Ms Marcia da Silva/Candida Boavida
Golder Associados
Mozambique
Per email: block1619esia@golder.com

14 November 2019
Revised 20 November 2019

Dear Madam

COMMENTS ON SASOL PETROLEUM MOZAMBIQUE EXPLORATION LIMITADA ("SASOL") BLOCK 16/19 OFFSHORE SEISMIC ACQUISITION AND DRILLING PROJECT, INHAMBANE AND SOFALA PROVINCES ENVIRONMENTAL PRE-FEASIBILITY AND SCOPING REPORT ("EPDA REPORT")

1. INTRODUCTION

1.1. The following Interested and Affected Parties (**"I&APs"**) submit their comments **for the environmental impact assessment ("EIA")** process being undertaken for the application for an environmental licence **("the Application")** by Sasol to the Ministry of Land, Environment and Rural Development **("MITADER")** for the proposed off-shore seismic acquisition and offshore drilling project **("the Project")**:

1.1.1. Tiffany Schauer, homeowner in Vilankulo;

1.1.2. Our Children's Earth Foundation (OCE), a non-profit organisation;

1.1.3. Odyssea Dive, Vilankulo;

1.1.4. Ilidio Joaquim Arnaldo Cole, leader of concerned fishermen, Vilankulo;

1.1.5. Catsonova Cruises, Vilankulo;

1.1.6. Marine Action Research, Zavora;

1.1.7. Zavora Lodge, Zavora;

1.1.8. Natural Resources Defense Council (NRDC), a non-profit organisationts;

1.1.9. Vilankulo Tourism Association.

1.2. The I&APs are both directly affected by, and interested in, the Project and its impacts on the social, economic and biophysical aspects of the marine and coastal environment.

1.3. In line with government policy and legislation, development must be sustainable and we contend that the Applicant's proposed activities as described in the EPDA Report, are not, particularly in the presence of such obvious fatal flaws.

1.4. In essence our comments relate to the following issues which are structured under the respective headings and set out in more detail below:

1.4.1. **THE PROJECT**: Our understanding of the Project and identification of information that has not been provided but which we believe is essential for meaningful public participation and informed decision-making.

1.4.2. **LEGISLATION TO BE CONSIDERED:** High level but key legislation that is applicable to the Project and significant shortcomings of the EPDA Report in respect of certain legal requirements which we believe should be addressed before the report is approved by MITADER. Most notable of these shortcomings is the inadequate Terms of Reference (TOR) necessary to guide the EIA in preparing the EIS Report.

1.4.3. **PROJECT AREA OF INFLUENCE:** The EPDA Report, specifically Section 5 and Table 91 sets the physical boundaries of the Area of Influence, particularly for the Area of Indirect Influence (AII), far too conservatively.

1.4.4. **ENVIRONMMENTAL IMPACTS AND FATAL FLAWS:** We also submit the following comments regarding the impacts and potential fatal flaws associated with the following aspects of the Project and request that they are considered by MITADER when evaluating the EPDA Report, and if approved, by the specialisfor inclusion in the in their respective reports, the findings of which should be reported on in the EIS Report.

1.4.5. **SPECIALIST STUDIES, CLIMATE CHANGE AND THE PRECAUTIONARY APPROACH.**

1.4.6. **PUBLIC PARTICIPATION PROCESS.**

[1] EPDA Report, Pages 41 to 43.

1.4.7. **REQUEST FOR ADDITIONAL INFORMATION**.

2. THE PROJECT

2.1. The Project is scheduled to be undertaken by Sasol Petroleum Mozambique Exploration Limitada (Sasol).

2.2. Sasol holds an oil and gas exploration license that extends south of the Save River mouth, to a point North of Cabo São Sebastião. The license block lies immediately north of the Bazaruto Archipelago National Park (BANP). The area of exploration interest within the concession block that is the subject of this environmental impact assessment covers areas of shallower water than previously assessed. The proposed exploration lies offshore of the Inhassoro, Govuro Districts (Inhambane Province) and Machanga (South of Sofala Province) on the Eastern coast of Southern Mozambique.[2]

2.3. The Project will take between 6 – 10 months. Phase 1 of the project is a 2D/3D Seismic Survey which will take approximately four months to complete and for which three alternative methodologies are discussed. Phase 2 is the drilling of an exploration well and "possibly two appraisal wells which take approximately 2 months per well". Various alternatives are also being considered for the drilling vessels as well as the discharge of drill cuttings and mud fluids.

2.4. While we acknowledge that the information provided in this section is relatively detailed, there is some fundamental information that appears to have been overlooked and we would appreciate you providing the following information to us in the Comments and Response Report[3]:

2.4.1. A map that shows the seismic survey grid and lead areas to be surveyed together with the boundaries of the BANP as well as the location of previous Njika drill sites at which Sasol proposes to dispose its drill cuttings and mud fluids[4]. Also on the same map, the routes to be used by all vessels including those supporting the Project (for example, supply vessels, patrol vessels, vessels used for discharge) as well as any other past, current or proposed petroleum operations[5] in the region

[2] EPDA Report, page 8.
[3] EPDA Report, page 7.
[4] EDPDA Report, page 24.
[5] Defined as "all or any of the operations related to exploration, development, production, separation and treatment, storage, transport and sale or delivery of petroleum at the agreed supply point in the country, including the operations of natural gas processing and the closure of all operations concluded".

undertaken by Sasol or any other party.

2.4.2. The anticipated volume of the drill cuttings and mud fluids resulting from the Project, a description of the hazardous nature of such material and the anticipated rate of discharge.

2.4.3. The anticipated types of waste and volumes of all wastes (general and hazardous) generated by the Project and the proposed methods for managing and disposing of such wastes.

2.4.4. The anticipated volume of sea traffic (including number and types of vessels, frequency etc.) associated with the Project as well as the associated emissions from such vessels (substances and concentrations).

2.4.5. The type and anticipated concentration of substances emitted from flaring gas and/or burning liquid hydrocarbons.

2.4.6. An indication of Sasol's preferred time/s of the year, if any for the seismic survey and drilling activities.

2.4.7. Spill prevention, spill containment and cleanup protocols, whether drilling mud/cuttings or petroleum as well as the oil spill contingency plan and emergency response plan for the Project.

2.4.8. All marine monitoring protocols in the project area and the BANP.

2.5. It is also requested that the environmental and socio-economic impacts of these components of the Project are also identified and assessed in the EIA phase.

3. LEGISLATION TO BE CONSIDERED

3.1. The legislation contains a number of high level rights, concepts and principles pertaining to environmental management and decision-making that need to be borne in mind and applied in the current EIA and environmental licensing process. We have set out the main ones below for ease of reference.

3.2. **Article 45 of** the Constitution of Mozambique states that every individual shall have the duty to:

3.2.1. advocate, in his or her relations with the community, the preservation of cultural values, the spirit of tolerance and of dialogue and, in general, to contribute to civic education and advancement;

3.2.2. defend and promote health;

3.2.3. protect and conserve the environment;

3.2.4. defend and protect the public good and the good of the community.

3.3. **Article 117** states that:-

3.3.1. The State shall promote efforts to guarantee the ecological balance and the conservation and preservation of the environment, with a view to improving the quality of life of its citizens.

3.4. With a view to guaranteeing the right to the environment within the framework of sustainable development, the State shall adopt policies aimed at:

3.4.1. preventing and controlling pollution and erosion;

3.4.2. integrating environmental objectives with sectoral policies;

3.4.3. promoting the integration of environmental values in to educational policies and programmes;

3.4.4. guaranteeing the rational utilisation of natural resources and the safeguarding of their capacity to regenerate, ecological stability and the rights of future generations;

3.4.5. promoting territorial ordinance with a view to ensuring the correct location of activities, and balanced socio-economic development.

3.5. **The Environmental** Law requires that environmental management is based upon fundamental principles that are derivative of the right of all citizens to an ecologically balanced environment that is favourable to their health and physical and mental well-being, namely:[6]

3.5.1. the rational utilisation and management of environmental elements in order to promote the improvement in the quality of life of citizens and to conserve

[6] Law No 20/1997, Article 4 (Environmental Law).

biodiversity and ecosystems;

3.5.2. the recognition and valorisation of the traditions and the knowledge of the local communities that contribute to the conservation and preservation of natural resources and the environment;

3.5.3. *Precaution, on the basis of which the management of the environment shall prioritise the establishment of system to prevent acts which are harmful to the environment in such a way so as to avoid the occurrence of negative environmental impacts which are material or irreversible, regardless of the existence of scientific certainty concerning the occurrence of such an impact*; (our emphasis)

3.5.4. A global, integrated vision of the environment as a grouping of interdependent ecosystems which may be naturally occurring or constructed and which must be managed in such a way so as to maintain their functional equilibrium without exceeding their intrinsic limits;

3.5.5. The broad participation of citizens as a crucial element of the implementation of the National Programme of Environmental Management;

3.5.6. Equality which guarantees equal opportunities to women and men for access to and use of natural resources;

3.5.7. Responsibility, on the basis of which whoever pollutes or in any way degrades the environment shall always have the obligation to repair or compensate the resulting damage; and

3.5.8. International cooperation, to obtain harmonious solutions to environmental problems, the cross-border, global dimensions of these problems are recognised.

