findings are highly concerning for South Africa's industrial development and that **exports, are at particular risk.**
The reasons are:

- South Africa's exports are focused on a few destinations and they are heavily concentrated around a small number of value chains. Thus, South Africa is vulnerable to changes in trade patterns arising from measures aimed at transiting to low-carbon pathways.

- Secondly, many of the importers are transitioning away from carbon-intensive pathways, and consequently many of these importers are considering imposing a **carbon border adjustment mechanism (carbon border tax)** that would reflect the amount of carbon emissions attributed to goods imported into the region creating challenges for industries and countries with a large carbon footprint. This is a form of green protectionism where the justification of trade protectionist measures under the guise of addressing climate change and environmental goals. South Africa's exports are already more carbon intensive due to our carbon-intensive energy system and the country is a large exporter of fossil fuels. Moreover, SA's vulnerability is reinforced by the absence of an ambitious climate change framework.

- Finally, South Africa's relatively long distance to its trading partners has implications for transport costs and associated GHG emissions (PWC, 2020; Montmasson-Clair, 2020).

Border Carbon Adjustments (BCA) are **climate measures to prevent the risk of carbon leakage** (i.e. the movement of production and associated emissions between countries due to different levels of decarbonisation effort through carbon pricing and climate regulation) and is designed to **support increased ambition on climate mitigation** (Monaisa & Maimele, 2023). The EU's BCA, known as the Carbon Border Adjustment Mechanism or CBAM, came into effect in October 2023. The UK is also planning a BCA (Maimele, 2024). The impact of CBAs will be determined by the **carbon embedded production in goods that are traded.** Thus, if we decarbonise our electricity systems more, the CBAs will have less impact on African countries (Monaisa and Maimele 2023).

The **EU CBAM** is a tax on embedded emissions for goods imported into the EU that emit more GHG emissions than allowed for EU manufacturers under the EU Emissions Trading System (ETS). Initially, the CBAM will apply to direct emissions from sectors identified as at risk of carbon leakage, i.e. electricity, cement, fertilisers, steel and aluminium (Monaisa and Maimele 2023). The **UK CBAM** is also a carbon tax paid on high emitting exports to the UK and mirrors the EU CBAM with less electricity plus ceramic and glass to its sector coverage (Maimele, 2024).

The EU CBAM will have a larger impact on African countries, as a share of GDP, than all other regions because the EU is an important trade market for African countries and several export commodities from Africa are relatively more carbon intensive than other countries (accounting for 26% of Africa's exports of fertiliser, 16% of iron and steel, 12% of aluminium and 12% of cement) (African Climate Foundation; The London School of Economics and Political Science, 2023). In the long run, **EU CBAM is forecast to reduce African exports to the EU by -5.7% and continental GDP by -1.1%** (equivalent to a $16 billion reduction in GDP at 2021 levels the GDP of the continent by 0.91%, although CBAM is forecast to reduce the GDP of no single African country by more than 0.18% (African Climate Foundation; The London School of Economics and Political Science 2023). A number of African Least Developed Countries would be among the most affected, notably Gambia and Mozambique (African Climate Foundation; The London School of Economics and Political Science 2023).

Analysis by TIPS notes that under the EU CBAM, a total of US$2.4 billion (about R45.4 billion) of South African exports (based on 2023 data) is at risk in the short term. This is about 11.3% of all South African exports to the EU, and about 2.2% of total South Africa exports to the world, and 0.7% of total South African GDP (Maimele, 2024). The UK CBAM would have a smaller impact but would likely result in a total of US$223 million (About R4.3 billion) of South African exports (based on 2023 data) being at risk in the short term. This is about 4.2% of all South African exports to the UK, and about 0.2% of total South Africa exports to the world, and just 0.1% of total South African gross domestic product (GDP). Fertilisers, iron and steel as well as aluminium are primary goods in jeopardy (Maimele, 2024).

TIPS offers recommendations for SA to reduce the impact of CBAs on our exports:

- Decarbonising industries: Companies and government should accelerate the decarbonisation of these carbon-intensive industries. Increasing renewable energy in production processes and investing in energy-efficient technologies will serve to decarbonise industrial sectors.

- Decarbonising South Africa's electricity system: South Africa's over-reliance on coal as a feedstock for electricity and liquid fuels production makes it one of the most carbon-intensive economies in the world. Increasing renewable energy in the national grid will decrease the indirect emissions of sectors that consume large amounts of electricity.

- Introducing more ambitious climate-change policies: South Africa's climate-change policies are not ambitious by global standards. An ambitious national climate change policy is required to steer the country towards a low-carbon development trajectory.

