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Comments on Singh et al. (2022) 'Marine seismic surveys for hydrocarbon exploration: What's at stake?'

Significance:

We write this Commentary as a reply to Singh et al.(S Afr J Sci. 118(3/4), Art. #13420). We found that Singh et al.'s article did not adequately cover a rounded viewpoint on the topic, and we highlight a different perspective, calling for a balanced review in this regard. We base our argument on two premises. First, the literature study is incomplete, which creates a misleading perception that nothing is currently being done in South Africa to transition to a low carbon economy. Second, we comment on the statements made on seismic surveys. Herewith, we request that the authors consider a corrigendum that better reflects this research space, and call for more discussion on this topic.

On the first concern, a statement in the paper[1] suggests that only one programme aims to transition South Africa's economy to a low carbon emission future, and that this is a new initiative. This is not the case. The statement in Singh et al.[1] reads as follows:

> *In November 2021, the governments of South Africa, France, Germany, the United Kingdom and the United States of America, along with the European Union, announced a long-term 'Just Energy Transition Partnership' to support South Africa's decarbonisation efforts. The partnership will mobilise an initial commitment of USD8.5 billion for the first phase of financing through various mechanisms including grants, concessional loans and investments and risk sharing instruments. The Partnership aims to prevent up to 1–1.5 gigatonnes of emissions over the next 20 years and support South Africa's move away from coal and its accelerated transition to a low emission, climate resilient economy.*

Although this is announcing a new project, we are aware of at least four ongoing programmes that focus on this topic. These are discussed below:

1. Funding is provided by the World Bank for research into carbon sequestration and this builds on more than a decade of work, thus far. The Council for Geoscience in collaboration with industry partners and government compiled an atlas in 2010 on the geological storage of carbon dioxide in South Africa[2], which identified possible onshore and offshore repositories within South Africa conforming to the prerequisites for carbon capture and storage. Since the publication of this atlas, research has expanded on three potential storage basins, namely the onshore Zululand and Algoa Basins and the offshore Durban Basin[3-9], with academic research into the viability of the offshore Orange Basin currently ongoing. CO_2 capture and storage is globally recognised as one of the key technologies in a suite of emission reduction strategies to combat anthropogenic climate change.[10,11] CO_2 capture and storage technologies linked with hydrocarbon exploitation is not a new practice – companies such as Statoil in Norway have captured and stored 22 Mt of CO_2 in offshore saline aquifers since 1996[12], largely mitigating the long-term effects of greenhouse gas emissions alluded to by Singh et al.[1] Current research within South Africa[8] indicates that individual sedimentary basins possess multiple storage reservoirs with capacities equivalent to regions of the Rotliegend sandstone in the North Sea[13]. This work is already under way and a next phase of study, or economic studies run in parallel with geological investigations, may investigate the uncertainty surrounding sustainable injection rates and to what extent storage infrastructure is feasible within a balanced energy mix (see for example Lane et al.[14]). The technologies and practices associated with geological CO_2 sequestration are all in current commercial operation, and have been so for a decade to several decades. Such commercial operations include enhanced oil recovery, acid gas (CO_2) injection, natural gas storage and CO_2 pipeline transportation. No major 'breakthrough' technological innovations appear to be required for large-scale CO_2 transportation and storage. There are, however, significant policy, legal and regulatory challenges that must be resolved before CO_2 capture and storage is widely implemented.
2. A newly instated World Bank funded project is in progress in Leandra, Mpumalanga, where the feasibility of injecting between 10 000 and 50 000 metric tons of CO_2 (per year) into underground basaltic formations will be tested in 2023, at a depth of at least 1 km below ground.[15,16] As continental flood basalts represent some of the largest geological structures on the planet, they have the potential to provide large volumes of CO_2 storage capacity to regions such as the Mpumalanga Province in South Africa, where sedimentary storage options are limited. Due to the extensive nature of such geological substrates and their mineral trapping properties, they represent important research focus points for meeting global CO_2 emissions targets, as has been illustrated through the Wallulah Project in the USA and Carbfix in Iceland.[17,18]
3. USAID and Power Africa are building a public–private partnership to improve access to clean electricity and Internet connectivity at health facilities in sub-Saharan Africa, by supporting the development of 3180 megawatts of electricity generation in South Africa through solar and wind power installations.[19]

4. South African banks are also invested in this initiative to consider the just energy transition. Nedbank's funding for renewable energy was established in 2015[20] and Investec's investment in Green Bonds since 2022[21].

Therefore, the message in the Singh et al. article[1], namely that this has not been considered in South Africa, is misleading.

On the matter of seismic surveys, we refer to two recently published papers. In Kavanagh et al.'s[22] 'Seismic surveys reduce cetacean sightings across a large marine ecosystem', they emphasise the importance of timing of seismic surveys to best mitigate against disturbance. These authors provide results on localised avoidance in this regard and we advocate for similar mitigation in planning these surveys in South African waters, before attempting to halt all exploration activities. Additionally, Carroll et al.'s[23] 'A critical review of the potential impacts of marine seismic surveys on fish & invertebrates' talks to the gap in knowledge on sound thresholds and recovery of marine fish and invertebrates. They caution against generalisations about airgun arrays among taxa until more information is available to ensure scientific validity. We underscore the importance of conducting a local study on measured harm or impact that hydrocarbon exploration through seismic surveying imposes on marine life, as this has not yet been done in South Africa. A rising demand for minerals, metals and hydrocarbons, in tandem with a rapid depletion of land-based resources and increasing global population, has led to a surge of interest in blue economies and South Africa is no exception. Therefore, finding a suitable balance between resource extraction and environmental protection is likely a more feasible option than a call for a moratorium on hydrocarbon exploration at this stage. The renewable energy space relies on a different suite of metals, and perhaps because those risks are less well understood, it seems a preferable compromise but requires further research to better constrain the trade-off.

Through this reply, and the two broad points discussed above, we appeal to Singh and colleagues[1] and the South African science community to consider a more representative literature study to present a complete picture of the just transition, and not promote the one specific 'Just Energy Transition Partnership' project. Furthermore, gaining a clearer understanding of risks associated with alternative energy options is timely.

Competing interests

We have no competing interests to declare.

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