3.6. **Importantly, Article 12 confirms that:-**

3.6.1. All activities which threaten conservation, reproduction, quality and quantity of biological resources, especially those which are threatened with extinction are prohibited.

3.7. The **Biodiversity Conservation Law** No 16/2014, June 10th ("BCL"), which is not mentioned in the EPDA, has the following fundamental objectives:

3.7.1. Contribute to biological diversity and genetic resource maintenance in national

territory as well as in Mozambican jurisdictional waters;

3.7.2. Protect endangered, rare and endemic species at the national, provincial, district and municipal level;

3.7.3. Contribute to preservation and restoration of diversity of natural, land and aquatic ecosystems;

3.7.4. Promote sustainable development through the sustainable use and benefit from natural resources;

3.7.5. Economically and socially value biological diversity, promoting sustainable activities including hunting, concessions for tourism and fishing, so as to financially endow conservation;

3.7.6. Conserve natural resources necessary for local community subsistence, respecting and valuing the communities' knowledge and culture;

3.7.7. Promote the use of principles and practices of conservation and natural resource management in the development process, especially with regards to local communities;

3.7.8. Protect the natural and cultural landscape of special beauty as well as natural and cultural heritage, representative of national identity;

3.7.9. Protect and repair waters and wetlands;

3.7.10. Incentivize and develop scientific research activities;

3.7.11. Promote environmental education and understanding of nature, leisure and recreation, as well as ecotourism in conservation areas7.

3.8. In this context, protected areas were defined as delimited territories, representing natural national heritage, destined for conservation of biological diversity and fragile ecosystems or animal and vegetable species.[8] Among categories of total protection there is the integral natural reserve, national park and cultural and natural monument[9]. The Project is situated "*within the boundaries of the Bazaruto Archipelago National Park*

[7] Article 12, Biodiversity Conservation Law.
[8] Article 13, no.1, Biodiversity Conservation Law.
[9] Article 14 Biodiversity Conservation Law.

(BANP)", the first official National Park of Mozambique.[10] (Our emphasis).

3.9. Further, the Biodiversity Conversation Law states that "*sustainable use of conservation areas, of public community domain, delimited, under management of one or more local communities where these have the right to use and benefit from land, with the goal to conserve flora and wildlife and sustainable natural resource use*,"[11] with the following objectives:

(i) Protect and conserve natural resources, sacred forests and other areas of historical, spiritual and religious importance and for cultural use by the local community;

(ii) Guarantee sustainable natural resource management so that it results in sustainable local development; and

(iii) Ensure access and sustainability of plants used for medicinal purposes and for biological diversity in general[12].

3.10. It is important to note that licensing for resource exploitation activities to third parties may only be done with consent of local communities, after the respective process of consultation leading up to creation of the necessary partnership contract.[13]

3.11. It is not necessary for us to set out the legal requirements for the EIA and environmental licence application process as these are set out in detail in the EPDA Report. However, we draw your attention to the following provisions where we believe that certain requirements for the EPDA and public participation process have not been met. These include:

3.11.1. Potential fatal flaws or questions have not been identified and properly considered as either precluding the continuation of petroleum operations or at least, further evaluated in the Environmental Impact Study (EIS Report). These potential fatal flaws as described in Annex V of Decree 54/2015 include:

- Activities in total protection or preservation areas (e.g. within the BANP)
- Presence of "Species Critically in and/or In Danger" (e.g. dugongs and turtles)
- Presence of a range of endemic or restricted species (e.g. corals and molluscs)

[10] EPDA Report, page 55.
[11] Article 15, no.1 Biodiversity Conservation Law.
[12] Article 15, no.2 Biodiversity Conservation Law.
[13] Article 15, no.3 Biodiversity Conservation Law.

- Presence of “Migratory/Congregatory Species”, where this habitat may be considered a unit of discreet management for those species (e.g. certain cetaceans, prawns species, turtles)
- Crucial area for the provision of services and key ecosystems in the national, provincial or district scale (e.g. seagrass beds, mangroves, coral reefs)

3.11.2. The Project is proposed in an area that contains species on the edge of extinction as well as migratory species, and, according to page 55 the EPDA Report, overlaps with the Bazaruto Archipelago National Park; and it is therefore not clear why MITADER has not refused the activity's implementation entirely.

> The project area lies within the boundaries of the Bazaruto Archipelago National Park (BANP). BANP was designated in 1971, it was the first official National Park of Mozambique, and initially comprised the three southernmost islands Bangue, Magaruque and Benguerua, together with a contiguous sea area extending 5 km to the West and to the 100 m line of bathymetry to the East (WWF, 2010). The protected area was then extended in 2002, to include the remaining islands of the archipelago (i.e. Bazaruto and Santa Carolina), and was renamed as the Bazaruto Archipelago National Park, with a total area of 1,430 km^2 (WWF, 2010; Perreira *et al*., 2014).

3.11.3. Article 19 of the Environmental Regulations for Petroleum Operations states that at least 15 days’ notice shall be given for public meetings and entitles all direct or indirectly interested or affected parties to take part in the EIA process. Not all I&APs received sufficient notice of the public meeting or were included on distribution list notifying them of the Project when the EIA process commenced. Further detail is provided below.

3.11.4. The EPDA Report is confusing because it refers to TOR separate to the EPDA but also the containment of the TOR within the EPDA Report. If indeed there exists a separate document, then we place on record that we have not been provided this document. If however, the TOR are contained with the EPDA, then we state that the TOR are insufficient and do not fully meet the legal requirements.

3.11.5. The aspects and impacts that the specialists will cover are vague and insufficiently detailed to be able to comment on whether these studies will be adequate. Identifying and describing the issues which will require a detailed investigation in the EIA phase lacks specialist input.

3.11.6. There is no description of the methodology for the evaluation of ecosystems

currently provided.

3.11.7. There is no methodology described for how impacts will be identified and assessed.

3.11.8. There is no mention of cumulative impacts.

4. PROJECT AREA OF INFLUENCE

4.1. The EPDA Report, specifically Section 5 and Table 9[14] sets the physical boundaries far too conservatively for the Area of Influence, particularly the Area of Indirect Influence.

4.2. By their own admission, the consultants in the same section acknowledge that "*the Northern Coast of Inhambane Province has been declared as a Priority Area for Tourism Investment (PATI) and it includes the Bazaruto Archipelago National park (BANP), one of the most important Conservation Areas in Mozambique*".

4.3. The reliance on local fisheries in the region is also recognized in the Section 5, as well as in Section 6.4 that describe the socio-economic environment[15]. It is stated on Section 4.4.6 that the "[f]ishing activity in Mozambique plays an important role in the economy of the country, with fish being Mozambique's second-largest export product "contributing "close to 14.3% to total exports and makes up approximately 1.5% of Gross Domestic Product (GDP). It is further stated that "Fishing is the dominant economic activity in the coastal regions of Inhassoro, Govuro and Machanga Districts" and even more significant, that the "Project Area falls inside of the Sofala Bank, which is the most important fishing ground in Mozambique. Sofala Bank extends from Angoche District (in Nampula Province) to the Save River Mouth, more than 900 km of coastline"[16].

4.4. It is therefore inconceivable that the Areas of Indirect Influence for the Seismic Acquisition Phase are all but one limited to the "local" area, which the EPDA report defines as "the remainder of the Concession Area" given the regional and national importance of the environment and the socio-economic dependence on the natural resources within this environment. Given the huge distance over which seismic sound travels and the obvious lack of boundaries in the ocean space, the Areas of Indirect Influence must be much bigger than defined in the EPDA Report. It is even more

[14] EPDA Report, Pages 41 – 43.
[15] EPDA Report, Page 57.
[16] EPDA Report, Page 61 and 62.

inconceivable that the consultants have described the Area of Indirect Influence of the Well Drilling Phase as having "No significant area of influence".

4.5. It is important that these areas of influence are expanded so that the respective specialist studies and their resultant findings are not artificially confined to boundaries that have been too narrowly set and are inappropriate, particularly in the marine environment.