- Reforming South Africa's carbon tax to reflect global carbon pricing will be critical to ensure that the country's carbon-intensive products reflect the social price of carbon. Increasing the South African carbon price will stimulate heavy emitters to reform their business models and operations (Monaisa and Maimele 2023).

If indirect emissions are included in future, South African exporters will face additional risks as the country is heavily reliant on coal for its electricity and liquid fuels (Monaisa and Maimele 2023). Thus, to ensure our exports are as competitive as possible in SA, we can't afford to invest in any further fossil fuels but should focus on transitioning to net zero (Roff, et al. 2022).

6. Financial Flows and Ownership

"This debt will be paid by generations" Sokhna Ba

The financing and ownership of fossil fuel extraction and production in Africa is largely from the global north (Dube No date):

- Between 2016 and 2021, approximately $132.3 billion of investment in fossil fuel companies and projects in Africa, largely from financial institutions from North America, Europe, and Australia

- An estimated 61% of the projected production in Africa between now and 2050 is owned by multinational companies headquartered in Europe, North America, and Asia (Daley, 2023).

The implication of this is that **the profits of the financing tend to accrue to countries in the global north** (Dube No date). At the same time, **African governments and citizens tend to hold the risk** – partially due to the risk of **stranded assets, poor contractual terms** given to African governments and the risk of developing countries becoming liable to pay compensation to private sector fossil fuel companies under **investor law** with the legally binding Energy Charter Treaty which supports investor confidence in part with mechanisms for investor–state dispute settlement (ISDS). The contracts that African

governments get into with investors from the global north need to be scrutinised to avoid risks that come with stranded assets. These contracts would be better off had most of the risks been borne by investors from the global north (Dube No date). Following the ExxonMobil court case in Guyana in 2023, which despite the environmental impact statement for the Guyana project identifying 12 islands with a gross state product of $147 billion that could be affected by an oil spill, ExxonMobil has failed to provide adequate oil spill coverage and insurance and yet will only be liable for $2 billion damage and the rest of the liability for any potential oil spill has been shifted back onto the people of Guyana.

7. The social costs of carbon

The social cost of carbon (SCC) is an estimate of the cost of the damage done by each additional ton of carbon emissions. It also is an estimate of the benefit of any action taken to reduce a ton of carbon emissions. (Asdourian and Wessel 2023). The SCC is used to assist policymakers to evaluate the impact of policies. Recent research by Bilal and Känzig (2024) estimates that the macroeconomic damages from climate change are six times larger than previously thought. They find that a 1°C increase in global temperature leads to a 12% decline in world GDP (Bilal and Känzig 2024). Using a standard neoclassical growth model, research identifies a Social Cost of Carbon of $1,056 per ton of carbon dioxide (Bilal and Känzig 2024). Both are multiple orders of magnitude above previous estimates.

The International Institute for Sustainable Development (IISD) finds in a report on South Africa's energy fiscal policies, that the social cost of fossil fuel combustion for South Africa is at least R550-billion a year and exceeds, by five times, the revenues government earns from fossil fuel combustion. The social cost includes deaths, disease and working days lost owing to air pollution and greenhouse gas (GHG) emissions. https://www.engineeringnews.co.za/article/social-cost-of-using-fossil-fuels-much-higher-than-govt-gains-study-shows-2022-01-31

8. Decommissioning costs

It is important to include the cost of decommissioning of offshore oil and gas infrastructure upfront in all financial decisions – otherwise these costs will be borne by the state and ultimately, by the South African taxpayers. For instance, the total cost of decommissioning UK offshore oil and gas production, transportation and processing infrastructure is estimated to cost £48bn (Oil & Gas Authority, 2020). Australian research highlights the importance of minimising impacts from contaminants when decommissioning infrastructure as these contaminants could escape into the wider environment – with additional costs attached to cleaning these up (Dawkins, 2020).

10. Conclusion

The analysis presented in this literature review underscores the multifaceted implications of continuing to invest in fossil fuels in South Africa. Despite the push from leaders for oil and gas to foster economic growth, the evidence suggests that this path is fraught with significant risks—not just economically, but also socially and environmentally. As the global energy landscape evolves and more nations commit to reducing carbon emissions, South Africa's reliance on fossil fuels threatens to exacerbate existing challenges, including economic instability, social inequality, and environmental degradation.

The emerging realities of transition risks, stranded assets, and climate impacts compel a reevaluation of energy policies and investment strategies. Africa possesses the potential to be a pioneer in renewable energy development, allowing for a sustainable economic future that prioritizes equity and environmental integrity. Therefore, the time to act is now; a shift towards renewable energy sources is not only imperative for mitigating climate risk but also vital for ensuring that the hopes and aspirations of all South Africans are met, fostering a resilient and equitable energy future for the continent.

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