5. ENVIRONMMENTAL IMPACTS AND FATAL FLAWS

5.1. We also submit the following comments regarding the impacts and potential fatal flaws associated with the following aspects of the Project. We request that they are considered by MITADER when evaluating the EPDA Report, and if approved, by the specialists for inclusion in their respective reports, the findings of which should be reported on in the EIS Report.

5.2. ***Seismic Surveying and Adverse Impacts to Marine Life***

5.2.1. Seismic surveying is performed to identify the potential for oil and gas reservoirs to exist below the seabed. In the EPDA Report the seismic surveying that is likely to be used, consists of a vessel that tows an array of air guns that generate acoustic waves; and a series of cables, referred to as streamers, that contain hydrophones to record vibrations reflected back from the underground geology. In addition to the survey vessel, numerous additional smaller boats are used to ensure that fishing boats and marine mammals are not in the vicinity of the boat. [17]

5.2.2. Acoustic waves are generated by air guns, which are metallic devices that inject high pressure air into the water. They are arrayed behind the survey vessel in groups of up to 48 air guns discharging simultaneously at depths between three and ten feet below the ocean surface. [18]

5.2.3. Seismic surveying during the Project is expected to last for approximately four months.[19]

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[17] Golder Associados Mocambique Limitada, Block 16/19 Offshore Seismic Acquisition and Drilling Project, Inhamabane and Sofala Provinces, Environmental Pre-Feasibility and Scope Definition Report ("EPDA"), June 2019, Page 12.

[18] EPDA Report, Pages 12-14.

[19] EPDA Report, Page 12.

5.2.4. Sounds waves generated during seismic surveys in the project area will produce intense noise that can result in a multitude of acute adverse biological impacts to marine life during the approximately four-month timeframe seismic surveying is expected to occur. The potential for adverse impacts to marine life is enhanced due to the shallow water nature of the project area and the presence of marine life aggregating features, such as coral reefs and seagrass beds.[20]

5.2.5. Adverse biological impacts to marine mammals, such as whales and dolphins, from sound waves generated during seismic surveying can range for tens to hundreds of miles from the survey area and include: [21,22,23,24]

- masking biologically essential marine mammal sounds, such as communication signals, echolocation, and sounds associated with orientation, finding prey or avoiding natural or manmade dangers;
- startle and fright;
- increased stress levels;
- temporary reduction in auditory sensitivity;
- cessation of vocalizations;
- altered dive and respiratory patterns;
- restricting access to essential habitats (such as the sea grass beds, which is the primary food source for the endangered dugong)[25];
- reducing availability of food sources due to shifts in behavior of prey species;
- avoidance of critical habitat areas;
- disruption of mating systems;
- disruption of feeding behaviour;

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20 International Union for Conservation of Nature, Effective planning strategies for managing environmental risk associated with geophysical and other imaging surveys, A resource guide for managers, 2016.

21 Verfuss, Ursula, K. et. al., Comparing methods suitable for monitoring marine mammals in low visibility conditions during seismic surveys, Marine Pollution Bulletin 126 (2018) 1-18, October 16 2017.

22 Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01

23 Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

24 National Research Council of the National Academies, Division on Earth and Life Studies, Ocean Studies Board, Committee on Potential Impacts of Ambient Noise in the Ocean on Marine Mammals, Ocean Noise and Marine Mammals, 2003.

25 EPDA Report, Page 54.

- mother-calf separation due to masking of contact calls;
- permanent hearing damage;
- stranding (also known as beaching) that can result in death.

5.2.6. The survivability of marine mammals depends highly on their ability to hear and identify biologically essential sounds. Hearing is the most important sensory modality for marine mammals when they are underwater and any reduction in their ability to hear has the serious potential to adversely impact their survivability.[26]

5.2.7. Noise-induced physical hearing losses can result from exposure to high intensity sound generated by the air guns used during seismic surveying that are loud enough to deep into the ocean floor.[27] The intense sound waves generated by air guns used during seismic surveying can be up to 260 decibels,[28] when sound is back-calculated to the source, with a maximum exposure potential to marine life in the range of 235 to 240 decibels.[29,30] Hearing losses in marine mammals and fish can be temporary, with recovery occurring shortly after sound exposure. Permanent hearing loss in marine mammals and fish can result from either chronic exposure to sound waves or from short-term exposure to intense sound waves.[31,32]

5.2.8. Seismic survey sound waves from the Project will increase background noise levels in the ocean in the vicinity of the project area for approximately four months and can mask the sound signals marine mammals and fish depend on for communication, identifying food sources, and avoiding threats.[33,34] Masking occurs when both the sound signals generated by marine mammals or fish and the sound waves from seismic surveying air guns and vessels occur at or near the same time

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26 Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

27 Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01

28 Unless otherwise noted, all decibel levels provided in this document are to sound pressure levels using the standard reference pressure for water-borne sounds (1 µPa).

29 Yeager, Ashley, The Scientist, Proposed Seismic Surveys Raise Concern Over Health of Marine Life, May 11, 2018. https://www.the-scientist.com/news-opinion/proposed-seismic-surveys-raise-concern-over-health-of-marine-life-36612. Accessed October 28, 2019.

30 National Research Council of the National Academies, Division on Earth and Life Studies, Ocean Studies Board, Committee on Potential Impacts of Ambient Noise in the Ocean on Marine Mammals, Ocean Noise and Marine Mammals, 2003.

31 Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

32 McCauley, Robert, D., et. al., High intensity anthropogenic sound damages fish ears, Journal of Acoustical Society of America, January 2003.

33 McCauley, Robert, D., et. al., High intensity anthropogenic sound damages fish ears, Journal of Acoustical Society of America, January 2003.

34 Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

and at similar frequencies.[35] Failure to communicate among members of a species can result in a loss of social organization, an inability for mother whales to locate their calves, or a failure for dispersed members of a group to locate each other and communicate.[36,37] Background noise from seismic surveys can hamper marine mammals' and fish ability to avoid natural or manmade threats.[38,39]

5.2.9. The ability of marine mammals to locate food sources, such as prey species, can be inhibited by seismic surveying. The sounds generated by air guns have been shown to directly impair foraging success in diverse species of marine mammals[4041] as well as to disrupt vocalizations associated with foraging and other essential behavior over large scales.[42] Seismic surveying activities can also result in the migration of prey species from the project area, making them unavailable as a food source for marine mammals.[43]

5.2.10. To avoid the sound waves generated during seismic surveying, marine mammals may vacate the project area, including essential habitats for certain species.[44] The seagrass beds located in the shallow waters of Bazaruto Bay in the project area provide a main source of food and shelter for the dugong, including supporting the largest dugong population in the western Indian Ocean. The dugong is considered a vulnerable species by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species due to declines in its population.[45] The presence and movement of the dugong population in the project area depends strongly on the presence of seagrass beds. Inability to access the seagrass meadows adjacent to the project area due to the presence of seismic survey vessels or abandonment

35 National Research Council of the National Academies, Division on Earth and Life Studies, Ocean Studies Board, Committee on Potential Impacts of Ambient Noise in the Ocean on Marine Mammals, Ocean Noise and Marine Mammals, 2003.

36 Yeager, Ashley, The Scientist, Proposed Seismic Surveys Raise Concern Over Health of Marine Life, May 11, 2018. https://www.the-scientist.com/news-opinion/proposed-seismic-surveys-raise-concern-over-health-of-marine-life-36612. Accessed October 28, 2019.

37 Natural Resource Defense Council, Impacts of Seismic Airgun Noise on Fish and Marine Invertebrates.

38 Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

39 Natural Resource Defense Coalition, Impacts of Seismic Airgun Noise on Fish and Marine Invertebrates.

40 Miller, P.J.O., Johnson, M.P., Madsen, P.T., Biassoni, N., Quero, M. and Tyack, P.L., Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico, *Deep-Sea Research I* 56: 1168-1181 (2009).

41 Pirotta, E., Brookes, K.L., Graham, I.M. and Thompson, P.M., Variation in harbour porpoise activity in response to seismic survey noise, *Biology Letters* 10(5): 20131090 (2014).
E.g., Castellote, M., Clark, C.W., and Lammers, M.O., Acoustic and behavioural changes by fin whales (Balaenoptera physalus) in response to shipping and airgun noise, *Biological Conservation* 147: 115-122 (2012).

43 Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

44 Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01

45 EPDA Report, Pages 54 – 55.

of the area due to the intense sound waves generated during seismic surveying will restrict access to a vital food source and an essential habitat for the dugong population.

5.2.11. Marine mammals may also suffer long-term adverse impacts due to chronic exposure to sounds waves from not only seismic surveying but drilling of exploration and appraisal wells as part of this project and potentially drilling of petroleum production wells in the future.

5.2.12. Seismic surveying can potentially lead directly to death in cetacean populations, such as whales and dolphins, through behavioral changes in response to the intense sound waves generated during seismic surveying. Whale stranding (beaching) incidents have been potentially linked to seismic surveying and it is established that the use of sonar has resulted in whale stranding incidents. Whales stranding themselves on beaches can result in death of the stranded individuals.[46] Incidents of dolphin deaths in response to behavior attempting to protect themselves from the intense sound waves generated during seismic surveying have also been reported. Deaths of cetaceans in response to seismic surveying are likely underreported, since detection of cetacean carcasses is extremely difficult.[47]

5.2.13. Fish reproduction potential is reduced by the sound waves produced by seismic surveying. Sound levels of 120 decibels and above have been shown to decrease egg viability, increase embryonic mortality, decrease larval growth, and the ability of fish larvae to avoid predators.[48] Background noise masks fish mating vocalization, making mating interactions more difficult to occur.[49]

5.2.14. The project area is home to populations of loggerhead and leatherback turtles and green and hawksbill turtles. The loggerhead turtle is considered an endangered species. The leatherback turtle is considered a vulnerable species.[50] The sounds waves from seismic surveying have the potential to adversely impact marine turtle

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46 Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

47 Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01

48 Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01

49 Natural Resource Defense Coalition, Impacts of Seismic Airgun Noise on Fish and Marine Invertebrates.

50 EPDA Report, Page 54.

behavior and cause avoidance of the project area. The potential for reduced hearing sensitivity in marine turtles, whose best hearing occurs in the low frequencies, also exists due to the intense low-frequency sound waves generated during seismic surveying.[51]

5.2.15. The EIS Report needs to document all of the potential adverse impacts to marine animals resulting from the sound waves generated during seismic surveying. The EIS Report also needs to detail the mitigation measures that will be taken to minimize or avoid adverse impacts to marine animals.

5.3. ***Marine Mammal Surveying and Monitoring***

5.3.1. A thorough pre-seismic survey screening and evaluation of environmental factors in the project area and marine life species that may be adversely impacted by seismic surveying vessels and sound wave production is essential to inform and develop a robust monitoring and mitigation program to minimize adverse impacts to marine life, the environment, and the local population. Critical habitats and threatened and endangered species within and in the vicinity of the project area need to be devoted special attention. Mitigation of acute impacts (e.g. marine mammal collision with vessels involved with seismic surveying activities) is imperative, but monitoring for the short-term and long-term impacts to marine life and developing means to mitigate them is also essential to reducing the Project's impact.[52,53]

5.3.2. The deployment of numerous vessels during seismic surveying presents the risk of collision with marine mammals that can cause death or serious injury. The introduction of airguns and streamers used to perform seismic surveying pose risks of collisions or entanglement that can injure or potentially result in the death to marine mammals.

5.3.3. The EPDA Report does not detail which marine mammals are intended to be kept clear of the survey vessels and project area and the methods used to identify them in ocean waters.[54] At least three species of whales and six species of dolphins live

[51] Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01

[52] Nowacek, Doulas P., et. al., Responsible Practices for Minimizing and Monitoring Environmental Impacts of Marine Seismic Surveys with an Emphasis on Marine Mammals, Aquatic Animals 39, pages 356-377, 2013.

[53] International Union for Conservation of Nature, Effective planning strategies for managing environmental risk associated with geophysical and other imaging surveys, A resource guide for managers, 2016.

[54] EPDA Report, Page 12.

in the project area. The endangered dugong lives in the project area.[55] The dugong population in the project area is estimated at between 250 and 350 individuals and is considered the last viable population in the region.[56] In total, three marine mammals considered species of Conservation Concern are located in the project area: the dugong; Indian Ocean Bottlenose dolphin; and, Indo Pacific Humpback dolphin.[57] It is also likely that the Indian Ocean Humpback Dolphin, considered an endangered species, resides in the project area.[58,59]

5.3.4. This, we submit, is a fatal concern / flaw affecting the Project.

5.3.5. Marine mammals can be difficult to detect and the unique behavior and characteristics of each different marine mammal in the project area can impact the ability for them to be located and protected. Visual detection alone is insufficient, since marine mammals are typically located below the water surface and come to the surface to replenish oxygen supplies as needed. As a result, non-visual monitoring methods are required, such as acoustic monitoring or thermal infrared monitoring, to increase the ability to detect marine mammals, although all methods are imperfect. Adequate time allowance prior to initiation of seismic surveying activities is essential to detect marine mammals and allow for implementation of protective measures and prevent them from entering the area where seismic surveying is performed, thus requiring a monitoring area larger than just the location of seismic surveying and of areas directly adjacent to seismic surveying.[60]

5.3.6. As noted above, seismic airgun surveys can disrupt behavior in marine mammals at distances of tens to hundreds of kilometers, well beyond the range at which the maintenance of near-source exclusion areas is practicable. Additionally, establishing such exclusion areas would not mitigate impacts to many other affected taxa, such as fish. For these reasons, mitigation must include measures that reduce the amount of survey activity, achieve the lowest practicable source

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55 EPDA Report, Page 54.

56 Letter to Sasol from Dr. Donna Kwan, Programme Management Officer – Dugongs, Dugong MOU, Subject: Concern over SASOL Seismic Testing and Drilling in Mozambique, July 15, 2019.

57 EPDA Report, Page 56.

58 Plön S, Atkins S, Conry D, Pistorius P, Cockcroft V, Child MF. 2016. A conservation assessment of Sousa plumbea. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

59 Cockcroft, Vic, et. al., Comments on the Proposed Sasol 2 and 3D Seismic Exploration and Exploration Well Drilling in Blocks 16 and 19And (sic) Their Potential for Impacts to Marine Mammals.

60 Verfuss, Ursula, K. et. al., Comparing methods suitable for monitoring marine mammals in low visibility conditions during seismic surveys, Marine Pollution Bulletin 126 (2018) 1-18, October 16, 2017.

levels, and avoid seasons of biological importance to the Area of Impact.

5.3.7. The EIS Report needs to document the species of concern in the project area and detail expected population numbers, seasonal presence, behavioral traits, reproduction time frames and practices, foraging habits, and specific habitat use. Where information essential to impact analysis and a consideration of mitigation is presently unavailable, Sasol must obtain it through wildlife surveys and other research effort. The influence that physical characteristics of the project have on species occurrence in the project area needs to be evaluated in the EIS Report, including the impacts of ocean currents, storm seasonality, and presence of essential habitats, such as coral reefs and seagrass beds. [61]

5.3.8. The EPDA Report fails to detail the specific threats to marine mammals posed by seismic surveying vessels and streamers containing air guns, such as impact by the seismic survey vessels, air guns sound waves, or dangers posed by streamers. The specific threats related to sound wave exposure to marine mammals both acutely and chronically needs to be evaluated to identify mitigation measures. The specific threats of physical injury or death posed by the survey vessels, streamers and air guns need be discussed and specific measures to avoid them need to be detailed in the EIS Report. Mitigation measures should be designed based on the results of the analysis of the specific species anticipated in the project area during seismic surveying and each species unique behavioral traits.[62] For example, while dolphin and whales breach the surface (porpoise) when they come up to breathe, dugong often do not and can stick only the tips of their snouts out of the water when breathing making it difficult if not impossible to see- particularly in turbid or rough waters.

5.3.9. During the Project, the only monitoring measure discussed in the EPDA Report is the deployment of small boats to ensure that marine mammals are not within the vicinity of the seismic surveying vessel.[63]

5.3.10. The specific details of the pre-seismic survey screening and monitoring program to ensure the safety of marine mammals in the project area during seismic surveying activities and mitigate threats to marine mammals needs to be detailed in the EIS

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61 International Union for Conservation of Nature, Effective planning strategies for managing environmental risk associated with geophysical and other imaging surveys, A resource guide for managers, 2016.

62 International Union for Conservation of Nature, Effective planning strategies for managing environmental risk associated with geophysical and other imaging surveys, A resource guide for managers, 2016.

63 EPDA Report, Page 12.

Report, including, but not limited to:[64,65]

- the configuration of the smaller boats around the seismic surveying vessel;
- the size of the monitoring zone;
- the monitoring period to be employed prior to streamer array deployment to ensure no marine mammals are present near acoustic sources when they are initially activated;
- number of personnel employed in locating marine mammals and their duties;
- procedures and instruments (e.g. binoculars) used to visually locate marine mammals;
- procedures and technology used during low-visibility conditions;
- non-visual technologies to be employed during pre-seismic surveying species identification and monitoring during seismic surveying activities, such as passive acoustic monitoring and thermal infrared monitoring;
- protocols for communication with the seismic surveying vessels when marine mammals are spotted and in potential danger;
- protocols the seismic surveying vessel will follow upon identification of a marine mammal that may potentially be endangered by seismic surveying operations;
- protocols for freeing any marine mammal caught in the seismic survey streamers;
- protocols for responding to any incidents where a marine mammal is injured by a vessel, air gun, or streamer;
- protocols for data management and recordkeeping during pre-seismic surveying species identification and monitoring during seismic surveying activities; and
- protocols for training staff tasked with performing monitoring, mitigation measures, communicating threats to marine mammals, and data management and recordkeeping.

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64 Verfuss, Ursula, K. et. al., Comparing methods suitable for monitoring marine mammals in low visibility conditions during seismic surveys, Marine Pollution Bulletin 126 (2018) 1-18, October 16, 2017.

65 International Union for Conservation of Nature, Effective planning strategies for managing environmental risk associated with geophysical and other imaging surveys, A resource guide for managers, 2016.

5.4. ***Adverse Impacts to Zooplankton and the Marine Life Food Chain***

5.4.1. Seismic surveying has the potential to cause mortality to zooplankton populations in the project area, a vital link in the marine life food chain.[66] Healthy populations of marine fish, predator species, and marine mammals are not possible without a healthy zooplankton population. Zooplankton communities also comprise the larval stages of commercial fish species, whose loss can adversely impact commercial fishing, the local population that relies on fishing as an essential food source, and the economy of the local community adjacent to the project area.[67]

5.4.2. The EIS Report must discuss the potential for adverse impacts to zooplankton populations and how those adverse impacts can impact other species in the marine life food chain and commercial fish populations. The EIS Report must also develop measures to mitigate against the adverse impacts seismic surveying may have on zooplankton populations and the resulting adverse impacts to commercial fish populations, the local community, and marine life.

5.5. ***Waste Disposal during Seismic Surveying***

5.5.1. The EPDA report does not discuss appropriate handling, disposal, and treatment methods for wastes generated during seismic surveying, only that the project will be conducted in accordance with national and international standards and conventions that regulate waste management and discharge of materials to the marine environment. During docking at Maputo harbor, waste materials described in the EPDA as "domestic wastes" that are generated on the seismic survey vessels will be managed and disposed of. No details are provided on what domestic wastes will be produced. [68]

5.5.2. The domestic wastes produced by seismic survey vessels are likely to include, at

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[66] McCauley, R.D., Day, R.D., Swadling, K.M., Fitzgibbon, Q.P., Watson, R.A., and Semmens, J.A., Widely used marine seismic survey air gun operations negatively impact zooplankton, *Nature Ecology & Evolution* 1: art. 0195 (2017).

[67] Nature Ecology and Evolution, Volume 1, Article 0195, McCauley, Robert, D., et. al., Widely used marine seismic survey air gun operations negatively impact zooplankton, June 22, 2017. https://www.nature.com/articles/s41559-017-0195.epdf?referrer_access_token=1-FqzpybX5XwfZSeG05TJdRgN0jAjWel9jnR3ZoTv0PhkxaPjqiQpTdLVOByexK8BTL2kkjm-f-IjrpIooVUdIPzaCeUFICGms9jcy-qGr7EQlxZXpPAN9SI5CIUiUlsH5K5bRYhHhgazc5t-0XTUJltZN2UzYxjuc7qyQ4VKkidzcI-xwfCubH50ex7_sfxKXhhXL37YHR-QrU93PqGFcUvLfGOkmcCQAN4PQjoYXU8KOCIXJcxon-3dJD4cJpFaK33k-G5HbconQBaUz3gZPYk3Q0O7cTVKtVjapmRgN6xB4ytGOu3cl-z-xq0Mj91&tracking_referrer=www.the-scientist.com, accessed, October 28, 2019.

[68] EPDA Report, Pages 17 - 18.

a minimum, paper and plastic trash, food-related waste, and human-related wastes. Improper handling or disposal of floatable trash or human-related wastes (raw sewage) can adversely impact marine animals and sensitive marine and coastal environments in and adjacent to the project area, such as coral reefs, seagrass beds, and mangroves. For example, coral reefs provide habitat for 249 species of fish and are a major tourist attraction.[69]

5.5.3. Plastics, such as plastic bags or bottles, that are improperly disposed of into the marine environment can accumulate in coral reefs, block sunlight essential to photosynthesis and can damage corals. Degraded plastics can be consumed by fish, turtles, and other marine mammals. Consumption of plastic trash by marine animals can lead to blocking of digestive tracts and introduction of toxic chemicals into their bodies.[70]

5.5.4. Raw sewage contains pathogens and nutrients (nitrogen and phosphorus) that are detrimental to the survival of coral reefs.[71] Coral reefs are adapted to low-nutrient environments and nutrients have the potential to produce harmful algal blooms that block sunlight required for photosynthesis and consume dissolved oxygen that corals rely upon for respiration.[72,73] Pathogens in raw sewage can cause disease in corals.[74]

5.5.5. The local population can also be adversely impacted through potential exposure to pathogens in raw sewage and food-borne illnesses or reductions in local tourist activity and subsequent economic activity due to environmental degradation through improper waste handling and disposal.[75]

5.5.6. The EIS Report must discuss the types of domestic wastes generated on the seismic survey vessels and associated vessels and protocols for their proper management, disposal, and treatment (if required). The EIS Report must include

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69 EPDA Report, Pages 49 - 50.

70 United State Department of Environmental Protection, Threats to Coral Reefs, May 4, 2018, https://www.epa.gov/coral-reefs/threats-coral-reefs. Accessed, October 30, 2019.

71 United State Department of Environmental Protection, Threats to Coral Reefs, May 4, 2018, https://www.epa.gov/coral-reefs/threats-coral-reefs. Accessed, October 30, 2019.

72 United State Department of Environmental Protection, Threats to Coral Reefs, May 4, 2018, https://www.epa.gov/coral-reefs/threats-coral-reefs. Accessed, October 30, 2019.

73 Phys.org, Researchers show that corals adapt to photosynthetic rates to prevailing environmental conditions, February 5, 2019, https://phys.org/news/2019-02-corals-photosynthetic-prevailing-environmental-conditions.html. Accessed October 31, 2019.

74 United State Department of Environmental Protection, Threats to Coral Reefs, May 4, 2018, https://www.epa.gov/coral-reefs/threats-coral-reefs. Accessed, October 30, 2019.

75 EPDA Report, Pages 17 - 18.

protocols for cleaning up and mitigating the impacts to the marine environment in the event of accidental or intentional releases of domestic wastes generated during seismic surveying activities.

5.6. ***Offshore Drilling***

5.6.1. Based on the results of seismic surveying, exploration well drilling and testing may commence. First, an exploration well will be drilled, followed with the potential for drilling two additional wells, known as appraisal wells. The drilling of each well is expected to take approximately two months, resulting in extending the Project to a total of approximately 10 months in length if both appraisal wells are drilled.[76] The proposed wells would be drilled in shallow waters ranging in depth from 10 meters to 50 meters.[77]

Drilling Fluids (Mud) and Drill Cuttings Releases**:**

5.6.2. Drilling fluids are used during well development to remove rock cuttings to the surface, maintain wellbore stability, cool and lubricate the drill bit, balance permeable formations, and transmit hydraulic energy to the drilling tools and bit.[78]

5.6.3. Table 6 of the EPDA details the typical components of drilling fluids to be used for well drilling during the Project. The base fluid in drilling fluids is water, but it also contains numerous known and unknown chemicals. The known chemicals include potassium chloride, calcium carbonate, potassium hydroxide and clarified xanthum gum (a polysaccharide-based thickener). The unknown chemicals include a polyamine shale inhibitor, biocide, defoamer, and a fluid loss reducing additive.[79] Since the chemicals that comprise the unknown chemicals in drilling fluid are not included in the EPDA Report, the extent of their toxicity and the potential adverse impact to the marine environment and local population as a result of drilling fluid releases cannot be ascertained at this time.

5.6.4. Drilling fluids that come up from the well contain, in addition to the chemicals listed in Table 6, drill cuttings consisting of rock and sediment removed from the well-hole during drilling operations. The EPDA Report does not detail the expected chemical and mineral composition of the drill cuttings.

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[76] EPDA Report, Pages 12 and 18.
[77] EPDA Report, Page 20.
[78] EPDA Report, Page 23.
[79] EPDA Report, Page 20.

5.6.5. During drilling in the shallow waters of the project area, the potential for drilling fluids releases exists that could result in numerous adverse impacts. In the event of either a release of drilling fluids underwater or a spill at the water surface, all of the chemicals listed, included the listed unknown chemical constituents, and drill cuttings of an unknown chemical and mineral composition removed from the well hole would be released into the marine environment with a multitude of potential adverse environmental impacts. Due to the unknown nature of these chemicals and drill cuttings, the potential adverse impacts they pose to marine life, the marine environment, and the local population cannot be ascertained at this time. According to the EPDA Report itself, direct discharge of drilling fluids and the resulting cuttings would result in "significant" impacts.[80] The shallow nature of the waters where drilling would occur can exasperate the impacts of drilling fluid or drill cutting releases to the environment.

5.6.6. Coral reefs exist in areas of low sediment deposits and provide habitat for 249 species of fish and are a major tourist attraction.[81] Sediment from a drilling fluid release that deposits on coral reefs can smother corals and interfere with their ability to feed, grow, and reproduce.[82] Coral reefs require conditions that include high light exposure and low turbidity, conditions that a sediment laden marine environment does not provide.[83] The chemicals in drill fluids could potentially be toxic to coral reefs. Damage to the coral reefs in and adjacent to the project area could also have detrimental on impacts on fish populations through habitat loss and the local community through reductions in its ability to fish and economic activity related to tourism.

5.6.7. Seagrass beds are located in shallow areas with low rates of sediment deposition. They provide essential food sources to the endangered dugong and to green turtles and support numerous species including crustaceans, echinoderms (e.g. starfish, sea urchins), and mollusks. Seagrass beds act as a refuge for fish and provide important breeding, nursing, and nesting areas.[84] Sedimentation, loss of adjacent supporting habitat, such as coral reefs, and chemical exposure resulting from a drilling fluids release that adversely impact seagrass beds would have a

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80 EPDA Report, Page 24.

81 EPDA Report, Pages 49 - 50.

82 United State Department of Environmental Protection, Threats to Coral Reefs, May 4, 2018, https://www.epa.gov/coral-reefs/threats-coral-reefs. Accessed, October 30, 2019.

83 National Oceanic and Atmospheric Administration, Oil Spills in Coral Reefs Planning and Response Considerations, July 2010.

84 EPDA Report, Pages 50.

corresponding impact on all of the species that rely upon the seagrass bed as an essential habitat for their survival.[85]

5.6.8. This region is a major feeding ground for the globally threatened reef manta ray, with the largest documented population in Africa (Marshall et al 2011) and indeed the largest documented feeding aggregations in Mozambique. As filter feeders they could be gravely impacted. The largest documented population of whale sharks in Africa lives off this coastline as well and as endangered species could also be affected.

5.6.9. The EIS Report needs to include the full list of chemical constituents in drilling fluids and the anticipated chemical and mineral composition of drill cuttings. The EIS Report needs to detail the potential risks they pose to marine life and the marine environment. A failure to include such critical information in the EIS Report would constitute data gaps that would result in an entirely unknown threat to marine life and the marine environment in the project area.

5.6.10. The EIS Report needs to detail safeguards for preventing drilling fluid spills from the well hole and protocols for safe handling of drilling fluids and drill cuttings to prevent spills.

5.6.11. The EIS Report needs to detail the protocols that will be following in the event of a drilling fluid release at the well hole or spill on the surface to minimize the risk of adverse impacts to marine life, the marine environment and the local community.

Drilling Fluids and Cuttings Disposal:

5.6.12. The selected disposal method for drilling fluids and drill cuttings is ocean disposal in deeper water ranging in depth from 400 meters to 800 meters. The EPDA Reports describes deep-water disposal of drilling fluids and cuttings as an alternative that "would severely limit" the adverse impacts to the marine environment associated with shallow water discharge and as "the most viable option for disposal." [86] The EPDA does not discuss what the impacts from deep water disposal are on either the deep-water marine environment or any resulting impacts on the shallow water marine environment.

5.6.13. The EIS Report needs to detail the potential impacts related to deep water drilling

[85] Gullstrom, Martin, et. al., Seagrass Ecosystems in the Western Indian Ocean, Journal of the Human Environment, December 2002.

[86] EPDA Report, Page 24.

fluids and drill cuttings disposal on the marine environment in the deep water disposal area and the shallow waters adjacent to the disposal area.

5.6.14. Land disposal of drilling fluids and drill cuttings was determined to be unfeasible for a variety of reasons:[87]

- Beira harbor, the closest harbor to the project area, does not have an established onshore disposal facility.
- Maputo harbor would require more ships to convey drilling fluids and drill cuttings for disposal and additional vessel movement raises the potential risks of collisions with marine mammals and other vessels.
- There is no immediate onshore waste facility within the appropriate hazard class to dispose of drilling fluids and drill cuttings.

5.6.15. The EPDA reports states that further investigations will be conducted to determine land disposal is a feasible option.[88] It is submitted that this aspect alone constitutes a fatal flaw in the Project.

5.6.16. Land disposal of drilling fluids and cuttings is the alternative with the least potential adverse impact to marine life and the marine environment. And yet it seems unlikely that this option is possible. EIS Report needs to provide a detailed investigation of all land disposal options, including:

- Not limiting the onshore disposal location to areas in the immediate project vicinity.
- Clearly defining the hazard class of drilling fluids and cuttings, which can provide additional details on the potential adverse impacts their release may cause to the marine environment and local population.
- Considering construction of an onshore facility to safely dispose of drilling fluids and cuttings near Beira harbor or other suitable locations.

<u>Petroleum Spills:</u>

5.6.17. The EPDA Report does not discuss the potential for petroleum spills during well drilling and testing and any safeguards that will be utilized to prevent petroleum

[87] EPDA Report, Page 24.
[88] EPDA Report, Page 24.

spills. The EPDA Report does not discuss protocols and contingencies for responding to a petroleum spill and minimizing its impact. Considering the drilling location in the shallow water, petroleum spills have the potential for severe adverse impacts to marine life, the marine environment, and the local population.

5.6.18. An oil spill modelling report must be included in the EPDA and part of the specialist studies for the EIS Report.

5.6.19. Adverse impacts on marine animals and the marine environment related to the project area include, but are not limited to: [89]

- Reduced growth, enlarged livers, changes in heart and respiration rates, fin erosion and reproduction impairment in adult fish;[90]
- Reductions in fish egg and larvae survivability;[91]
- Destruction of the water repellency of bird feathers, thus exposing birds to environmental elements they are unaccustomed to;[92]
- Ingestion of oil by birds or marine mammals, which can result in death;[93]
- Impeded coral reproduction, growth, behavior, development and, potentially, death;[94]
- Degradation and even complete death of mangroves;[95]
- Chronic poor health, failed pregnancies, and increased mortality in dolphin populations;[96] and
- The chemicals used during oil spill cleanups in the ocean pose additional adverse impacts to marine animals and the marine environment.[97]

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89 National Oceanic and Atmospheric Administration, How does oil impact marine life, June 25, 2018, https://oceanservice.noaa.gov/facts/oilimpacts.html. Accessed October 30, 2019.

90 National Oceanic and Atmospheric Administration, How does oil impact marine life, June 25, 2018, https://oceanservice.noaa.gov/facts/oilimpacts.html. Accessed October 30, 2019.

91 National Oceanic and Atmospheric Administration, How does oil impact marine life, June 25, 2018, https://oceanservice.noaa.gov/facts/oilimpacts.html. Accessed October 30, 2019.

92 National Oceanic and Atmospheric Administration, How does oil impact marine life, June 25, 2018, https://oceanservice.noaa.gov/facts/oilimpacts.html. Accessed October 30, 2019.

93 National Oceanic and Atmospheric Administration, How does oil impact marine life, June 25, 2018, https://oceanservice.noaa.gov/facts/oilimpacts.html. Accessed October 30, 2019.

94 National Oceanic and Atmospheric Administration, Oil Spills in Coral Reefs Planning and Response Considerations, July 2010.

95 National Oceanic and Atmospheric Administration, Oil Spills in Mangroves Planning and Response Considerations, September 2014.

96 National Oceanic and Atmospheric Administration, Office of Response and Restoration, Summarizing Five Years of NOAA Research on the Impacts of the Deepwater Horizon Oil Spill on Dolphins, October 30, 2019, https://response.restoration.noaa.gov/about/media/summarizing-five-years-noaa-research-impacts-deepwater-horizon-oil-spill-dolphins.html. Accessed October 30, 2019.

97 National Oceanic and Atmospheric Administration, Office of Response and Restoration, How Oil Harms Animals and Plants in Marine Environments, October 30, 2019, https://response.restoration.noaa.gov/oil-and-

5.6.20. The EIS Report needs to discuss the potential for petroleum spills from the Project and the associated adverse environmental impacts. The EIS Report needs to detail safeguards included in the Project to safeguard against petroleum spills during drilling operations. Protocols and contingencies for response to a petroleum spill must be included in the Project.

5.7. ***Tourism***

5.7.1. Tourism in the districts adjacent to the project area is a vital industry and an important aspect of the local economy. The Bazaruto Archipelago National Park (BANP) and Zinave National Park are located adjacent to and/or in the Project area, and these natural areas are drivers of the local tourism industry. The Mozambique Strategic Development Plan for Tourism includes Vilankulo, Inhassoro, and Bazaruto areas located adjacent to the project area as a National Priority Area for Tourism Investment. [98]

5.7.2. Adverse impacts to the natural beauty of the environment in the coastal regions of the districts adjacent to the project area has the potential to inhibit tourist activity during the Proposed Project and after its completion. The BANP and coral reefs are major tourist attractions.[99] Any impacts from the Project on the aesthetic beauty of the BANP, coral reefs, mangroves, and other natural attractions that drive the tourism industry in the districts adjacent to the project area have the potential to reduce tourist demand in the near-term and long-term. The local population that relies on the tourist industry for employment would be adversely impacted as a result.[100] Reductions in the long-term growth potential of the tourism industry in the districts adjacent to the project area would adversely impact local economic development and economic opportunities for the local population for years after completion of the Project.

5.7.3. Whale watching is a tourist attraction in the project area between the months of July and December.[101,102] Whales are visible at the surface for only brief periods of time and the presence of seismic survey vessels and the vessels that accompany

chemical-spills/oil-spills/how-oil-harms-animals-and-plants-marine-environments.html. Accessed October 30, 2019.

98 EPDA Report, Pages 63 - 64.

99 EPDA Report, Pages 49 and 63.

100 Press Release, October 28, 2019.

101 Sunset Dhow Safaria, http://www.sunsetdhowsafari.com/whale-watching-bazaruto-archipelago-mozambique/. Accessed October 31, 2019.

102 Anantara Hotels Resorts Spas, The Journey of the Humpback Whales in Mozambique, July 9, 2019, https://www.anantara.com/en/press-releases/0709-the-journey-of-the-humpback-whales-in-mozambique. Accessed October 31, 2019.

them on the ocean surface can influence whale behavior.[103] The sounds waves generated during seismic surveying and exploratory well drilling can impact whale movement patterns and may cause whales to vacate and avoid the project area and the adjacent ocean areas.[104,105] Changes in whale behavior and movement patterns would reduce the ability of whale watchers to observe whales within the project area and adjacent ocean areas, thus potentially adversely impacting tourist activity related to whale watching and the local economy. In order to minimize adverse impacts on the tourism industry, seismic surveying which generates the strongest sound waves in the ocean associated with the Project, should be prohibited between July and December to minimize impacts on whale watching activity.

5.7.4. Tourist activities rely heavily on the pristine nature of the project area, such as snorkeling and underwater diving in the coral reefs.[106] In addition to whale watching, the other marine species common to the project area, including dolphins, sharks, manta rays, sea turtles and the dugong draw tourists to the area. [107,108] Any interruption the natural movement patterns of these species or the viability and natural beauty of the coral reefs, seagrass beds or mangroves in the project area can adversely impact tourism and the local economy.

5.8. ***Local Community***

5.8.1. The local community in the vicinity of the Project area is characterized by high levels of poverty and illiteracy. Access to transportation, electricity, and adequate road infrastructure is limited. The disadvantages faced by the local population can make their participation in the public comment and participation process nearly impossible in many cases, and as important stakeholders who will be impacted immensely by the proposed project, the local population has limited ability to

[103] Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

[104] Gordon, Jonathan, C.D., et. al., A Review of the Effects of Seismic Survey on Marine Mammals, Marine Technology Society Journal.

[105] Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01

[106] Siyabona Africa, Mozambique Travel Guide to Bazaruto Archipelago, 2017, http://www.mozambique.co.za/Mozambique_Regional_Info-travel/bazaruto-archipelage-travel-guide.html. Accessed November 4, 2019.

[107] Siyabona Africa, Mozambique Travel Guide to Bazaruto Archipelago, 2017, http://www.mozambique.co.za/Mozambique_Regional_Info-travel/bazaruto-archipelage-travel-guide.html. Accessed November 4, 2019.

[108] Venables, Stephanie, et. al., A Giant Opportunity: The Economic Impact of Manta Rays on the Mozambican Tourism Industry, An Incentive for Increased Management and Protection, Tourism in Marine Environments, Volume 12, No. 1, pages 51-68, 2016.

provide input during the Environmental Impact Assessment process.[109]

5.8.2. Much of the local population relies upon subsistence farming and fishing for sustenance.[110,111] The Project has the potential to adversely impact the local economy and the local population's ability to provide itself basic sustenance by adversely impacting the availability of fish and access to fishing grounds within and adjacent to the project area.

5.8.3. Fishing is performed by the local population in the project area on both a small, individual and industrial scale. Industrial fishing occurs primarily east of the Bazaruto Archipelago and small-scale fishing occurs in areas adjacent to the coast. The project area is located within the Sofala Bank, the most important fishing ground in Mozambique. Fishing is the dominant economic activity in the coastal regions of Inhassoro, Govuro, and Machanga districts adjacent to the project area.[112]

5.8.4. The Project has the potential to reduce the availability of fish in the ocean waters within and adjacent to the project area in numerous ways in the short and long-term, including:

- Reduction in the zooplankton populations, which form a vital link in the marine life food chain and contain the larval stages of commercial fish populations;
- Damage to essential ecosystems, such as coral reef and seagrass beds, which provide shelter and breeding ground for fish populations, caused by drilling fluids and drill cuttings releases, spills, or ocean disposal, domestic waste releases, or petroleum spills;
- Movement of fish populations away from seismic survey vessels and associated boats in the project area;
- Behavioral changes and adverse health impacts in fish populations caused by sound waves produced during seismic surveying;
- Adverse health impacts resulting from potential oil spills on adult fish populations; and

[109] EPDA Report, Page 64.
[110] EPDA Report, Page 64.
[111] ERM, Environmental Impact Assessment for Sasol's Off-Shore Exploration Project in Blocks 16 & 19 Inhambane and Sofala Provinces Mozambique, Final EPDA Report, Non-Technical Summary, March 2006.
[112] EPDA Report, Pages 61-62.

- Reductions in fish egg and larvae viability resulting from potential oil spills.

5.8.5. During seismic surveying, an exclusion zone will be created around the seismic surveying vessel that will inhibit all access by all commercial or private vessels that will extend up to 5.5 kilometers (km) in front of the seismic survey vessel, up to 7.4 km to each side of the seismic survey vessel, and 14.8 km behind the seismic survey vessel. The resulting exclusion zone would have an area up to 300 square km that would be prohibited from fishing activities by the local population during the approximately four months of seismic surveying.[113] Additional restrictions are likely during the up to six month time from of exploratory and appraisal well drilling operations.

5.8.6. Culturally, the local population has strong connections to the sea and traditional ceremonies are commonly held in the coastal areas.[114] The Project has the potential to disrupt the important cultural connection the local population has with the project area.

5.9. ***Summary of comments on impacts and fatal flaws***

5.9.1. The Project has the potential for numerous adverse impacts to marine life, the marine environment, the local community, and local economic activity and development. Seismic surveying activities and the sound waves it produces can result in adverse health effects, even death, and behavioral changes in marine wildlife, including a number of endangered and vulnerable species.

5.9.2. Exploratory well drilling activities using drilling fluids containing unknown chemical constituents and producing drill cuttings of an unknown chemical and mineral composition have the potential for accidental releases and ocean disposal that threaten the sensitive marine environment, including coral reefs and seagrass beds and all of the marine animals that rely upon them as essential habitats.

5.9.3. As with any project that involves drilling oil wells in the ocean, the ever-present risk of petroleum spills to the marine environment and their long-lasting, widespread, and devastating impacts exist for the Project. The local community will be impacted through reductions in their ability to fish, a life-sustaining activity for much of the population. Economic activity and economic growth may be inhibited, due to

113 EPDA Report, Page 16.

114 ERM, Environmental Impact Assessment for Sasol's Off-Shore Exploration Project in Blocks 16 & 19 Inhambane and Sofala Provinces Mozambique, Final EPDA Report, Non-Technical Summary, March 2006.

reductions in tourist activity, the growth of the tourism industry, and commercial and individual fishing activity.

5.9.4. The above constitutes environmental and socioeconomic risk that are fatal flaws to the Project.

6. SPECIALIST STUDIES, CLIMATE IMPACT & THE PRECAUTIONARY APPROACH

6.1. The EPDA Report states that "there is limited data available for [plankton and invertebrate] in the project area.." This is not acceptable as this phase of the EIA process is for establishing the baseline data with specialist input on all areas that may be impacted by the Project.

6.2. Section 9 of the EPDA Report is titled "CONCLUSION" and lists the proposed specialist studies to be undertaken during the EIA phase, which we, submit, is inadequate.

6.3. Anthropogenic climate change is real and poses serious risk for the wellbeing of humans and our society. The IPCC, in its recent IPCC Special Report on the impacts of global warming of 1.5ºC above pre-industrial levels, found: "Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate (high confidence).Estimated anthropogenic global warming is currently increasing at 0.2°C (likely between 0.1°C and 0.3°C) per decade due to past and ongoing emissions (high confidence).

6.4. Other features of the climate system that are changing include changes in the basic circulation patterns of the atmosphere and the ocean; increasing intensity and frequency of many extreme weather events; increasing acidity of the oceans; rising sea levels and consequent increases in coastal flooding; and intensification of the hydrological cycle.[115]

6.5. There is no doubt that Mozambique is already feeling the effects of the climate crisis. Intense Tropical Cyclone Kenneth was the strongest tropical cyclone to make landfall in Mozambique since modern records began, hitting northern Mozambique with a windspeed of 220km/h (140mph) on 25 April 2019, flattening thousands of homes

[115]National Oceanic and Atmospheric Administration, USA (NOAA) (2018), Global Climate Report – Annual 2017.

flooding low-lying areas. It may be the strongest storm to ever hit Africa's East Coast. This occurred just 5 weeks after Cyclone Idai killed over 1000 people in Mozambique, Zimbabwe and Malawi. The UN World Meteorological Organization projects the disaster could be among the worst weather-related disasters in the southern hemisphere with the destruction of more than 360,000 hectares (900,000 acres) of crops, damage to at least 17,000 houses, and affecting nearly 2 million people.[116] The UN's Economic Commission for Africa estimates that Mozambique, Zimbabwe, and Malawi, may have lost $1 billion worth of infrastructure in the cyclone. [117]

6.6. Recognising this risk, governments of the world have agreed to limit warming to 1.5-2°C under the Paris Agreement. Mozambique is signatory to this Agreement. To have any chance of meeting the Paris 2°C target, carbon emissions around the world need to be decreasing rapidly. Opening up and using new fossil fuel reserves or resources increases carbon emissions, in conflict with what is required under the Paris Agreement. There is no room for any new fossil fuel development.

6.7. It is a reasonably foreseeable future activity that Sasol hopes to engage in production if fossil fuels are discovered. Therefore, it is necessary for stakeholders and decision-makers to understand the climate impacts of the production phase prior to a licence for this phase. Failure to do so would allow Sasol to argue that, since it has already invested large sums of money for exploration, then it should be allowed to engage in production regardless of the costs of the climate impacts.

6.8. There is no climate impact assessment listed for investigation in the EIS Report. Climate change is a relevant consideration when granting an environmental licence, and a formal expert report on climate change impacts is the best evidentiary means to consider climate change impacts in their multifaceted dimensions.

6.9. The precautionary principle features widely in environmental legislation around the world, including Law No 20/1997, Article 4. Precaution entails that where there is a threat of serious or irreversible damage to a resource, the lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. It is based on the theory that it is better to err on the side of caution and prevent environmental harm which may become irreversible.

[116] https://www.nature.com/articles/d41586-019-00981-6
[117] https://blogs.nasa.gov/hurricanes/tag/idai-2019/

6.10. In light of the acknowledgement that "due to environmental sensitivity of the shallow area, SPMEL agreed with MIREME to suspend exploration activities in the shallow water part of Block 16 and 19 until a Strategic Environmental Assessment (SEA) is published my Mozambique authorities"[118] it is submitted that this precautionary approach should not be disregarded simply because the SEA document is taking a while to publish.

6.11. Aside from a climate impact assessment study, other specialist studies, or components that appear to be missing from the EDPA Report / TOR include:

6.11.1. Baseline assessments;

6.11.2. Marine mammals;

6.11.3. Endangered species including sharks, rays and dugongs;

6.11.4. Maritime heritage;

6.11.5. Oil spill modelling;

6.11.6. Cutting modelling;

6.11.7. Oil spill contingency plan; and

6.11.8. Cumulative impacts.

6.12. There should also be independent reviews of the above and proof of financial provision for environmental clean-up, contingency and closure.

7. PUBLIC PARTICIPATION PROCESS

7.1. We submit that the public participation process conducted to date is flawed as the parties to this submission were not informed of the Project timeously nor were they invited to the public meetings.

7.2. We request the following public participation steps are taken in the EIS phase, particularly in view of the voluminous and highly technical reports that are anticipated:

[118] EPDA Report, page1.

7.2.1. Upfront communication to all I&APs of the public participation proposed for the EIA as this information is missing from the EPDA Report.

7.2.2. A 60-day public comment period for the draft EIS Report, inclusive of specialist studies.

7.2.3. A two-day workshop to be held with specialists at an easily accessible venues and suitable day and time, with translation services available, to allow I&APs to engage verbally with the specialists over their findings.

7.2.4. Technical information and specialist findings that are presented to local residents in a way that can be easily understood.

8. REQUEST FOR ADDITIONAL INFORMATION

8.1. In addition to our comments on the EPDA Report and request for additional technical Project information, we also request the following:

8.1.1. A copy of the screening/pre-assessment application;

8.1.2. A copy of the official outcome of such pre-assessment application;

8.1.3. A copy of the officially adopted minutes of the meeting held in August 2017 between Sasol's environmental team and officials of the National Director for Environment as mentioned on page 1 of the EPDA Report;

8.1.4. A copy of the request by Sasol submitted in December 2017 and subsequent approval by MITADER received on 24 January 2018;

8.1.5. Results of the modeling exercises performed in 2008 in association with the Environmental Impact Assessment related to the off-shore exploration drilling in the M-10 and Sofala Concessions;

8.1.6. Reports detailing impacts that were made as a result of seismic surveying and exploratory well drilling in the deep water sections of Blocks 16 and 19 in 2008 and 2009;[119,120]

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119 EPDA Report, Page 1.

120 ERM, Offshore Hydrocarbon Exploration Drilling Operations in the Sofala Concession Area, Sofala and Inhambane, Mozambique, Environmental Impact Assessment Report, Final Report, March 2011, Pages I-1 and I-2.

8.1.7. Monitoring and/or audit reports for Sasol's previous exploration activities in the region as this will assist in the identification and evaluation of the proposed activities.

8.1.8. The name and curriculum vitae of the independent peer reviewer to be appointed and the other experts we have requested be appointed to review the respective specialist studies.

8.1.9. Details of the public participation process to date including:-

- A list of all stakeholders identified;
- Proof of notification to such stakeholders of public meetings;
- List of places where EPDA Report was distributed;
- List of community meetings held;
- Copies of register of attendance at public meetings.

8.1.10. Copy of the Comments & Response Report once prepared (as referred to on page 7 of the EPDA Report).

8.1.11. Details as to when the seismic surveys and drilling could safely occur without unnecessary risk or impact given that:

- Cyclone season is from December to March;
- Turtle breeding season is approximately November to March.
- April and May are Giant Manta season (also to be uplisted to endangered); and
- Whale season is from July to September/October; and
- Whale shark (an endangered species) season is during October and November.

8.1.12. An electronic copy of the final version of the EPDA Report once it has been submitted to the MITADER, in which the changes to the EPDA Report dated June 2019 are highlighted (for example in a different colour text) for ease of reference.

9. CONCLUSION

9.1. For the multiple reasons provided above, we submit that MITADER should reject the

EPDA Report and only allow the EIA to proceed and EIS Report to be prepared once these procedural and content non-compliances have been addressed in a new EPDA Report that undergoes another round of public participation.

9.2. In the event that MITADER allows Sasol to proceed to the next stage, we reiterate our concerns with the EPDA Report and the vital aspects that need to be included in the EIS Report.

9.3. Lastly, we remind Golder of its obligations, as an independent consultant, to be objective, even if this results in views and findings that are not favourable to the application, and to disclose all material information to the authorities and I&APs that reasonably has or may have the potential of influencing any decision to be taken by MITADER and the objectivity of any report.

Kindly acknowledge receipt hereof.

Yours faithfully,

Tiffany Shauer

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